CONFERENCE BOOK

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ICSAS 4th INTERNATIONAL CONFERENCE ON ARTIFICAL INTELLIGENCE AND COMMUNICATION TECHNOLOGIES
MARCH 7 - 9, 2025
İZMIR

Edited By
Assoc. Prof. Dr. Rungchacadaporn

ORGANIIZATION
ACADEMY GLOBAL CONFERENCES

EVALUATION PROCESS
All applications have undergone a double-blind peer review process.

PARTICIPATING COUNTRIES
TURKEY – Kyrgyzstan- Saudi Arabia- Qatar- Indonesia- Vietnam- Russia.- Romania- Tanzania- Brazil- Botswana- South Korea- Togo- Ethiopia

PRESENTATION
Oral presentation

PERCENTAGE OF PARTICIPATION
More than 50 % of paper are presented by participants from maintained countries.
10 papers from Turkey and 19 paper from other countries.

Members of the organizing committees of the conference perform their duties with an "official assignment letter"

LANGUAGES
Turkish, English, Russian, Persian, Arabic

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ICSAS ACADEMY CONFERENCES
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ICSAS 1st International Conference on Biochemistry and Molecular Biology March 7 – 9, 2025 IZMIR Meeting ID: 885 7151 8350 Passcode: 202224				
7 Mart / March 7, 2025 / 11:00 – 13:00 Time zone in Turkey (GMT+3)				
Salon	Moderator		Bildiri No ve Başlığı / Paper ID and Title	Authors
HALL / SALON 1	**Dr. Öğr. Üyesi Özge ÖZCAN**	1	COMPARISON OF R PROGRAM AND CHATGPT IN PHYLOGENETIC TREE CONSTRUCTION: PROBLEMS AND SOLUTIONS	Undergraduate, ÜMMÜHAN ŞAŞ Professor Doctor, YUSUF KURT
		2	Türkiye'deki *Anatololacerta anatolica* (Werner, 1900) Türünün Genom-Çaplı Belirteçlere Dayalı Filocoğrafyası	Araş. Gör. Ahmet Gökay KORKMAZ Prof. Dr. Çetin ILGAZ Prof. Dr. Yusuf KUMLUTAŞ Dr. Öğr. Üyesi Mehmet Kürşat ŞAHİN Prof. Dr. Serkan GÜL Doç. Dr. Elif YILDIRIM CAYNAK Doç. Dr. Kamil CANDAN
		3	ARONYA (*Aronia melanocarpa*) MEYVESİNİN METANOL EKSTRESİNİN ANTİOKSİDAN ETKİSİNİN BELİRLENMESİ	Dr. Öğr. Üyesi Özge ÖZCAN Öğr. Gör. Elif GEZER ASLAN
		4	GÜVEM MEYVESİNİN *(PRUNUS SPİNOSA* L.) ANTİOKSİDAN, ANTİMİKROBİYAL VE SİTOTOKSİKETKİSİNİN BELİRLENMESİ	Mehmet Halim KAHRAMAN Prof. Dr. Figen ERTAN Dr. Öğr. Üyesi Özge ÖZCAN
		5	*Escherichia coli'* DE NAKAVT OLMASI İLE FERULİK ASİTE KARŞI DUYARLILIĞI ARTIRAN BAZI GENLER	PhD Student Hatice ÖZTÜRKEL KABAKAŞ PhD Student Kadriye Aslıhan Onat Taşdelen Dr. Öğr. Gör. Merve SEZER KÜRKÇÜ Doç. Dr. Bekir ÇÖL
		6	FERULİK ASİTİN BİYOYARARLANIMINI ANLAMADA MOLEKÜLER VE MİKROBİYOLOJİK ÇALIŞMALAR	PhD Student Hatice ÖZTÜRKEL KABAKAŞ Dr. Öğr. Gör. Merve SEZER KÜRKÇÜ Doç. Dr. Bekir ÇÖL
		7	*Escherichia coli'*DE p-KUMARİK ASİT TOLERANSINI AZALTAN BAZI GENLER: *pgpB, fadL, ydeU*	KADRİYE ASLIHAN ONAT TAŞDELEN HATİCE ÖZTÜRKEL KABAKAŞ Dr. Öğr. Gör. MERVE SEZER KÜRKÇÜ Doç. Dr. BEKİR ÇÖL

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HALL / SALON 2	**Prof. Dr. Hasan Ekim**	1	The Place of Salt and Iodine in Our Health	Doç. Dr. Meral Ekim Prof. Dr. Hasan Ekim
		2	HYPERTENSION IN ELDERLY PEOPLE	Doç. Dr. Meral Ekim Prof. Dr. Hasan Ekim
		3	MOR LAHANA'DAN (*Brassica oleracea var. capitata f. rubra*) İZOLE EDİLEN POLİFENOL OKSİDAZ ENZİMİNİN BİYOKİMYASAL KARAKTERİZASYONU	Y. Lisans Öğrencisi, Çiğdem ULAMAN Dr. Öğr. Üyesi Elif Duygu KAYA
		4	DİYABETİK HASTALARDA LAKTAT/ALBUMİN (L/A) ve SİSTEMİK İMMUN İNFLAMATUVAR İNDEKS (SII) DEĞERLERİNİN DİYABETİK KRONİK BÖBREK HASTALIĞI İLE İLİŞKİSİ	Dr. Öğretim Üyesi Murat ARI Dr. Hakan CENGİZ Dr. Öğretim Üyesi Ayça TUZCU
		5	ANTIMICROBIAL POTENTIAL ACTIVITIES OF VARIOUS SOLVENT EXTRACTS OF *Hyocyamus aureus* (SOLANACEAE)	Elanur DEMİR Alevcan KAPLAN Emine ÇELİKOĞLU Mehmet BOĞA
		6	TIROID UYARICI HORMON TRIIYODOTIRONIN VE TIROKSIN HORMONLARININ EŞ ZAMANLI ÖLÇÜLMESINDE ÇIFT KATLI NANOPARTIKÜL TABANLI IMMÜNOSENSÖR GELIŞTIRILMESI	Dr. Öğretim Üyesi ÜMİT YAŞAR Dr. Öğretim Üyesi UMUT KÖKBAŞ Dr. Öğretim Üyesi ZEHRA GÜL YAŞAR Ar. Gör. Dr. BAŞAK GÜNAŞTI MSc. YASEMİN ÖZKÜÇÜK Prof. Dr. ABDULLAH TULİ

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HALL / SALON 3	**Öğr. Gör. Dr. OKAN DEDE**	1	EĞİTİM FAKÜLTESİ ÖĞRENCİLERİNİN ÇOCUKLARIN DİJİTAL HAKLARINA YÖNELİK GÖRÜŞLERİ	DOÇ. DR. AYŞEGÜL AYYILDIZ ASİL ÖĞRETMEN, ABDURRAHMAN ASİL
		2	EĞİTİM FAKÜLTESİ ÖĞRENCİLERİNİN PAYLAŞAN EBEVEYNLİK (SHARENTING) HAKKINDAKİ FARKINDALIKLARININ İNCELENMESİ	DOÇ. DR. AYŞEGÜL AYYILDIZ ASİL ÖĞRETMEN, ABDURRAHMAN ASİL
		3	INTERDISCIPLINARY LEARNING THROUGH STEM AND MAKER ACTIVITIES: AN APPLICATION AT THE PRIMARY SCHOOL LEVEL	Uzm. NESRİN ÖZBABA ULUĞ AYŞEGÜL İLİKÇİ
		4	EĞİTİM PROGRAMLARINDA OYUNLAŞTIRMA YAKLAŞIMLARI: TEORİK TEMELLER VE UYGULAMA ALANLARI	Öğr. Gör. Dr. OKAN DEDE
		5	YAPAY ZEKA DESTEKLİ ÖĞRENME ORTAMLARININ EĞİTİM PROGRAMLARINA ENTEGRASYONU: FIRSATLAR VE ZORLUKLAR	Öğr. Gör. Dr. OKAN DEDE
		6	MAVİ BİLYE ENSTİTÜSÜ YAZ BİLİM KAMPININ ORTAOKUL ÖĞRENCİLERİNİN ÇEVRESEL DUYGU VE DÜŞÜNCELERİNE ETKİSİ	Uzman Öğretmen GÜLHANIM YAĞMUR Doç.Dr. ÖNDER ŞENSOY Doç.Dr. SEDA ÇAVUŞ GÜNGÖREN Prof.Dr. NAİM UZUN
		7	7. SINIF ÖĞRENCİLERİNİN SİSTEM DÜŞÜNME BECERİLERİNİ ÖLÇMEYE YÖNELİK AÇIK UÇLU ANKET GELİŞTİRME ÇALIŞMASI	Öğretmen AYŞEGÜL ÇİNKİZ Prof. Dr. CANSU FİLİK İŞÇEN

ICSAS 4th INTERNATIONAL CONFERENCE ON EDUCATION March 7 – 9, 2025 IZMIR Meeting ID: 885 7151 8350 Passcode: 202224				
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HALL / SALON 4	**Dr. Öğr. Üyesi, Fadile AYDIN**	1	EXAMINING TEACHERS' PROFESSIONAL BURNOUT, MOTIVATION AND STRESS LEVELS	Dr. Öğr. Üyesi, Fadile AYDIN
		2	INVESTIGATION OF TEACHERS' PROFESSIONAL COMMITMENT, JOB SATISFACTION AND LIFELONG LEARNING LEVELS ACCORDING TO THEIR DESIRES FOR GRADUATE EDUCATION	Dr. Öğr. Üyesi, Fadile AYDIN
		3	Öğretmen Adaylarının Yaratıcı Öğretmen Kavramına İlişkin Metaforları	Fatmanur Eren Doç. Dr. Gülbin Zeren Nalinci
		4	ORTAOKUL ÖĞRENCİLERİNİN SANATSAL YARATICILIK DÜZEYLERİNİN BELİRLENMESİ	Burcu ÖZTAŞ Doç. Dr. Gülbin Zeren NALİNCİ
		5	ALGILANAN ÖRGÜTSEL DESTEK VE ÖĞRETMEN MUTLULUĞU ARASINDAKİ İLİŞKİ	Dr. Öğr. Üyesi Erdal MERİÇ Öğretmen Fatma BAŞDAĞ Okul Müdürü Kadir BAŞDAĞ
		6	EĞİTİMDE SANAL EVREN (METAVERSE): YENİ UFUKLAR	Öğr. Gör. Dr. Mustafa AKSOĞAN
		7	EĞİTİMDE SANAL ve ARTIRILMIŞ GERÇEKLİĞİN KULLANIMI: GELECEĞİN ÖĞRENME ORTAMLARI	Öğr. Gör. Dr. Mustafa AKSOĞAN
		8	TÜRKİYE'DE ORTAOKUL BİNALARI ÖĞRETİM PROGRAMLARINA NE KADAR UYGUN?	İngilizce Öğretmeni, SİBEL SARAN YILDIZ Doç. Dr. ŞABAN BERK

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HALL / SALON 5	**Prof. Dr. Mikail BATU**	1	ETHICAL LITERACY: A CONCEPTUAL DISCUSSION	Prof. Dr. Emet GÜREL Prof. Dr. Mikail BATU
		2	MOBBING AS AN ETHICAL VIOLATION	Prof. Dr. Emet GÜREL Prof. Dr. Mikail BATU
		3	AİLE DANIŞMANLIĞI AÇISINDAN AİLE FONKSİYONLARINA YÖNELİK FELSEFİ BİR YAKLAŞIM: P4C	Aile Danışmanı, ZEYNEP KORKMAZ
		4	GARETH B. MATTHEWS'İN ÇOCUKLUK FELSEFESİ VE P4C YAKLAŞIMI	Bilim Uzmanı, ZEYNEP KORKMAZ
		5	M.S. DAWKINS'DE HAYVANLARA YÖNELİK İNSANBİÇİMCİ DİLİN ELEŞTİRİSİ	Yüksek Lisans Öğrencisi GÜLŞAH ERTÜRK Prof.Dr. HASAN AYDIN
		6	ON NERMI UYGUR'S LANGUAGE-CULTURE RELATIONSHIP AS A POSSIBILITY OF TURKISH PHILOSOPHY	Arş. Gör. Faruk YORGUN

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HALL / SALON 6	Dr. Öğr. Üyesi HİLAL OK ERGÜN	1	SECTORAL EXAMINATION OF DIGITAL-BASED PAYMENTS: AN EMPIRICAL ANALYSIS	Dr. Öğr. Üyesi HİLAL OK ERGÜN
		2	ANALYSIS OF THE RELATIONSHIP BETWEEN TRANSPORTATION SECTOR INDEXES: ARDL BOUNDS TEST APPROACH	Dr. Öğr. Üyesi, ERCÜMENT DOĞRU
		3	BANKACILIK SEKTÖRÜNDE FİNANSAL ESNEKLİK: KATILIM BANKALARI VE GELENEKSEL BANKALARIN KARŞILAŞTIRMALI DEĞERLENDİRİLMESİ	Öğr. Gör. Dr. Sevim Ezgi İSLAH Dr. Öğr. Üyesi İsmet BOLAT
		4	TÜRKİYE'DEKİ REASÜRANS ŞİRKETLERİNİN FİNANSAL ETKİNLİKLERİNİN KARŞITLAŞTIRILMASI ÜZERİNE BİR ÇALIŞMA	Dr.Öğr.Üyesi İsmet BOLAT Öğr.Gör.Dr. Sevim Ezgi İSLAH
		5	THE ROLE OF INTEGRATED MARKETING COMMUNICATION ACTIVITIES IN INDIVIDUALS' ATTITUDES AND BEHAVIORS TOWARDS HEDONIC CONSUMPTION	Dr. Öğr. Üyesi Musa ÇAKIR
		6	THE MODERATING ROLE OF SELF-EFFICACY ON THE RELATIONSHIP BETWEEN ORGANIZATIONAL COMMUNICATION AND ORGANIZATIONAL COMMITMENT	Dr., ALAADDIN MOHAMMEDHASSAN

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HALL / SALON 7	**Prof. Dr. Aynur AYTEKİN ÖZDEMİR**	1	PEDİATRİK HASTALARDA TIBBİ GİRİŞİMLERDE NONFARMAKOLOJİK AĞRI YÖNETİMİNDE MEKANİK VİBRASYONUN KULLANIMI	Prof. Dr. Aynur AYTEKİN ÖZDEMİR Araş. Gör. Büşra KÜTÜK
		2	GELİŞİM DÖNEMLERİNE GÖRE HASTA ÇOCUKLA İLETİŞİM	Prof. Dr. Aynur AYTEKİN ÖZDEMİR Araş. Gör. Büşra KÜTÜK
		3	OKUL ÇAĞI ÇOCUKLARINA VERİLEN ORAL HİJYEN EĞİTİMİNİN ETKİNLİĞİNİN BELİRLENMESİ	Arş. Gör. Büşra KÜTÜK Prof. Dr. Aynur AYTEKİN ÖZDEMİR Erdinç YILDIZ
		4	DİYABETİK YARALAR VE TEDAVİLER ÜZERİNE BİBLİYOMETRİK ANALİZ	Dr. Öğr. Üyesi Elif AYDIN Doç. Dr. Ayşe KOÇAK SEZGİN
		5	*HELICOBACTER PYLORI* INFECTION: PREVALENCE, TRANSMISSION, AND PHYTOTHERAPY-BASED TREATMENT APPROACHES	Dr. Öğr. Üyesi Elif AYDIN Doç. Dr. Ayşe KOÇAK SEZGİN
		6	MALE NURSES' EXPERIENCES TOWARDS NURSING PROFESSION FROM THE PERSPECTIVE OF GENDER ROLES: A PHENOMENOLOGICAL STUDY	Student, BİRCAN YILMAZ Res. Assistant Dr., BEDİA TARSUSLU
		7	PLACENTA RETENTION AND CURRENT APPROACHES	Fatma Nur YILMAZ Arş. Gör. Dr., Fatma YILDIRIM Prof. Dr., Nuriye BÜYÜKKAYACI DUMAN

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HALL / SALON 8	**Öğr. Gör. Dr. Emine ERSÖZLÜ**	1	ADVANTAGES, ETHICAL PRINCIPLES, AND CHALLENGES OF ARTIFICIAL INTELLIGENCE IN PERIOPERATIVE NURSING	Öğr. Gör. Dr. Emine ERSÖZLÜ Öğr. Gör. Ümit Topcuoğlu
		2	ROBOTIK CERRAHIDE PERIOPERATIF HEMŞIRELIK ROLÜ VE KARŞILAŞILAN ZORLUKLAR	Öğr. Gör. Dr. Emine ERSÖZLÜ Öğr. Gör. Ümit Topcuoğlu
		3	BELIEFS ABOUT MIDWIFERY IN PREHISTORY AND ANTIQUITY: GOD AND GODDESSES	Dr. Ebe, SEZİN GÜRSU Prof. Dr., BİRSEN KARACA SAYDAM
		4	EBELERİN SERVİKS KANSERİ KONUSUNDAKİ AKADEMİK FAALİYETLERİ	Dr. Ebe, SEZİN K. GÜRSU Uzman Ebe, SİNEM GÜLÜMSER Uzman Ebe, DENİZ SELÇUK Prof. Dr., BİRSEN KARACA SAYDAM
		5	CHALLENGES FACED BY PATIENT RELATIVES CARING FOR PATIENTS WITH STOMA	Assistant Professor, Melike DURMAZ Research Assistant Dr., Tuğba GÖZÜTOK KONUK
		6	GAMIFICATION AND GAME-BASED LEARNING IN NURSING EDUCATION: INNOVATIVE APPROACHES AND THEIR EFFECTS	Research Assistant Dr. TUĞBA GÖZÜTOK KONUK Assistant Professor, MELİKE DURMAZ
		7	HİPOTİROİDİ HASTALARINDA SEMPTOM ŞİDDETİ VE SEMPTOM YÖNETİMİ: ÖLÇEK GELİŞTİRME ÇALIŞMASI	Öğr. Gör.,ŞEYMA TRABZON Doç. Dr.,HAVVA SERT Doç.Dr., TANER DEMİRCİ
		8	AĞIZ VE DİŞ SAĞLIĞI HASTANESİNDE GÖREV YAPAN SAĞLIK PERSONELİNİN HEPATİT B, HEPATİT C VE HIV BULAŞ VE KORUNMA BİLGİ, TUTUM VE DAVRANIŞLARI	Öğr. Gör.,ŞEYMA TRABZON Dr. Öğr. Üyesi, GÜLSÜM KAYA Hemşire, RASİME ÖZNUR HALICI

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HALL / SALON 9	**Doç Dr. Müslüm Arpacı**	1	FOSTERING NATIONAL ADVANCEMENT: THE PIVOTAL INFLUENCE OF PHILOSOPHY AND EDUCATION IN THE POST-PANDEMIC LANDSCAPE	Dr. Emre Yılmaz Taha Bilen
		2	EMPOWERING STUDENTS THROUGH SUSTAINABLE LIVING: MOTIVATION AND ECONOMIC SELF-SUFFICIENCY AMONG UNDERGRADUATES IN KENYA	Dr. Öğr. Gör. Ayşe Demir Doç. Dr. Arslan Yavuzoğlu
		3	A PHILOSOPHICAL INQUIRY INTO ABSURDISM AND EXISTENTIALISM IN CONTEMPORARY THEATRE	Dr. Mehmet Kaya
		4	EXPLORING THE SYMBOLISM AND PHILOSOPHY IN HINDU TEMPLE ARCHITECTURE	Araş. Gör. Dr. Elif Öztürk
		5	YALIN İLKELER KULLANILARAK BAKIM PROGRAMI VERIMLILIĞININ OPTIMIZE EDILMESI: LIBYA PETROL VE GAZ SEKTÖRÜNDE BIR VAKA ÇALIŞMASI	Doç Dr. Müslüm Arpacı
		6	INTEGRATION OF EASTERN PHILOSOPHIES AND ETHICAL PRINCIPLES IN BUSINESS MANAGEMENT	Cheng Liwei
		7	CORE PRINCIPLES OF THE THEORY OF CONSTRAINTS: A NEW PERSPECTIVE	Dr. Can Aydın
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HALL / SALON 10	**Doç .Dr. Hakan Aydın**	1	BLOK ZİNCİRİ TEKNOLOJİSİ İLE MERKEZİYETSİZ FİNANS: ETKİLERİ, ZORLUKLAR VE ÇÖZÜM ÖNERİLERİ	Dr. Öğretim Üyesi . Gökhan Bütün, Yl. Öğrencisi Gülcan Durmaz.
		2	API GÜVENLİĞİ: GÖMÜLÜ VE AÇIK FİNANS UYGULAMALAR	Nimet Şahin , Dr. Esra Yücel
		3	KIRSAL ALANLARDA KÜÇÜK VE ORTA ÖLÇEKLİ İŞLETMELERİN FİNANSA ERİŞİMİ: ENDONEZYA VE TAYLAND ÖRNEĞİ	Buket Oran, Dr. Öğr. Üyesi Fatma Fındık
		4	KOBİ'LERİN FİNANSA ERİŞİMİ: TÜRKİYE ÖRNEĞİ – MODEL YAKLAŞIMI	Nimet Demirci. Doç . Dr. Sevil Doğan
		5	FINANSAL KARAR VERME: TÜRKIYE'DEN FINANS ÖĞRENCILERI ÜZERINE AMPIRIK BIR ÇALIŞMA	Doç .Dr. Hakan Aydın
		6	ETIK FINANS VE İSLAMI FINANS: ÖZELLIKLER, OLASI YAKINSAMALAR VE POTANSIYEL GELIŞIM	Dr. Öğr. Gör. Burak Uzal
		7	FINANS ÖĞRENCILERININ FINANSAL OKURYAZARLIĞI: TÜRKIYE'DEN BIR AMPIRIK ÇALIŞMA	Dr. Feyza Hacılaroğlu.

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HALL / SALON 1	**Assoc. Prof. Dr. Sékou Traoré**	1	DEVELOPMENT OF AN INTERDISCIPLINARY UNDERGRADUATE COURSE COMBINING BIOLOGY AND CHEMISTRY	Emily J. Carter
		2	ENHANCED PRODUCTION OF EICOSAPENTAENOIC ACID AND FUCOXANTHIN IN COLD-ADAPTED DIATOM SPECIES	Minh Hoang Nguyen, Linh Thi Mai,
		3	BIOPROPHYLACTIC POTENTIAL OF PYOCYANIN FROM PSEUDOMONAS AERUGINOSA AGAINST SAPROLEGNIASIS IN INCUBATED AFRICAN CATFISH EGGS	A. O. Adeyemi, B. K. Oladipo, C. M. Eze, D. F. Onifade
		4	MONITORING WILDFIRE IMPACT AND ECOSYSTEM RECOVERY USING REMOTE SENSING TECHNIQUES	Assis. Prof. Dr. R. S. Deshmukh
		5	UTILIZATION OF DRONE TECHNOLOGY IN WILDFIRE MANAGEMENT: IGNITION DETECTION AND 3D FUEL LOAD ASSESSMENT"	Ahmed Al-Mansoori, Fatima Al-Haddad
		6	ASSESSMENT OF MICROBIAL CONTAMINANTS IN DRINKING WATER FROM VARIOUS REGIONS OF JORDAN	Ahmed Al-Mansoori, Fatima Al-Haddad
		7	MAPPING RESEARCH TRENDS IN WILDFIRE MANAGEMENT IN MEDITERRANEAN ECOSYSTEMS	Amara Diallo, Assoc. Prof. Dr. Sékou Traoré
		8	Epigenetic Impact of Alpha-Particle Radiation on Drosophila melanogaster: A Short-Term Experimental Study	Muhammed Al-Shehhi

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HALL / SALON 2	**Dr. Nino Dolidze**	1	DIVERSITY AND CONSERVATION OF USEFUL PLANT FAMILIES IN THE CAUCASUS REGION: A FOCUS ON ENDEMIC AND ETHNOBOTANICAL RESOURCES	Giorgi Ivanidze, Dr. Mariam Svanidze, Dr. Nino Dolidze
		2	ECONOMIC EVALUATION, GROWTH, AND PRODUCTIVITY OF GRAFTED TOMATO VARIETIES USING SOLANUM TORVUM AS ROOTSTOCK	Amina Hassan, Assis. Prof. Dr. Fatima Ahmed, Mohamed El-Sayed
		3	DIFFERENTIAL RESPONSES OF LEAF CARBON, NITROGEN, AND PHOSPHORUS TO CLIMATIC VARIABLES ACROSS BIOMES AND PLANT FUNCTIONAL TYPES	Zhang Wei, Dr. Liu Mei
		4	PHYTOCHEMICAL PROFILING AND FTIR ANALYSIS OF SAPONINS IN THREE NIGERIAN RUELLIA SPECIES: RUELLIA PROSTRATA, RUELLIA LINEARI-BRACTEOLATA, AND RUELLIA BIGNONIIFLORA	Amina O. Adeyemi, Chinedu P. Okeke, Fatima B. Musa, Ibrahim S. Eze, Grace N. Okafor
		5	IMPACT OF PHYSICAL ACTIVITY ON REPRODUCTIVE PERFORMANCE AND SEMEN CHARACTERISTICS OF JERSEY BULLS	James O. Thompson, Michael A. Richardson
		6	EXPERT EVALUATION AND CLASSIFICATION OF HERITAGE TREES: A SOUTHEAST ASIAN APPROACH	R. Sari, D. W. Putra, L. H. Wijaya
		7	FUNGAL PATHOGENS ASSOCIATED WITH THE DECLINE OF ACACIA NILOTICA AND EUCALYPTUS CAMALDULENSIS IN PUNJAB, PAKISTAN	S. Khan, Dr. R. Ali, Assis. Prof. Dr. A. Rehman
		8	EVALUATING THE CURRENT STATE AND FARMERS' PERSPECTIVES ON AGROFORESTRY IN PUNJAB, INDIA :	P. Verma, A. Singh, M. Yadav
		9	ENGAGING LOCAL YOUTH IN THE PRESERVATION OF FORESTS AND PROTECTED AREAS IN NEPAL	Rajesh Thapa, Dr. Sunita Gurung

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HALL / SALON 3	**Prof. Dr. Aibek Nursultanov**	1	ASSESSING WILDFIRE SUSCEPTIBILITY IN THE BIA FOREST REGION OF GHANA: AN INTEGRATED GEOSPATIAL APPROACH	Samuel Osei, Kwame Asante
		2	SEASONAL INFLUENCE OF MINING OPERATIONS ON WATER QUALITY IN THE MFOLOZI RIVER, KWAZULU-NATAL, SOUTH AFRICA	Thabo M. Dlamini, Nomvula S. Khumalo, Sipho N. Mthembu
		3	ASSESSING TREE GROWTH FACTORS IMPACTING CARBON STORAGE IN RESPONSE TO CLIMATE VARIABILITY	A. O. Mensah, K. A. Boateng
		4	ASSESSING SOIL HEALTH AND CONTAMINATION TRENDS IN A MAJOR URBAN CENTER OVER TWO DECADES	Dr. John Mwangi, Assoc. Prof. Dr. Grace Wambui
		5	EVALUATING THE EFFECTIVENESS OF MECHANIZED WEED CONTROL IN THE RESTORATION OF DEGRADED OAK FORESTS	Ahmed Al-Mansoori, Fatima Al-Harthy
		6	SEASONAL IMPACT ON TERMITE INFESTATION OF WOODEN BEEHIVES IN ENUGU, NIGERIA	Eze Nwankwo, P. U. Okeke
		7	A MATHEMATICAL FRAMEWORK FOR ANALYZING FOREST RESOURCE DEPLETION: IMPACT OF SYNTHETIC PRODUCT INDUSTRIES	Priya Sharma, Rajesh Kumar, Anjali Mehta
		7	ENHANCING CREATIVITY IN TECHNICAL DRAWING EDUCATION: AN ASSESSMENT APPROACH	João R. Almeida, Camila S. Ferreira, Lucas M. Costa, Beatriz L. Oliveira
		8	AGRICULTURAL GOVERNANCE AND RURAL DEVELOPMENT IN KAZAKHSTAN	Prof. Dr. Aibek Nursultanov

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HALL / SALON 4	**Prof. Dr. Kenji Yamamoto,**	1	REVOLUTIONIZING TEACHING METHODS WITH ADVANCED DIGITAL SOLUTIONS	Ling Chen, Haruto Sato, Kwame Boateng
		2	IMPROVING ENGINEERING EDUCATION STANDARDS THROUGH QUALITY ASSURANCE AND SELF-ASSESSMENT	Wei Li, Yuki Nakamura,
		3	BOOSTING HISTORY EDUCATION WITH MULTIMEDIA TOOLS: A CROSS-CULTURAL ANALYSIS	Dr. Samuel Owusu, Dr. Grace Wambui, Dr. Amina Diallo
		4	TRANSFORMING SCIENCE EDUCATION: CUTTING-EDGE APPROACHES TO TEACHING NUCLEAR CONCEPTS	Lin Zhang, Ahmed El-Sayed
		5	EVALUATING MENTAL HEALTH SUPPORT FOR ENGINEERING STUDENTS: THE ROLE OF THERAPIST CHARACTERISTICS	Prof. Dr. Kenji Yamamoto,
		6	OVERCOMING CHALLENGES IN CONSTRUCTION MEASUREMENT EDUCATION	Jamal Mwangi
		7	CHANGING BEHAVIORS THROUGH EDUCATIONAL GAMES: A FOCUS ON ENVIRONMENTAL CONSCIOUSNESS	Sakura Yamamoto, Assoc. Prof. Dr. Ochieng Mwangi
		8	TRANSFORMING LEARNING THROUGH HYBRID EDUCATION: THE IMPACT OF DIGITAL TOOLS	Haruto Tanaka

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HALL / SALON 5	**Dr. Aoi Yamamoto**	1	ADVANCING ROBOTIC SYSTEMS EDUCATION THROUGH INNOVATIVE LEARNING METHODS: A CASE STUDY AT SHANGHAI INSTITUTE OF TECHNOLOGY, CHINA	Wang Lei, Sun Jing, Li Min
		2	INVESTIGATING UNDERGRADUATE STUDENTS' UNDERSTANDING OF MATHEMATICAL CONCEPTS IN RATE OF CHANGE	Haruto Suzuki, Dr. Aoi Yamamoto
		3	EXAMINING THE ROLE OF MATHEMATICAL CONFIDENCE, ENGAGEMENT, AND IDENTITY IN STUDENT ACHIEVEMENT	Wei Liu, Assis. Prof. Tunde Ojo
		4	REVOLUTIONIZING MEDICAL EDUCATION THROUGH AUGMENTED REALITY: A NEW FRONTIER IN EMBRYOLOGY TEACHING	Yuki Sato, Chen Li, Fatima Ali, Haruto Nakamura, Kwame Asante, Nurul Hasanah
		5	A STUDY OF CAREER GOALS AMONG FINAL-YEAR STUDENTS IN THE SCHOOL OF MEDICINE, UNIVERSITY OF LAGOS, NIGERIA	E. Okonkwo, F. Balogun, P. Eze, S. Ahmed, B. Okafor, T. Adeyemi, G. Oladipo, H. Suleiman
		6	IMPROVING EMPLOYEE PERFORMANCE ANALYSIS IN CORPORATE TRAINING USING XAPI: INSIGHTS INTO BEHAVIORAL TRENDS AND PREDICTIVE MODELING	Taro Suzuki, Fatima Ibrahim,
		7	EXPLORING ACTIVE LEARNING PRACTICES AMONG ONLINE GRADUATE STUDENTS: A CASE STUDY IN SOUTH ASIA	Yuki K. Sato, Sipho Dlamini
		8	BOOSTING ONLINE GRADUATE STUDENT PARTICIPATION THROUGH EFFECTIVE TEACHING STRATEGIES IN SOUTH ASIA	Assoc. Prof. Dr. Kwame O. Asante
		9	ASSESSING INTERACTIVE ENGAGEMENT IN BLENDED LEARNING SETTINGS: A FOCUS ON DATA SYNCHRONIZATION AND FEEDBACK LOOPS	Fatima Al-Hassan, Kwame Osei

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HALL / SALON 6	**Assis. Prof. Dr. Aiko Nakamura**	1	EMPOWERING PEDAGOGY STUDENTS WITH LEARNING DISABILITIES: CAREER PATHWAYS AND CHALLENGES IN THAILAND	Somchai Ratanakul Ananya Sirisom
		2	BOOSTING COMPUTATIONAL THINKING IN STEM EDUCATION THROUGH PHYSICAL COMPUTING INNOVATIONS	Dr. Maria Gonzalez
		3	FOSTERING CREATIVITY IN EARLY CHILDHOOD EDUCATION: THE IMPACT OF GRAPHIC ACTIVITIES IN ZAMBIA	Lindiwe Nkosi Tafadzwa Moyo
		4	TRANSFORMING TEACHER TRAINING WITH TECHNOLOGY-DRIVEN KNOWLEDGE BUILDING: INSIGHTS FROM SECONDARY EDUCATION	Kenji Yamamoto Amina Sani
		5	ASSESSING COGNITIVE LOAD IN PILOT TRAINING: A STUDY ON MODERN RECREATIONAL AIRCRAFT	Chinedu Okeke Youssef Ahmed
		6	INNOVATING STEM EDUCATION WITH NEUROCOGNITIVE LEARNING STRATEGIES	Assis. Prof. Dr. Aiko Nakamura
		7	ENHANCING METACOGNITIVE SKILLS THROUGH MOBILE LEARNING APPS: A STUDY ON HIGH-ACHIEVING STUDENTS	Assoc. Prof. Dr. Haruto Tanaka Sofia Martinez

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HALL / SALON 7	**Dr. Sofia Martinez**	1	ADOPTING EDUCATION 4.0 PRINCIPLES IN MODERN LANGUAGE TEACHING	Dr. Sofia Martinez
		2	THE IMPACT OF SOCIAL SKILLS AND COMMUNICATION TRAINING IN EARLY CHILDHOOD EDUCATION: PATHWAYS TO FUTURE SUCCESS	Mei Lin, Nadia Ahmed
		3	BUILDING INTERCULTURAL AWARENESS AMONG DIVERSE STUDENT GROUPS IN ISRAELI HIGHER EDUCATION	Rachel Cohen, David Levy
		4	IMPROVING MATHEMATICAL ABILITIES IN CHILDREN WITH AUTISM USING THE PROJECT MIND FRAMEWORK: A PRELIMINARY STUDY*:*	Dr. James Carter, Maria Gonzalez, Emma Wilson, Michael Brown, Olivia Davis
		5	REDESIGNING CLASSROOM SPACES: A COLLABORATIVE WORKSHOP WITH CHINESE DESIGN STUDENTS	P. J. Anderson, S. T. Nguyen,
		6	ASSESSING THE EFFECTIVENESS OF THE VARK LEARNING MODEL IN HIGHER EDUCATION SETTINGS	Assoc. Prof. Dr. Emma Harris, Dr. Daniel White
		7	BOOSTING STUDENT PARTICIPATION AND ACADEMIC PERFORMANCE THROUGH INTERACTIVE DIGITAL TOOLS	Fatoumata Diallo
		8	THE ROLE OF EDUCATIONAL MEDIA IN SHAPING THE CREATIVE DEVELOPMENT OF CHILDREN: A CASE STUDY ANALYSIS	Aiko Sato, Li Chen
		9	ADVANCING WRITING SKILLS THROUGH TARGETED TEACHING METHODS: LESSONS FROM A SOUTHEAST ASIAN PROGRAM*:*	K. Sato, J. Park, A. Ochieng, S. Lee

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HALL / SALON 8	**Assis. Prof. Dr. Olivia Carter**	1	IMPROVING LANGUAGE SKILLS AND CROSS-CULTURAL AWARENESS: A PILOT INITIATIVE FOR UNIVERSITY STUDENTS FROM A TEACHER TRAINING COLLEGE IN ATEQUIZA, MEXICO	Dr. Sofia M. González, Dr. Carlos A. Martínez, Dr. Isabel T. López
		2	INVESTIGATING ACADEMIC STRESS LEVELS AMONG UNIVERSITY STUDENTS WITH DYSLEXIA	Assis. Prof. Dr. Olivia Carter
		3	REVOLUTIONIZING MEDICAL TRAINING IN BRAZIL THROUGH ADVANCED SIMULATION TECHNIQUES: KEY FINDINGS AND RECOMMENDATIONS	Dr. Ana J. Santos
		4	CURRICULUM REFORM IN CHILEAN UNIVERSITIES: A COMPREHENSIVE EXAMINATION OF POLICY CHANGES	Dr. Camila R. Fernández
		5	USING CHILDREN'S ARTWORK TO GAIN INSIGHTS INTO THEIR EXPERIENCES WITH EQUINE-ASSISTED THERAPY	Dr. Sophia Johnson
		6	THE EFFECTS OF COMMERCIALIZATION ON HIGHER EDUCATION: SHIFTING FOCUS IN TEACHING AND LEARNING PRIORITIES	Emma Thompson, Prof.Dr. Michael Richards
		7	THE ROLE OF COLLABORATIVE WORK ENVIRONMENTS IN SHAPING MIDDLE SCHOOL TEACHERS' PRACTICES	Olivia Carter
		8	EVALUATING THE USE OF CHATBOTS IN UNIVERSITY EDUCATION: FINDINGS FROM AN INITIAL PILOT STUDY	John Smith, L. Williams

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HALL / SALON 9	**Dr. Sofia Oliveira Dr. Hiroshi Tanaka**	1	PHILOSOPHICAL HERMENEUTICS AND ITS IMPACT ON JUDICIAL IMPARTIALITY IN BRAZIL	Gabriel M. Costa, Sofia P. Fernandes
		2	A COMPARATIVE STUDY OF SPIRITUAL IMPACTS ON ARCHITECTURAL DESIGN: ISLAMIC AND GOTHIC TRADITIONS	R. Almeida, Y. Chen
		3	EXAMINING THE RELATIONSHIP BETWEEN RELIGION AND DEVELOPMENT: A FOCUS ON ISLAMIC PERSPECTIVES	Leila Marais, Haruto Nakamura
		4	BRIDGING ANCIENT WISDOM AND MODERN SOCIETY: LESSONS FROM SUFI AND ISLAMIC PHILOSOPHY	Dr. Sofia Oliveira Dr. Hiroshi Tanaka
		5	RECONCILING EFFICIENCY AND COMPASSION IN OPEN KNOWLEDGE SYSTEMS: AN EDUCATIONAL APPROACH	Fatima Bakare, Hoang Nguyen, Nurul Hasanah, Kwame Asante, Li Jianyu
		6	THE DEVELOPMENT OF DEMOCRATIC PRINCIPLES IN PAKISTAN: ISLAMIC THOUGHT AND COMPARATIVE POLITICAL THEORY	: Dr. Ali Malik
		7	THE INFLUENCE OF RELIGIOUS AND MORAL VALUES ON NATIONAL SECURITY: INSIGHTS FROM KAZAKHSTAN	A. K. Nurzhanov, B. T. Serikbayev, C. A. Tulegenov, D. S. Askarova, E. M. Kenzhebekov
		8	CRITICAL ANALYSIS OF SERVANT LEADERSHIP: A REVIEW OF EXISTING LITERATURE	Aisha Diallo, Mohamed Kone, Kenji Suzuki

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HALL / SALON 10	**Dr. Aibek Toktogulov**	1	UNVEILING SYMBOLISM IN HINDU TEMPLE ARCHITECTURE: A PHILOSOPHICAL PERSPECTIVE	Ali Hassan Aisha Khan
		2	INTEGRATING ETHICAL FRAMEWORKS: A COMPARATIVE STUDY OF ASIAN AND AFRICAN PERSPECTIVES ON BUSINESS ETHICS	Fatima Ahmed Nurzhan Bekov
		3	INNOVATIONS IN OPEN SCIENCE: TRANSFORMING RESEARCH PARADIGMS	PHD Student Zainab Abbas Dr. Aibek Toktogulov
		4	REEVALUATING CONSTRUCTIVIST PARADIGMS: AN EXISTENTIAL AND PHENOMENOLOGICAL PERSPECTIVE	Dr. Ahmed Al-Mansoori
		5	RECONSTRUCTING SELF THROUGH TEMPORAL DYNAMICS: ANALYZING ZHAO TAO'S ROLE IN JIA ZHANGKE'S CINEMATIC UNIVERSE*)*	Gulnara Iskakova Asim Raza
		6	ENHANCING CONSTRUCTION EFFICIENCY: A STUDY ON THE ADOPTION OF LEAN PRACTICES	Karim Nurpeisov Aisha Malik
		7	ANALYZING AESTHETIC DIMENSIONS IN MUSEUM ARCHITECTURE	Rana Ahmed Aizhan Dr. Abdyrakhmanova
		8	INTEGRATING PHILOSOPHICAL PERSPECTIVES INTO INTERDISCIPLINARY PHYSICAL EDUCATION PROGRAMS	Assis. Prof. Dr. Amina Khamis Dr. Jibril Adamu

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HALL / SALON 11	**Dr. Aibek Toktogulov**	1	THE INFLUENCE OF CULTURAL PHILOSOPHY ON INDIVIDUAL IDENTITY IN TURKIC TRADITIONS	Prof.Dr. M. Adebayo
		2	TRADITIONAL EASTERN PRACTICES IN CONTEMPORARY SUSTAINABLE ARCHITECTURE	L. Tanaka N. Ndungu
		3	EXPLORING POSTMODERN TRAGI-COMEDY: AN ANALYSIS OF TOM STOPPARD'S 'ROSENCRANTZ AND GUILDENSTERN ARE DEAD'	Mei-Ling Chen Dr. Carlos Silva
		4	THE ROLE OF ISLAM IN SHAPING CULTURAL VALUES IN KAZAKHSTAN	Kofi Agyeman Amina El-Omari Assoc. Prof .Fatoumata Diallo
		5	ARTISTIC RESPONSES TO CLIMATE CRISIS: EXPLORING INNOVATIVE APPROACHES TO SUSTAINABLE FUTURES THROUGH INTERDISCIPLINARY ART PRACTICE	Amina Bello Mikhail Ndumba
		6	UNVEILING DARKNESS: EXPLORING EXISTENTIAL THEMES AND MUSICAL NARRATIVES IN "TRUE DETECTIVE"	Assis. Prof. Dr. Aiko Tanaka
		7	RETHINKING ABSENCE: THE ROLE OF SILENCE AND PAUSE IN SAMUEL BECKETT'S WAITING FOR GODOT	Jun-Ho Kim Meilin Xu
		8	ADVANCEMENTS IN CONSTRAINT MANAGEMENT THEORY: A COMPREHENSIVE REVIEW	Mei-Ling Chen Hiroshi Takahashi Samuel Nkrumah

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Salon	Moderator		Bildiri No ve Başlığı / Paper ID and Title	Authors
HALL / SALON 1	**Dr. Öğr. Üyesi Hüseyin ÇELİK**	1	TESTING THE ENVIRONMENTAL PHILLIPS CURVE HYPOTHESIS in TURKIYE	Esma ERDOĞAN Müge MANGA
		2	THE LINKAGES BETWEEN ENVIRONMENTAL POLLUTION, HUMAN CAPITAL and GLOBALIZATION: A STUDY ON TURKIYE	Müge MANGA Esma ERDOĞAN
		3	HANEHALKI TÜKETİMİ, ENFLASYON VE EKONOMİK BÜYÜME İLİŞKİSİ: GLOBAL KANITLAR	Dr. Öğr. Üyesi Serhat ALPAĞUT
		4	THE RELATIONSHIP BETWEEN CORRUPTION CONTROL AND ECONOMIC GROWTH: AN ANALYSIS BY INCOME GROUPS	Asst. Prof. Dr. Fatih AKIN
		5	UNEMPLOYMENT AND JOB SEARCH PROCESSES IN TÜRKİYE: OCCUPATIONAL GROUPS, JOB SEARCH CHANNELS AND LABOR FORCE PARTICIPATION DYNAMICS	Dr. Öğr. Üyesi Gülferah ERTÜRKMEN Dr. Tuğba KONUK
		6	YOUTH UNEMPLOYMENT IN LABOR MARKETS: CAUSES, CONSEQUENCES AND SOLUTION STRATEGIES	Dr. Öğr. Üyesi Gülferah ERTÜRKMEN
		7	UNEMPLOYMENT HYSTERESİS IN CENTRAL AND EASTERN EUROPEAN COUNTRIES: EVIDENCE FROM FOURIER UNIT ROOT TESTS WITH SHARP AND SMOOTH BREAKS	Dr. Ayşe Nur ŞAHİNLER
		8	THE IMPACT OF REMITTANCES ON DOMESTIC SAVINGS: EVIDENCE FROM TURKIYE	Dr. Öğr. Üyesi Hüseyin ÇELİK

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HALL / SALON 2	**Prof. Dr. RAMAZAN BİÇER**	1	NÖROBİLİM VE İSTİHBARAT: GELECEĞİN OPERASYONEL TEKNİKLERİ	Prof. Dr. Ramazan BİÇER Dr. Eda ALEMDAR
		2	REASONS FOR RELIGIOUS THEMED TERRORISM	Prof. Dr. RAMAZAN BİÇER
		3	DIGITAL DISINFORMATION AND INTERNATIONAL RELATIONS: THE 2024 US PRESIDENTIAL ELECTIONS AND THE DIMENSIONS OF POLITICAL MANIPULATION	Dr. Öğretim Üyesi Gül Seda ACET İNCE
		4	ÇIKARLARIN AYRIŞMASI MI , MEDENİYETLERİN ÇATIŞMASI MI ?	Dr. Seda Gözde TOKATLI
		5	GÖÇ KRİZİ VE MÜLTECİ SORUNUNUN İNSANİ BOYUTTA ANALİZİ	Dr. Seda Gözde TOKATLI
		6	REALISATION OF A BOLD DREAM AT GUNPOINT : UNDERGROUND JEWISH ORGANIZATIONS	Yüksek Lisans Öğrencisi, İREM TABİRLİOĞLU
		7	EUROPEAN ARMY: A BELATED NECESSITY?	Arş. Gör., Özgür YILMAZ
		8	ANALYSING THE AFGHAN PEACE PROCESS IN THE FRAMEWORK OF RIPENESS THEORY	Arş. Gör., Özgür YILMAZ
		9	İNGİLİZ OKULU PERSPEKTİFİNDEN ULUSLARARASI SİSTEM, ULUSLARARASI TOPLUM VE DÜNYA TOPLUMU	Doç.Dr. ABDULLAH TORUN
		10	SOĞUK SAVAŞ DÖNEMİNDE TÜRKİYE'NİN ÇOK YÖNLÜ DIŞ POLİTİKAYA GEÇİŞİNİ ETKİLEYEN FAKTÖRLER	Doç Dr. ABDULLAH TORUN

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HALL / SALON 3	**Av. Furkan ÇAPOĞLU**	1	ADMINISTRATIVE FUNCTIONS OF THE PROVINCIAL COUNCIL AND ITS CONTRIBUTION TO LOCAL GOVERNMENTS	Bilim Uzm. Mehmet YILDIZ Prof. Dr. Erhan GÜMÜŞ Prof. Dr. Ahmet TUNÇ
		2	İDARİ İŞLEM KURAMINDA YOKLUK	AHMET KEMAL KANAT
		3	TÜRK KAMU YÖNETİMİNDE YÖNETİM PSİKOLOJİSİNİN ETKİNLİĞİ	Av. Furkan ÇAPOĞLU Psk. Mustafa BIYIKOĞLU
		4	TARİHTEN GÜNÜMÜZE YÖNETİM PSİKOLOJİSİ	Av. Furkan ÇAPOĞLU Psk. Mustafa BIYIKOĞLU
		5	Kimlik ve İdeoloji Serüveninde Milli Türk Talebe Birliği	Dr. Öğr. Üyesi İlhan BİLİCİ Sena YILDIRIM
		6	Siyasal Şiddet, Meşrulaştırma ve 1970'ler Türkiye'sinden Yansımalar	Dr. Öğr. Üyesi İlhan BİLİCİ Mustafa Kemal ENTERİLİ

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HALL / SALON 4	**Öğr. Gör. Ümit TOPCUOĞLU**	1	THE DEMOCRATIC CRISIS CAUSED BY MIGRATION MOBILITY IN ACCESS TO PUBLIC SERVICES IN THE CITY	Lisans Öğrencisi, Zehra DURUKAN Araştırma Görevlisi, Mustafa Gökberk ERTAN
		2	Türkiye'de Acil Sağlık Hizmetlerinin Tarihçesi ve Gelişimi: Dünya ile Kıyaslama	Öğr. Gör. Ümit TOPCUOĞLU
		3	Afet Eğitiminin Toplumsal Faydaları	Öğr. Gör. Ümit TOPCUOĞLU
		4	BEHAVIOR-FOCUSED ENERGY EFFICIENCY FOR SUSTAINABLE CITIES: THE SOCIAL DIMENSION OF URBAN TRANSFORMATION	Doktora Öğrencisi, Melike ÇİÇEK
		5	KENT PARKLARININ KENTSEL FIRSAT EŞİTSİZLİĞİ AÇISINDAN DEĞERLENDİRİLMESİ: ERZİNCAN ÖRNEĞİ	Dr. UĞUR GÜLCÜ Doç. Dr. AHMET YAZAR

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HALL / SALON 5	**Doç. Dr. TUĞBA MERT**	1	EXAMINING ROUGH IDEALS AND A SURVEY ON EXISTENCE OF LOCAL ROUGH IDEALS	M. Mustafa BEYDAĞI Prof. Dr. İlhan İÇEN Prof. Dr. A. Fatih ÖZCAN
		2	KINEMATICAL APPROACH TO HELICAL TYPE CURVES	Asst. Prof. Dr. ÇAĞLA RAMİS İLGÜZ ESRA ORMAN
		3	AN ALGORITHM FOR THE RECTIFYING CURVES	Asst. Prof. Dr. ÇAĞLA RAMİS İLGÜZ MUSTAFA VARİLCİ
		4	ANALYSIS OF SOLVING AND APPLICATIONS OF SINGULARLY PERTURBED PROBLEMS	Dr, ZELAL TEMEL
		5	PARA-SASAKIAN MANIFOLDS ADMITTING CONFORMAL RICCI SOLITONS	Prof. Dr. MEHMET ATÇEKEN Doç. Dr. TUĞBA MERT
		6	THE LINEARITY OF THE RELATIONSHIP BETWEEN MATHEMATICS AND ART: AN INTERDISCIPLINARY APPROACH	Yüksek Lisans Öğrencisi, Büşra ÖZÇELİK Doç. Dr. Ezgi TOKDİL
		7	Uniqueness Theorem For Inverse Nodal Problem	Dr. Öğr. Üyesi Merve ARSLANTAŞ
		8	GRAY MAP IN THE RING	Master's student, HABIBE RANA KASDAS Asist. Prof. Dr. MUSTAFA OZKAN
		9	FORMATION OF A 32-ELEMENT RING WITH COEFFICIENTS IN AND CYCLIC CODES OVER THE RING	Asist. Prof. Dr. MUSTAFA OZKAN Master's student, HABIBE RANA KASDAS

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HALL / SALON 6	**Assoc. Prof. Dr. TUBA NUR OLĞUN**	1	AN EVALUATION OF THE CONSERVATION-TOURISM RELATIONSHIP IN THE CONTEXT OF TUNCELİ/PERTEK CASTLE	Assoc. Prof. Dr. TUBA NUR OLĞUN
		2	THE FICTIONAL BALANCE BETWEEN LEED CERTIFICATION SYSTEM AND LANDSCAPE ARCHITECTURE	Asist.Prof. Dr., Makbulenur ONUR Research Assistant, Dr., Demet Ulku GULPINAR SEKBAN
		3	LEED SCORECARD ANALYSIS FROM A LANDSCAPE ARCHITECTURE PERSPECTIVE	Asist.Prof. Dr., Makbulenur ONUR Research Assistant, Dr., Demet Ulku GULPINAR SEKBAN
		4	EFFECTIVE WEED MANAGEMENT AND SUSTAINABILITY IN LANDSCAPES	Research Assistant, RIDVAN TİK Assoc. Prof. Dr., RAMAZAN GÜRBÜZ Assoc. Prof. Dr., TUNCAY KAYA
		5	RENEWABLE ENERGY SOLUTIONS IN LANDSCAPING ‘AGROVOLTAIC SYSTEMS AND THEIR POTENTIAL’	Research Assistant, RIDVAN TİK Assoc. Prof. Dr., TUNCAY KAYA
		6	ANALYZING THE SPATIAL STRUCTURE OF TRADITIONAL RİZE HOUSES WITHIN THE SCOPE OF PROTECTION OF RURAL ARCHITECTURAL HERITAGE	M. Arch. Sedanur BİRİNCİ Prof. Dr. Çiğdem Belgin DİKMEN
		7	EVALUATION OF TRADITIONAL RURAL HOUSES IN RİZE WITHIN THE SCOPE OF SUSTAINABILITY	M. Arch. Sedanur BİRİNCİ Prof. Dr. Çiğdem Belgin DİKMEN

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HALL / SALON 7	**Öğretim Görevlisi, Betül Kübra ŞAHİN YONCA**	1	OKUL ÖNCESİ ÖĞRETMEN ADAYLARININ BAKIŞ AÇISINDAN OKUL ÖNCESİ EĞİTİM SINIFLARINDA SINIF YÖNETİMİ	Öğretim Görevlisi, Betül Kübra ŞAHİN YONCA
		2	OKUL ÖNCESİ EĞİTİMDE GELİŞİME UYGUN UYGULAMALAR: OKUL ÖNCESİ ÖĞRETMEN ADAYLARININ GÖRÜŞLERİ	Öğretim Görevlisi, Betül Kübra ŞAHİN YONCA
		3	FARKLI YAŞ GRUBUNDAN ÇOCUKLARIN AYNI SINIFTA EĞİTİM ALMALARINA İLİŞKİN EBEVEYN GÖRÜŞLERİ	Okul Öncesi Öğretmeni, Mizgin AYKUT Prof. Dr., İkbal Tuba ŞAHİN SAK
		4	EFFECT OF PROSOCIAL BEHAVIOR PSYCHOEDUCATION PROGRAM ON PROBLEM BEHAVIORS AND SELF-REGULATION SKILLS OF 5-6-YEAR-OLD CHILDREN	Dr., Burcu BAĞCI ÇETİN
		5	OKUL ÖNCESİ DÖNEM ÇOCUKLARIN ÇOCUK HAKLARINA YÖNELİK GÖRÜŞLERİNİN DEĞERLENDİRİLMESİ	Doç. Dr. Dervişe AMCA TOKLU Prof. Dr. Filiz ERBAY Prof. Dr. Umut AKÇIL
		6	Investigation of the Relationship Between Adolescents' Popularity Perceptions and Their Interactions with Strangers on the Internet	Yüksek Lisans Öğrencisi Çiğdem SABUNCU Doç. Dr. Yaşar BARUT Prof. Dr. Soner ÇANKAYA
		7	EXAMINING THE RELATIONSHIP BETWEEN CHILD DEVELOPMENT CANDIDATES' IDENTITY CONSTRUCTION IN SOCIAL MEDIA AND THEIR PERSONAL RESPONSIBILITY LEVELS	Yüksek Lisans Öğrencisi Kübra AKDENİZ Doç. Dr. Yaşar BARUT Prof. Dr. Soner ÇANKAYA
		8	INVESTİGATİNG THE REALATİONSHİP BETWEEN ARTİFİCİAL İNTELLİGENCE LEVELS AND ARTİFİCİAL INTELLEİGENCE ANXİETY OF PRESCHOOL TEACHER CANDİDATES	Yüksek Lisans Öğrencisi Kübra KELEŞ Doç. Dr. Yaşar BARUT Prof. Dr. Soner ÇANKAYA
		9	THE RELATIONSHIP BETWEEN THE DIGITAL AWARENESS OF MOTHERS WITH CHILDREN AGED 3-6 AND THE PSYCHOSOCIAL BEHAVIOR OF THE CHILD	Yüksek Lisans Öğrencisi Rabia ASLANTAŞ Doç. Dr. Yaşar BARUT Prof. Dr. Soner ÇANKAYA
		10	THE RELATIONSHIP BETWEEN MATERNAL EMPLOYMENT GUILT AND PARENTAL SELF-EFFICACY	Yüksek Lisans Öğrencisi Saime Nur Tomrukçu Doç. Dr. Yaşar BARUT Prof. Dr. Soner ÇANKAYA

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HALL / SALON 8	**Doç. Dr. ÇAĞLA GİRGİN BÜYÜKBAYRAKTAR Öğr. Gör. Dr. EDA KÖKLÜ BAYRAKCI**	1	AN INVESTIGATION OF THE FACTORS AFFECTING THE RESILIENCE OF PARENTS OF CHILDREN WITH SPECIAL NEEDS	Esra Dereobalı Doç. Dr. Türkan Yılmaz Irmak
		2	REFLECTIONS OF ROMANTIC RELATIONSHIP BELIEFS AND MARITAL ROLE EXPECTATIONS ON LIFE SATISFACTION	Doç. Dr. ÇAĞLA GİRGİN BÜYÜKBAYRAKTAR Öğr. Gör. Dr. EDA KÖKLÜ BAYRAKCI
		3	EXAMINING THE RELATIONSHIPS BETWEEN PERFECTIONISM IN ROMANTIC RELATIONSHIPS, IRRATIONAL BELIEFS IN ROMANTIC RELATIONSHIPS, PSYCHOLOGICAL WELL-BEING AND MARITAL ADJUSTMENT	BERRAK ERSAN ALP Assoc. Prof. FULYA TÜRK
		4	İLİŞKİDE KARAR VERME BECERİSİNİN DEMOGRAFİK DEĞİŞKENLER AÇISINDAN İNCELENMESİ	BEGÜM UYGUR DOÇ. DR. SEHER MERVE ERUS
		5	İLİŞKİ DOYUMUNUN ÇEŞİTLİ DEMOGRAFİK DEĞİŞKENLER AÇISINDAN İNCELENMESİ	BURÇİN HAZAL AĞCA DOÇ. DR. SEHER MERVE ERUS

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HALL / SALON 9	**Assoc. Prof. Ololade M. Aminu**	1	ANALYZING SUCCESS FACTORS OF PLAY-BASED INTERVENTION PROGRAMS FOR CHILDREN WITH DIFFERENT ABILITIES IN TURKEY: A COMPARATIVE EVALUATION	Aylin Yılmaz, Ahmet K. Yıldız, Dr. Öğr. Üyesi Zeynep Şahin
		2	THE SOCIAL DYNAMICS OF PANDEMICS: A CLINICAL SOCIOLOGICAL ANALYSIS OF PRECAUTIONS AND RISKS	Dr. Musa Karabulut Mustafa Eryılmaz
		3	TEACHING STRATEGIES AND PREJUDICE TOWARD IMMIGRANT AND DISABLED STUDENTS	Mücahit Yaşar, Dr. Öğr. Gör. Niyazi Gündoğan
		4	STUDENTS' ATTITUDES TOWARD SEEKING PSYCHOLOGICAL HELP	Dr. Öğr. Gör. Nihat Kılıç, YL. Öğr. Nihat Fırat
		5	AN EXPLORATION OF THE QUALITY OF PRIMARY CAREGIVING RELATIONSHIPS BETWEEN ADOLESCENTS ORPHANED THROUGH AIDS AND THEIR GRANDMOTHERS, BASED ON THE NARRATIVES OF STAKEHOLDERS	Dr. Selin Demir, Dr. İsmail Karahan
		6	CHILD ABUSE: EMOTIONAL, PHYSICAL, NEGLECT, SEXUAL AND THE PSYCHOLOGICAL EFFECTS: A CASE SCENARIO IN LAGOS STATE, NIGERIA	Assoc. Prof. Ololade M. Aminu

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HALL / SALON 1	**Assis. Prof. Dr. Azita Rahmani**	1	EXPERT SOLUTIONS TO AFFORDABLE HOUSING FINANCE CHALLENGES IN DEVELOPING ECONOMIES	Michael Johnson, Assis. Prof. Dr. Sarah L. Thompson
		2	THE IMPACT OF DIGITAL INCLUSIVE FINANCE ON THE HIGH-QUALITY DEVELOPMENT OF CHINA'S EXPORT TRADE	Dr. Li Zhang, Dr. Ming Chen
		3	ETHEREUM-BASED SMART CONTRACTS FOR TRADE AND FINANCE	Assoc. Prof. Dr. John Carter
		4	FINANCING-SCHEDULING OPTIMIZATION FOR CONSTRUCTION PROJECTS USING GENETIC ALGORITHMS	John A. Thompson Michael B. Harris Laura D. Evans
		5	FACTORS DETERMINING WOMEN EMPOWERMENT THROUGH MICROFINANCE: AN EMPIRICAL STUDY IN SRI LANKA	A. Perera, S. T. Fernando
		6	MARKET ACCEPTANCE OF A MURABAHA-BASED FINANCE STRUCTURE WITHIN A SOCIAL NETWORK OF NON-ISLAMIC SMALL AND MEDIUM ENTERPRISE OWNERS IN AFRICAN PROCUREMENT	Assis. Prof. Dr. Azita Rahmani
		7	Triangle Challenges of Sustainability at the University Level within the Framework of a Knowledge-Driven Economy and Society	Dr. Petr Novák
		8	STATISTICAL ANALYSIS OF THE IMPACT OF MARITIME TRANSPORT GROSS DOMESTIC PRODUCT ON NIGERIA'S ECONOMY	A. T. Johnson, M. L. Adebayo
		9	THE IMPACT OF JOB-RELATED EMOTIONS ON JOB-RELATED HAPPINESS AMONG FRONTLINE EMPLOYEES IN FINANCIAL FIRMS	John A. Thompson, Sarah L. Bennett

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HALL / SALON 2	**Assoc. Prof. Dr. Ghasem Ghorbani Rostam**	1	CONCEPTUAL APPROACH FOR FLEXIBLE BUSINESS PROCESS MODELING	Dr. Hannelore Peeters Prof. Dr. Alain Vermeulen
		2	ORGANIZATIONAL DECISION MAKING BASED ON BUSINESS INTELLIGENCE	Pejman Hosseinioun, Dr. Rose Shayeghi, Assoc. Prof. Dr. Ghasem Ghorbani Rostam
		3	ON CULTIVATING INTERDISCIPLINARY BUSINESS INTERPRETING TALENTS BASED ON MARKET DEMAND	Aylar Myradova, Serdar Berdimuhamedov
		4	BUSINESS BUYERS' EXPECTATIONS IN BUYER-SELLER ENCOUNTERS	Fatih Yenilmez , Dr. Öğr. Üyesi Sude Biçer
		5	SOA EMBEDDED IN BPM: A HIGH-LEVEL VIEW OF THE OBJECT-ORIENTED PARADIGM	Phd İmran Güner
		6	A SPECIFICATION-BASED APPROACH FOR RETRIEVAL OF REUSABLE BUSINESS COMPONENTS FOR SOFTWARE REUSE	Yl. Öğrencisi Adnan Akçay , Dr. Abdullah Aydın Hisar
		7	IDENTIFYING BUSINESS INCUBATORS BASED ON THEIR REAL ACTIVITIES: EVIDENCE FROM CHINA	Dr. Ping Deng, Assis. Prof. Dr. Wentao Yu
		8	PROCESS-BASED BUSINESS TRANSFORMATION THROUGH SERVICES COMPUTING	Sinnakkrishnan Perumal, Dr. Nitish Pandey

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HALL / SALON 3	**Dr. Baatar Enkhbayar**	1	POLITICAL FINANCE IN AFRICA: A CASE STUDY OF ETHIOPIA	John A. Smith, Emily R. Johnson
		2	THE ASSESSMENT OF LOW-CARBON ECONOMY IN JIANGSU, CHINA	Michael Thompson, Sarah Lee
		3	DEVELOPMENT STRATEGY AND TREND ANALYSIS IN THE INFORMATION ECONOMY: INSIGHTS FROM GLOBAL EXPERIENCES APPLIED TO AZERBAIJAN	Farid Məmmədov, Leyla Hüseynova, Elnur Qasımov
		4	ENHANCING INTELLECTUAL CAPITAL TO FOSTER INNOVATION, ENTREPRENEURSHIP, AND SUSTAIN THE KNOWLEDGE ECONOMY	Dr. Baatar Enkhbayar
		5	SUFFICIENCY ECONOMY: A CONTRIBUTION TO ECONOMIC DEVELOPMENT	Assoc. Prof. Dr. Ayesha Khalid
		6	UTILITY ANALYSIS OF API ECONOMY BASED ON MULTI-SIDED PLATFORM MARKETS MODEL	Dr. Claire Moreau
		7	A BALANCED SCORECARD APPROACH FOR EVALUATING STRATEGIC ALIGNMENT OF NATIONAL R&D PROGRAMS IN CREATIVE ECONOMY POLICY	Aylin Əliyeva, Farid Məmmədov, Leyla Hüseynova, Elnur Qasımov, Zəhra Rzayeva
		8	CHALLENGES AND OPPORTUNITIES FOR PROMOTING CIRCULAR ECONOMY IN THE CONSTRUCTION SECTOR	I. Petrov, A. Ivanova, D. Sokolov, K. Volkov

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HALL / SALON 4	**Assis. Prof. Dr. Dupont Vandenberghe**	1	DEVELOPING INTELLECTUAL CAPITAL TO ADVANCE INNOVATION AND ENTREPRENEURIAL CAPACITY AND SUSTAIN KNOWLEDGE ECONOMY	Hamid Alalwany, Nabeel A. Koshak Mohammad K. Ibrahim
		2	TERRITORIES' CHALLENGES AND OPPORTUNITIES TO PROMOTE CIRCULAR ECONOMY IN THE BUILDING SECTOR	Cem Güven, Dr. Öğr. Üyesi Beyhan Yiğit, YL. Öğrencisi. Cumhur Ahmedova
		3	BANKING CRISIS AND ECONOMIC EFFECTS OF THE BANKING CRISIS IN NIGERIA	Chinedu Okafor, Amina Bello, Musa Ahmed
		4	TRIANGLE ISSUES OF SUSTAINABILITY AT THE UNIVERSITY LEVEL WITHIN THE CONTEXT OF THE KNOWLEDGE ECONOMY AND SOCIETY	Fariz Aliyev, Assoc. Prof. Dr. Nigar Mammadova
		5	STATISTICAL ANALYSIS OF THE IMPACT OF MARITIME TRANSPORT GROSS DOMESTIC PRODUCT ON BELGIUM'S ECONOMY	Assis. Prof. Dr. Dupont Vandenberghe
		6	A REVIEW ON THE OUTLOOK OF THE CIRCULAR ECONOMY IN THE AUTOMOTIVE INDUSTRY	M. Schneider, L. Weber
		7	THE ROLE OF MULTINATIONAL ENTERPRISES' INVESTMENTS IN ECONOMIC DEVELOPMENT: A CASE STUDY OF POLAND	M. Kowalski, J. Nowak
		8	ANALYZING THE POTENTIAL OF JOB CREATION BY TAKING THE FIRST STEP TOWARDS CIRCULAR ECONOMY: CASE STUDY OF BRAZIL	M. K. Schmidt, L. Fischer, P. M. Thomas

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HALL / SALON 5	**Dr. Carlos Mendes, Prof. Mariana Costa, Sofia Oliveira**	1	ETHICAL CHALLENGES IN ANTI-DOPING POLICIES: A COMPARATIVE ANALYSIS OF TURKEY AND INTERNATIONAL STANDARDS	Aisha Rahman
		2	MORPHOLOGICAL DIFFERENCES AMONG FEMALE SPRINTERS IN NIGERIA	Chinwe Okafor, Ibrahim Adamu, Fatima Suleiman
		3	LONG-TERM PHYSICAL TRAINING AND ITS INFLUENCE ON SKELETAL DEVELOPMENT IN SOUTH AFRICAN WOMEN	Nomvula Dlamini, Thabo Maseko
		4	EXAMINING THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY, DIET, AND COGNITIVE AGILITY	Ravi Prakash, Dr. Priya Natarajan
		5	PROMOTING COMMUNITY HEALTH THROUGH SPORTS: A HOLISTIC STRATEGY	Dr. Carlos Mendes, Prof. Mariana Costa, Sofia Oliveira
		6	IMPROVING STUDENT PARTICIPATION IN SWIMMING LESSONS: THE ROLE OF STRUCTURED TEACHING MODELS	Gabriela Fernández
		7	THE INFLUENCE OF ATHLETE SATISFACTION ON TEAM PERFORMANCE: A CASE STUDY FROM CAIRO UNIVERSITY	Omar El-Sayed, Hanaa Mahmoud
		8	THE EFFECTS OF LONGITUDINAL FITNESS TRAINING ON BODY COMPOSITION IN EASTERN EUROPEAN ADOLESCENT BOYS	Dmitry Ivanov, Aneta Kovacs

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HALL / SALON 6	**Assoc. Prof. Dr. Ricardo M. Vasquez**	1	EXPLORING PHYSICAL ACTIVITY BEHAVIOR CHANGE, MOTIVATION, AND PERCEIVED BARRIERS AMONG MEDICAL STUDENTS IN TANZANIA	Dr. Amani Kibwana, Fatima Njoroge
		2	THE ROLE OF CREATIVE HOBBIES IN MENTAL WELL-BEING AMONG NURSING STUDENTS: A STATISTICAL ANALYSIS	Researcher Sofia Mendes
		3	CLINICAL TRAINING EXPERIENCES IN PEDIATRIC WARDS: PERSPECTIVES FROM NURSING STUDENTS	Beatriz Tavares, João Henrique Costa
		4	EFFECTS OF MINDFULNESS TRAINING ON STRESS MANAGEMENT AMONG FIRST-YEAR NURSING STUDENTS	Dr. Ahmed Oumar
		5	DETECTION OF LEGIONELLA PNEUMOPHILA IN HOSPITAL WATER SYSTEMS IN LAGOS, NIGERIA USING PCR METHODS	Daniel C. Adebayo, Zhang Wei, Farid Al-Rashid
		6	IDENTIFYING COVID-19 STRAINS THROUGH BLOOD BIOMARKER ANALYSIS IN ATHLETES	Assoc. Prof. Dr. Ricardo M. Vasquez
		7	PHYSICAL AND METABOLIC CHARACTERISTICS OF ELITE KENYAN LONG-DISTANCE RUNNERS: A PERFORMANCE STUDY	Leonardo J. Ferreira
		8	INVESTIGATING THE EFFECTS OF COOL-WATER IMMERSION ON POST-EXERCISE RECOVERY IN HUMID CLIMATES	Samuel Chukwuma, Laila Hussain, Xinyi Zhou

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HALL / SALON 7	**Assoc. Prof. Dr. Amina Chikondi**	1	FOSTERING PROFESSIONAL IDENTITY DEVELOPMENT IN UNDERGRADUATE NURSING STUDENTS THROUGH EXPERIENTIAL LEARNING	Emma Njeri, Mohammad Faizan, Thandiwe Moyo
		2	ASSESSING DIGITAL HEALTH LITERACY AMONG NURSING STUDENTS: A CASE STUDY FROM UNIVERSITY OF LUSAKA	Kwame Boateng, Assoc. Prof. Dr. Amina Chikondi
		3	PROMOTING PROBLEM-SOLVING AND ADAPTABILITY SKILLS IN NURSING EDUCATION THROUGH CASE-BASED LEARNING	Gabriela Rocha, Carlos Mendes
		4	TRADITIONAL HEALING PRACTICES AND MODERN PAIN MANAGEMENT: IMPLICATIONS FOR PALLIATIVE CARE	Fatima Diallo
		5	THE IMPACT OF SIMULATION-BASED LEARNING ON CLINICAL DECISION-MAKING AMONG NURSING STUDENTS	S. Rahman, J. Wang
		6	INTEGRATING ARTIFICIAL INTELLIGENCE INTO NURSING EDUCATION: CHALLENGES AND OPPORTUNITIES	Assoc. Prof. Dr. Benjamin Okafor
		7	DEVELOPING MOBILE APPLICATIONS FOR CLINICAL TRAINING IN NURSING: INSIGHTS FROM EDUCATORS	Zhang Min, Halima Yusuf
		8	UTILIZING COMPETENCY-BASED ASSESSMENTS IN MEDICAL-SURGICAL NURSING EDUCATION: A COMPARATIVE ANALYSIS	Sophia Chen, Jin Ho Park, Hassan Idris

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HALL / SALON 8	**Assist. Prof. Dr. Ahmed Al-Mousa**	1	THE ROLE OF CLINICAL PRECEPTORS IN SHAPING UNDERGRADUATE NURSING CURRICULUM	Ayla Pereira, Kofi Mensah
		2	THE IMPACT OF MIDWIFERY EDUCATION ON CLINICAL OUTCOMES	Assis. Prof. Dr. Sara Tan, Dr. James Lee
		3	EFFECTS OF NURSING SERVICES ON THE PHYSICAL WELL-BEING AND BEHAVIORAL PATTERNS OF FEMALE INMATES IN PRISONS	Elena Rodrigues, Fatoumata Diop, Wang Li
		4	TRAITS OF SUCCESSFUL NURSE LEADERSHIP: INSIGHTS FROM WARD NURSES IN SYRIA	Assist. Prof. Dr. Ahmed Al-Mousa
		5	MIDWIFERY AND ITS CONTRIBUTION TO SAFE DELIVERIES IN DEVELOPING COUNTRIES	Lina Zeyad, Khaled Al-Salem
		6	IMPROVING NUTRITIONAL CARE FOR PEDIATRIC CANCER PATIENTS: NURSING INTERVENTIONS	Dr. Laura Oliveira, Dr. Ibrahim Ahmed
		7	IMPACT OF PEER SUPPORT ON PROBLEM-SOLVING SKILLS IN NURSING STUDENTS	Dr. Ahmed Jibril, Prof. Dr. Mei Zhang
		8	EVALUATING NURSING COMPETENCIES IN CLINICAL ENVIRONMENTS: A STUDY OF CAMBODIAN NURSES	Sokha Chea, Nadia Sulaiman

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HALL / SALON 9	**Assoc. Prof. Dr. Eduardo Silva**	1	THE PRACTICAL DELIVERY ROOM EXPERIENCE OF NURSING STUDENTS AT DHOFAR UNIVERSITY	Aisha Al-Harthi, Dr.Salim Al-Balushi
		2	RESILIENCE EVALUATION AMONG PATIENTS WITH CHRONIC KIDNEY DISEASE UNDERGOING DIALYSIS TREATMENT	Joana M. Costa, Ricardo Silva, Helena Marques
		3	PHYSICAL PROPERTIES AND RESISTANT STARCH CONTENT IN RICE FLOUR AFTER A-AMYLASE HYDROLYSIS	Carlos Almeida, Mai Linh Nguyen, Fouad Al-Khouri
		4	MIDWIFERY IN URBAN VERSUS RURAL SETTINGS: A COMPARATIVE STUDY	Phd. Candidate Nora Ahmed, Elias Al-Sabah
		5	MIDWIFERY CARE IN HIGH-RISK PREGNANCIES: A GLOBAL PERSPECTIVE	Dr. Maria Oliveira, Assoc. Prof. Dr. Eduardo Silva
		6	THE ROLE OF MIDWIVES IN POSTPARTUM MENTAL HEALTH SUPPORT	Emma Bennett, Mark Turner
		7	EXPLORING THE ROLE OF MIDWIVES IN BIRTH CONTROL EDUCATION	Dr. Maryam Al-Khalifa, Hana Al-Mansoori

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HALL / SALON 10	**Dr. Joseph K. Kamau,**	1	KNOWLEDGE AND PERCEPTION OF MATERNAL HEALTH CARE AMONG PREGNANT WOMEN IN PUBLIC HOSPITALS IN MAPUTO, MOZAMBIQUE	Carlos M. Fernandes, Lucia P. Andrade, Isabel R. Tavares
		2	CHALLENGES AND MOTIVATIONS IN ACCESSING IMMUNIZATION SERVICES AMONG REFUGEE CAREGIVERS IN ZIMBABWE: A QUALITATIVE ANALYSIS	Patricia T. Moyo, Kwame K. Asante, Prof. Dr. Emmanuel N. Nkrumah, Dr. Joseph K. Kamau, Alexandre D. Nsengiyumva
		3	ENHANCING COLLABORATION IN PALLIATIVE CARE PROVIDERS: INSIGHTS FROM BOTH URBAN AND RURAL AREAS IN NIGERIA	Chinonso I. Okafor, Yemi A. Olufemi, Ruth O. Alade, Akinwale J. Balogun
		4	EXPLORING THE IMPACT OF STRESS AND COPING STRATEGIES AMONG PATIENTS UNDERGOING HEMODIALYSIS IN KENYA	Grace O. Kinyua, Dr. Martin A. Nyambura
		5	EVALUATION OF EVIDENCE-BASED NURSING PRACTICES IN PEDIATRIC DENTAL CARE IN PUBLIC HEALTH SETTINGS	Dr. Regina S. Osei, Dr. Benjamin E. Okoro
		6	ASSESSING THE IMPACT OF HIGH-FIDELITY SIMULATION ON TEAMWORK AND COMMUNICATION AMONG NURSING STUDENTS IN EAST AFRICA	Koffi J. Dufresne, Zainab O. Ajayi, S. Nambiro, Dr. Sheila M. Nyongo
		7	THE ROLE OF COMPLEMENTARY THERAPIES IN PEDIATRIC ONCOLOGY TREATMENT: A STUDY ON THE INTEGRATION OF YOGA	Dr. Solomon J. Okonkwo

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HALL / SALON 11	**Dr. Maria Gallo, Prof. Dr. Luca Bianchi,**	1	SOCIO DEMOGRAPHIC CORRELATES OF POST-TRAUMATIC STRESS DISORDER AMONG YOUTH UNDERGOING DOMESTIC VIOLENCE IN EUROPEAN CONTEXTS	Laurent Dupont, Sofia Hernandez
		2	SOCIOLOGY PERSPECTIVE ON EMOTIONAL MALTREATMENT: RETROSPECTIVE CASE STUDY IN A JAPANESE ELEMENTARY SCHOOL	Dr. Maria Gallo, Prof. Dr. Luca Bianchi,
		3	THE IMPACT OF ERIC TRANSFERENCE ON THE DURABILITY OF PSYCHOANALYTIC TREATMENT: AN EXPLORATORY CASE STUDY	Sara Romano, Dr. Lukas Schmidt
		4	THE IMPACT OF THE BUILT ENVIRONMENT ON CHILDREN: ENVIRONMENTAL PERCEPTIONS OF DEPRIVED CHILDREN IN EUROPEAN SLUMS	Elias Becker, Clara Fernández, Nia Thomsen
		5	ASSOCIATION BETWEEN ADHD MEDICATION, CANNABIS, NICOTINE USE, MENTAL DISTRESS, AND OTHER PSYCHOACTIVE SUBSTANCES	Luca Bergamini, Assoc. Prof. Dr. Maria De Luca, Anna Fischer, Dr. Jeanette Nadeau
		6	ADDRESSING GLOBAL TRAUMA: SOMATIC INTERVENTIONS IN PTSD TREATMENT AND CLINICIAN BURNOUT PREVENTION	Marie Dupont, Johannes Fischer, Lucia Moretti

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HALL / SALON 12	**Dr. Zola Moyo**	1	CORRELATION BETWEEN MEANING IN LIFE AND ACADEMIC PERFORMANCE IN AFRICAN COLLEGE STUDENTS	Amina N'Diaye, Kwame Agyemang, Dr. Zola Moyo
		2	IMPROVING DECISION SUPPORT FOR ORGAN TRANSPLANT	A. M. Ndlovu, P. L. Dlamini, T. O. Adeyemi, J. C. Mbatha, S. S. Nkosi, B. E. Chukwu
		3	LOVE AND MONEY: SOCIETAL ATTITUDES TOWARD INCOME DISPARITIES IN AGE-GAP RELATIONSHIPS	Kwame A. Asante Ngozi O. Okafor Tendai M. Chirwa
		4	EFFECTS OF GRATITUDE PRACTICE ON RELATIONSHIP SATISFACTION AND THE ROLE OF PERCEIVED SUPERIORITY	Kwame Mensah, Amina Ndlovu, Temba Dube
		5	MINDFULNESS-BASED STRESS REDUCTION FOR ENHANCING SELF-ESTEEM AND WELL-BEING: THE CRITICAL ROLE OF CONTINGENT SELF-ESTEEM IN PREDICTING WELL-BEING COMPARED TO EXPLICIT SELF-ESTEEM	Amina Diouf, Kwame Nkrumah Thandiwe Mbatha
		6	SUICIDE WRONGFUL DEATH: STANDARD OF CARE PROBLEMS INVOLVING THE INACCURATE DISCERNMENT OF LETHAL RISK WHEN FOCUSING ON THE ELICITATION OF SUICIDE IDEATION	Jin Wei Li, Yu Hang Zhang, Aiko Tanaka
		7	EXPERIENCES AND IMPACT OF ATTACHMENT AMONG WOMEN WITH INSECURE ATTACHMENT IN COHABITATION: IMPLICATIONS FOR THERAPEUTIC PRACTICE	Nur Aisyah Sari, Rina Puspitasari, Andi Muhammad Haris
		8	CULTURAL PRACTICES AS A COPING MEASURE FOR WOMEN WHO TERMINATED A PREGNANCY IN ADOLESCENCE: A QUALITATIVE STUDY	Phd. Nina P. Wijaya Prof. Dr. Rina H. Putri
		9	HELPING OTHERS AND YOUTH MENTAL HEALTH: A QUALITATIVE STUDY EXPLORING PERSPECTIVES OF YOUTH ENGAGING IN PROSOCIAL ACTIVITIES	Ayesha Tanaka, Rajiv Kumar, Mei Ling Zhao

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HALL / SALON 1	**Dr. Öğr. Üyesi Ahmet Düha KOÇ**	1	ÇOCUK SAĞLIĞI POLİTİKALARI ÜZERİNE YAPILAN ÇALIŞMALARIN VOSVİEWER İLE BİBLİYOMETRİK ANALİZİ	Arş. Gör. Osman ŞAHMAN Arş. Gör. Dr. Semih ISLICIK
		2	The Impact of Electronic Health Records on Nursing Management	Öğr. Gör. Dr. Emine ERSÖZLÜ
		3	Digitalization in Nursing Management: Technological Innovations and Challenges	Öğr. Gör. Dr. Emine ERSÖZLÜ
		4	Türkiye ve Dünya Genelinde Paramedik Eğitimi ve Lisans Programları	Öğr. Gör. Ümit TOPCUOĞLU
		5	TOPLUMDA İLKYARDIM EĞİTİMİNİN FAYDALARI	Öğr. Gör. Ümit TOPCUOĞLU
		6	SÜRDÜRÜLEBİLİRLİK VE SÜRDÜRÜLEBİLİR KALKINMA	Prof. Dr. Yunus Emre ÖZTÜRK Birgül Sena IŞIK
		7	DİGİTALİZATİON and ITS EFFECTS ON REDUCİNG CARBON FOOTPRİNT	Prof.Dr. YUNUS EMRE ÖZTÜRK Yüksek Lisans Öğrencisi, AYŞE KEMER
		8	COĞRAFİ BİLGİ SİSTEMLERİ (CBS) İLE 112 AMBULANS ROTALAMA VE ACİL MÜDAHALE OPTİMİZASYONU	Dr. Öğr. Üyesi Ahmet Düha KOÇ
		9	SAĞLIK BİLİŞİMİ KULLANARAK ACİL DURUM YÖNETİMİNDE HATA AZALTMA STRATEJİLERİ	Dr. Öğr. Üyesi Ahmet Düha KOÇ

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HALL / SALON 2	**PROF. DR. OGUZHAN ZENGIN**	1	A BIBLIOGRAPHIC REVIEW OF POSTGRADUATE THESES ON POST-TRAUMATIC STRESS DISORDER	Doktorant, MAHMUT SAMİ KÖKTAŞ
		2	ENSURING HEALTHY LIVES AND PROMOTING WELL-BEING FOR ALL IN TURKEY: ALIGNING WITH THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT	PROF. DR. OGUZHAN ZENGIN
		3	FROM EDUCATION TO EMPLOYMENT: EXPLORING TURKEY'S PROGRESS TOWARD GENDER EQUALITY	PROF. DR. OGUZHAN ZENGIN
		4	MEDICAL SOCIAL SERVICE PRACTICES FOR CANCER PATIENTS AND THEIR RELATIVES ONCOLOGICAL SOCIAL SERVICE	Asst. Prof., İhsan KUTLU Graduate student, Fatma Sude UZUN
		5	THE SOCIOLOGICAL ANALYSIS OF HONOR AND CUSTOM KILLING IN TURKEY	Dr. ZEYNEP ŞENTÜRK DIZMAN
		6	DARK TOURISM: SOCIOLOGICAL REFLECTIONS OF DEATH AND SUFFERING	Doktora Öğrencisi Ayşe KÖSE ŞİRİN
		7	ORMAN YANGINLARININ KIRSAL YAPIYA ETKİLERİ ÜZERİNE SOSYOLOJİK BİR DEĞERLENDİRME	Doktor Öğretim Üyesi, ÜMMÜ BULUT KESKİN
		8	ÜNİVERSİTE-MEKAN İLİŞKİSİ BAĞLAMINDA ÜNİVERSİTELERİN DÖNÜŞTÜRDÜĞÜ KIRSAL ALANLAR	Doktor Öğretim Üyesi, ÜMMÜ BULUT KESKİN

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HALL / SALON 3	Doç.Dr., ŞAHİN İNANÇ	1	DEVELOPMENT OF TIME SERIES BASED CALL COUNT PREDICTION MODELS FOR CALL CENTERS OF ELECTRONIC PAYMENT AND MONEY INSTITUTIONS	Hasan Hüseyin Yurdagül Zehra Sude Sarı Şule Yeşilyurt Ceren Ulus M. Fatih Akay
		2	DELIVERY TIME PREDICTION FOR THE E-COMMERCE SECTOR	Batuhan Taşkapı Hasan Hüseyin Yurdagül Zehra Sude Sarı Ceren Ulus M. Fatih Akay
		3	ENERJİ YÖNETİMİNDE PARÇACIK SÜRÜ OPTİMİZASONU UYGULAMASI	Dr,ONUR MESUT ŞENARAS Doç.Dr., ŞAHİN İNANÇ Prof.Dr., ARZU EREN ŞENARAS
		4	LOJİSTİK YÖNETİMİ İÇİN YAPAY ARI KOLONİSİ OPTİMİZASYONU UYGULAMASI	Dr,ONUR MESUT ŞENARAS Doç.Dr., ŞAHİN İNANÇ Prof.Dr., ARZU EREN ŞENARAS
		5	HUMAN RESOURCES IN THE METAVERSE: A QUALITATIVE STUDY ON RECRUITMENT THROUGH VIRTUAL REALITY	J. Tğm. Dr. Ahmet SARNIÇ
		6	ULTRA DÜŞÜK GÜÇLÜ IOT CİHAZLAR İÇİN GERÇEK ZAMANLI İŞLETİM SİSTEMİ TASARIMI VE GELİŞTİRİLMESİ	Mekatronik Mühendisi,ERTAN ARAS Doç. Dr.,DİLŞAD ENGİN
		7	Deep Learning for Fracture Detection: Achieving High Precision and Sensitivity Across Multi-Region X-ray Images	Dr. Refika Sultan DOĞAN Dr. Rukiye Nur KAÇMAZ
		8	DEVELOPMENT OF A RULE-BASED SELLER CLUSTERING SYSTEM	Muhammed Kesici Oğuzhan Mangır Tuğçe Dinç Ceren ULUS M. Fatih AKAY
		9	BIST 100 PRICE PREDICTION WITH GRU	Asst. Prof. İlkay Sibel KERVANCI Asst. Prof. Gözde ÖZSERT YİĞİT
		10	ADRESSING IMBALANCE IN DRUG-TARGET INTERACTION PREDICTION WITH HYBRID FEATURE REDUCTION AND DATA AUGMENTATION STRATEGIES	Asst. Prof. Dr., Gözde ÖZSERT YİĞİT Asst. Prof. Dr., İlkay Sibel KERVANCI

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HALL / SALON 4	**Dr. Öğr. Üyesi, EMİNE SEÇİL KARAMUKLU**	1	Investigation of The Compatibility of Primary School English Course Learning Outcomes with Other Courses in Terms of Social Emotional Learning	Selver TUNA Doç. Dr. Bahadır KÖKSALAN
		2	İLKOKUL TÜRKÇE, HAYAT BİLGİSİ, SOSYAL BİLGİLER DERS KİTAPLARININ SORUMLULUK DEĞERİ BAKIMINDAN İNCELENMESİ	Dr. Öğr. Üyesi, Zekiye ÇAĞIMLAR Uzman Öğretmen, İNCİ YAŞAR
		3	İLKOKUL FEN BİLİMLERİ VE MATEMATİK DERS KİTAPLARININ SORUMLULUK DEĞERİ BAKIMINDAN İNCELENMESİ	Dr. Öğr. Üyesi, Zekiye ÇAĞIMLAR Uzman Öğretmen, İNCİ YAŞAR
		4	ÖZEL EĞİTİM ÖĞRETMENLİĞİ BÖLÜMÜ ÖĞRENCİLERİNİN ÖZEL EĞİTİM MESLEK LİSELERİNE İLİŞKİN GÖRÜŞLERİ	Dr. Öğr. Üyesi, EMİNE SEÇİL KARAMUKLU
		5	PSİKOLOJİK DANIŞMANLIK VE REHBERLİK BÖLÜMÜ ÖĞRENCİLERİNİN KAYNAŞTIRMA/BÜTÜNLEŞTİRME UYGULAMALARINA İLİŞKİN METAFORİK ALGILARI	Dr. Öğr. Üyesi, EMİNE SEÇİL KARAMUKLU
		6	THE IMPORTANCE OF R&D AND EDUCATION STUDIES IN INCREASING CLIMATE CHANGE AWARENESS	Expert Ecologıst Bedirhan EKER Associate Professor Yasin ÜNAL

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HALL / SALON 5	**Doç. Dr. SİBEL ADAR CAN**	1	ORTAOKUL MATEMATİK ÖĞRETMENLERİNİN MATEMATİK OKURYAZARLIĞI ETKİNLİKLERİNİ GERÇEKLEŞTİRME DURUMLARININ İNCELENMESİ	Yüksek Lisans Öğrencisi, İREM BAŞAĞAÇ Prof. Dr., KÜRŞAT YENİLMEZ
		2	ARCHETYPES: A JOURNEY INTO THE DEPTHS OF THE HUMAN PSYCHE	Assoc. Prof. Dr. Nazile Abdullazade
		3	Dikkat Eksikliği Hiperaktivite Bozukluğu Olan Ortaokul Öğrencilerinin Bağlanma Stilleri ile Psikolojik Sağlamlık Düzeyleri Arasındaki İlişkinin İncelenmesi	Mısra Çifteci Dr. Öğr. Üyesi, Çağla Çelimli
		4	HASTA VE YAŞLI BAKIM HİZMETLERİ BÖLÜMÜ ÖĞRENCİLERİNİN EMPATİ BECERİLERİNİN GELİŞTİRİLMESİNE YÖNELİK EĞİTİM PROGRAMI İÇİN BİR İHTİYAÇ ANALİZİ	Yüksek Lisans Öğrencisi, MUSTAFA ÖZTÜRK Dr. Öğr. Üyesi BURHAN ÜZÜM
		5	A CASE STUDY BASED ON DIGITAL LITERACY LEVELS OF EFL LEARNERS IN TURKEY: WHAT ARE THEIR PERCEPTIONS?	Assist. Prof. HALENUR OCAKTAN ÇELİKTÜRK
		6	YOUR DIFFERENCE/AWARENESS CREATING A SUSTAINABLE WORLD WITH CREATIVE DRAMA	Assist. Prof. Dr., GÜLİZ ŞAHİN Undergraduate Student, ESRA KARAAL Undergraduate Student, AZRA MAÇÇA
		7	AN EVALUATION ON THE COMPETENCIES OF CLASSROOM TEACHER CANDIDATES IN VISUAL ARTS TEACHING COURSE	Doç. Dr. SİBEL ADAR CAN
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HALL / SALON 6	**Dr. Öğr. Üyesi Fatih ŞAHİN**	1	Over Kanseri ve Ebelik: Tespit, Danışmanlık ve Bütünsel Destek	AYSEL KURUOĞLU YASEMİN HAMLACI BAŞKAYA
		2	THE USE OF ARTİFİCİAL INTELLİGENCE İN ASSİSTED REPRODUCTİVE TECHNOLOGİES	Ebe (Tezli Yüksek Lisans Öğrenci), Ayşenur YETİM Arş. Gör. Dr., Fatma YILDIRIM Prof. Dr., Nuriye BÜYÜKKAYACI DUMAN
		3	A Solution-Oriented Approach in Psychiatric Nursing	Dr. Öğr. Üyesi Fatih ŞAHİN
		4	SAĞLIK ÇALIŞANLARININ YAŞADIĞI İŞ STRESİNİN SİGARA İÇME ARZUSUNA ETKİSİ	Yüksek Lisans Öğr. Havvanur GÜNEŞ Yüksek Lisans Öğr. Fatma Nur DALBOY Doç. Dr. Yasemin HAMLACI BAŞKAYA
		5	EBEVEYNLERİN ATEŞ YÖNETİMİ TERCİHLERİNİN DEĞERLENDİRİLMESİ	Doç. Dr. Funda KARDAŞ ÖZDEMİR Arş. Gör. Melis Can KESGİN GÜNGÖR
		6	SÜNNET OLAN ÇOCUKLARDA DİKKAT DAĞITMA TEKNİKLERİNİ KULLANAN RANDOMİZE KONTROLLÜ ÇALIŞMALARIN İNCELENMESİ	Arş. Gör. Melis Can KESGİN GÜNGÖR Doç. Dr. Funda KARDAŞ ÖZDEMİR
		7	INVESTIGATION OF WOMEN'S HEALTH LITERACY AND HEALTH BELIEFS ABOUT HUMAN PAPILLOMA VIRUS AND VACCINE: A CROSS-SECTIONAL DESCRIPTIVE STUDY	Hemşire, JANIL ALANUR HAKİM Dr. Öğretim Üyesi ASLI KARAKUŞ SELÇUK

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HALL / SALON 7	**Doç.Dr.Hafize ÖZDEMİR ALKANAT**	1	Maintaining Secure Attachment in Neonatal İntensive Care Unit	Melis İLBASAN Doç. Dr. Handan ÖZCAN
		2	Is Comsumption a Risk in Maintaining Fertility?	Melis İLBASAN Doç. Dr. Handan ÖZCAN
		3	SİRKADYEN RİTMİN BOZULMASI VE KRONOTİPİN SAĞLIK ÜZERİNE ETKİLERİ	Doç.Dr.Hafize ÖZDEMİR ALKANAT
		4	SİRKADYEN RİTİM VE KRONOKEMOTERAPİ ÜZERİNE HEMŞİRELİK NOTLARI	Doç.Dr.Hafize ÖZDEMİR ALKANAT
		5	Is Unsafe Sexual Activity a Risk in the Maintenance of Fertility?	Gülbanu GÜMÜŞOK, Doç. Dr. Handan ÖZCAN
		6	Effects of Endocrine Disruptors on Fertility	Gülbanu GÜMÜŞOK, Doç. Dr. Handan ÖZCAN
		7	MASSAGE TECHNIQUES USED TO REDUCE LABOR PAIN	Assistant Professor, Sebahat Hüseyinoğlu Graduate Sudent, Sevda Elkatmiş
		8	THE POWER OF ART THERAPY İN PREGNANCY, CHİLDBİRTH AND POSTPARTUM	Dr. Öğr. Üyesi, Sebahat HÜSEYİNOĞLU Arş. Gör. Kübra Nur KILIÇ Arş. Gör Begüm CAN Doç. Dr. Reyhan AYDIN DOĞAN

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HALL / SALON 8	**Asst. Prof. Dr., LÜTFİYE NUR UZUN**	1	THE IMPORTANCE OF FAMILY-CENTERED CARE IN CHILDREN WITH CHRONIC ILLNESS	Hemşire Nihat GÜNEŞ Dr. Öğr. Üyesi Veysel CAN Dr. Öğr. Üyesi Mehmet BULDUK
		2	BIBLIOMETRIC ANALYSIS OF GRADUATE THESES ON STREET CHILDREN	Hemşire Nihat GÜNEŞ Dr. Öğr. Üyesi Veysel CAN Dr. Öğr. Üyesi Mehmet BULDUK
		3	Sleep Hygiene During Pregnancy	Nezaket TARHAN Doç. Dr. Handan ÖZCAN
		4	Nursing and Midwifery Interventions in Ovarian Hyperstimulation Syndrome	Nezaket TARHAN Doç. Dr. Handan ÖZCAN
		5	EXAMINING THE RELATIONSHIP BETWEEN NURSING STUDENTS' CAREER CHOICES AND GENDER ROLES PERCEPTIONS	Damla ŞAHİN Assist. Prof. Dr Bahar ÇOLAK
		6	CODING EMOTIONS: ARTIFICIAL INTELLIGENCE, NURSING AND MASLOW'S PYRAMID OF NEEDS	Asst. Prof. Dr., LÜTFİYE NUR UZUN
		7	The Relationship Between Post Traumas, Psychosocial Difficulties, Quality of Life and Sleep Status of Children Diagnosed with Secondary Enuresis After Earthquake	Dr. Öğr. Üyesi Mehmet Emin DÜKEN
		8	COMPLİCATİONS AND MANAGEMENT OF ABDOMİNAL TRAUMA İN PREGNANCY	Yüksek Lisans Öğrencisi Ebe, Merve KAYA Doç. Dr. Yasemin Hamlacı Başkaya

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HALL / SALON 9	**Assist. Prof. Dr. N. MEZİYET DİLEK**	1	TARIMSAL ÜRETİMDE ENERJİ YÖNETİMİNDE YENİLENEBİLİR ENERJİ TEKNOLOJİLERİNİN ÖNEMİ	Prof.Dr. Hasan Hüseyin ÖZTÜRK Dr. Hasan Kaan KÜÇÜKERDEM
		2	SERA İKLİMLENDİRME İÇİN GÜNEŞ ENERJİSİ DESTEKLİ ISI POMPASI KULLANIMI	Prof.Dr. Hasan Hüseyin ÖZTÜRK Dr. Hasan Kaan KÜÇÜKERDEM
		3	ÇİLEK YETİŞTİRİCİLİĞİNDE RİZOBAKTERİ VE VİNAS UYGULAMALARININ GELİŞME VE VERİM ÜZERİNE ETKİLERİ	Neslihan TOPAL Prof. Dr. Ahmet EŞİTKEN
		4	CEVİZ KABUĞUNUN KOH VE İLE KİMYASAL AKTİVASYONU SONUCU ELDE EDİLEN AKTİF KARBONUN KARAKTERİZASYONU	Prof. Dr. ESRA ALTINTIĞ Dr. BİRSEN SARICI
		5	METİLEN MAVİSİNİN MANYETİK AKTİF KARBON İLE GİDERİMİNİN İNCELENMESİ	Prof. Dr. ESRA ALTINTIĞ Dr. BİRSEN SARICI
			IĞDIR OVASI'NDA BULUNAN ARAZİLERİN SULAMA SİSTEMİNİN DEĞERLENDİRİLMESİ ve KAPALI SULAMA SİSTEMİNE GEÇİLMESİ İMKÂNLARININ ARAŞTIRILMASI	Ziraat Mühendisi, Mehmet Fatih ÇELEBİ
		6	ANTHOCYANNINS AND THE USE OF ANTHOCYANNINS AS FOOD COLOURANTS	Dr. Fatmagül Hamzaoğlu
		7	USE OF COLD PLASMA TECHNIQUE IN FOOD TECHNOLOGY	Assoc. Prof. KUBRA UNAL Assist. Prof. Dr. N. MEZİYET DİLEK
		8	MARINATION PROCESS IN MEAT TECHNOLOGY: OBJECTIVES AND EFFECTS	Assist. Prof. Dr. N. MEZİYET DİLEK
		9	GIDA İŞLEMEDE 3D BASKI TEKNOLOJİSİNE GENEL BAKIŞ	Doç. Dr. Emine NAKİLCİOĞLU Gizem TİRYAKİ
		8	KAHVE TELVESİNİN GIDA SANAYİSİ ALANINDA DEĞERLENDİRİLMESİ	Gizem TİRYAKİ Doç. Dr. Emine NAKİLCİOĞLU

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HALL / SALON 10	**Dr. Carolina Reyes Assoc. Prof. Dr. Jeanette Mbala**	1	THE EVOLUTION OF MIDWIFERY PRACTICES: CULTURAL AND MEDICAL PERSPECTIVES FROM TURKEY AND SOUTH AFRICA	Dr. Aylin Demir
		2	INTEGRATING TRADITIONAL AND MODERN MIDWIFERY: A COMPARATIVE STUDY IN INDONESIA AND KENYA	Dr. Siti Rahmawati Dr. Akinyi Njoroge
		3	ASSESSING THE IMPACT OF MIDWIFERY EDUCATION ON MATERNAL AND NEONATAL OUTCOMES IN BANGLADESH AND GHANA	Dr. Farida Chowdhury Dr. Kwame Boateng
		4	THE ROLE OF MIDWIVES IN COMBATING MATERNAL MORTALITY: LESSONS FROM BRAZIL AND UGANDA	Dr. Maria Oliveira Dr. Grace Nakato
		5	MIDWIFERY AND COMMUNITY HEALTH: EMPOWERING WOMEN THROUGH HOLISTIC CARE IN VIETNAM AND ETHIOPIA	Mekdes Tesfaye Linh Tran
		6	TECHNOLOGICAL ADVANCEMENTS IN MIDWIFERY: THE IMPACT OF TELEHEALTH IN RURAL AREAS OF THE PHILIPPINES AND TANZANIA	Dr. Angelica Dela Cruz Dr. Juma Mwinyi
		7	EXPLORING MIDWIFERY POLICY AND PRACTICE: CHALLENGES AND OPPORTUNITIES IN MALAYSIA AND ZAMBIA	Noor Hidayah Dr. Bwalya Chisanga
		8	MIDWIFERY INTERVENTIONS FOR HIGH-RISK PREGNANCIES: STRATEGIES FROM MOROCCO AND INDIA	Dr. Salma El Idrissi
		9	THE IMPACT OF MIDWIFERY-LED BIRTH CENTERS ON MATERNAL SATISFACTION: CASE STUDIES FROM MEXICO AND CAMEROON	Dr. Carolina Reyes Assoc. Prof. Dr. Jeanette Mbala

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HALL / SALON 11	**Assoc. Prof. Dr.Natasha Ivanova**	1	IMPROVING MATERNAL HEALTH THROUGH MIDWIFERY-LED CARE MODELS: A GLOBAL PERSPECTIVE	Aisha Al-Harthy Dr. Fatima Ibrahim Dr. Elena Petrova
		2	THE ROLE OF MIDWIVES IN PREVENTING POSTPARTUM DEPRESSION: A QUALITATIVE STUDY	Dr. Nawal Al-Mazroui Assis. Prof. Dr. Layla Abdullahi
		3	INTEGRATING TRADITIONAL MIDWIFERY PRACTICES INTO MODERN MATERNAL CARE IN SUB-SAHARAN AFRICA	Esther Mwangi Dr. Safiya Hassan
		4	MIDWIFERY EDUCATION AND SKILL DEVELOPMENT: CHALLENGES AND OPPORTUNITIES IN THE MIDDLE EAST	Dr. Laila Al-Kindi Mohammed Al-Farsi
		5	TECHNOLOGY-ASSISTED MIDWIFERY: TELEHEALTH SOLUTIONS FOR REMOTE MATERNAL CARE	Assoc. Prof. Dr.Natasha Ivanova
		6	MATERNAL HEALTH DISPARITIES AMONG MIGRANT WOMEN: THE ROLE OF MIDWIFERY SERVICES	Phd. Candidate Maria Fernández
		7	THE ROLE AND SIGNIFICANCE OF INTERVENTION RESEARCH IN SOCIAL WORK	Prof. Dr. João Henrique Silva
		8	MIDWIFERY INTERVENTIONS IN REDUCING CESAREAN SECTION RATES: A SYSTEMATIC REVIEW	Msc. Sara Abdulwahab

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HALL / SALON 1	**Prof. Dr. Anna Dubois, Dr. Sofia Rossi**	1	FEDERALISM AND INTERNATIONAL AFFAIRS: THE ROLE OF SUB-STATE GOVERNMENTS IN EUROPEAN COUNTRIES	Olivier Durand Jan Kowalski
		2	KOREA AND JAPAN ECONOMIC RELATIONS: AN ANALYSIS THROUGH THE WORLD TRADE ORGANIZATION	Emilie L. Dufresne, Matteo P. Costa
		3	SELF-PERCEIVED EMPLOYABILITY OF INTERNATIONAL RELATIONS STUDENTS IN EUROPEAN UNIVERSITIES	Dr. Julian Andersson, Prof. Dr. Claire Dubois
		4	THE ROLE OF EUROPEAN COUNTRIES IN RESOLVING THE RELIGIOUS CONFLICTS IN CENTRAL ASIA	Prof. Dr. Anna Dubois, Dr. Sofia Rossi
		5	PUBLIC RELATIONS FOR THE FACULTY OF MANAGEMENT SCIENCE IN AFRICAN UNIVERSITIES	Adebayo Olumide, Chipo Ndlovu, Kwame Amankwah
		6	CHILEAN BUSINESS ORIENTALISM: THE ROLE OF NON-STATE ACTORS IN THE FRAME OF ASYMMETRIC BILATERAL RELATIONS	Kwame Osei Amina N'Diaye
		7	ECONOMIC GROWTH RELATIONS TO DOMESTIC AND INTERNATIONAL AIR PASSENGER TRANSPORT IN AFRICA	Kwame Nkrumah, Amina Binta, Julius Ochieng, Zanele Moyo
		8	HORIZONTAL DIMENSION OF CONSTITUTIONAL SOCIAL RIGHTS	Amina Oumarou, Thabo Mokoena, Nana Adomah
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HALL / SALON 2	**Assoc. Prof. Dr. Fatima Zohra Benkhedda**	1	OPERATION STRATEGY AND PUBLIC RELATIONS TRENDS FOR PUBLIC RELATIONS STRATEGIES DEVELOPMENT IN AFRICA	Kwame O. Adom, Nia A. Kwesi
		2	APPLICATION ASPECTS OF PUBLIC RELATIONS BY NONPROFIT ORGANIZATIONS: A CASE STUDY OF THE MIDDLE EAST	Omar Al-Mansouri, Leila Kassem, Tariq Abdullah
		3	APPLICATION'S ASPECTS OF PUBLIC RELATIONS BY NONPROFIT ORGANIZATIONS. CASE STUDY MIDDLE EAST	Omar Al-Sabah, Layla Al-Dosari, Khaled Al-Farouq
		4	THE IDEA OF INTERNATIONAL CRIMINAL JUSTICE IN THE FUNCTION OF PROSECUTION OF INTERNATIONAL CRIMES	Omar Al-Mansoori, Aisha Al-Hashimi
		5	AN EFFICIENT MULTI JOIN ALGORITHM UTILIZING A LATTICE OF DOUBLE INDICES	D. Ahmad R. Al-Hassan, Assis. Prof. Dr. Nadia B. Al-Sayed
		6	EXPLORING THE PROFESSIONAL COMPETENCY CONTENTS FOR INTERNATIONAL MARKETERS IN THE MIDDLE EAST	Mohammad Al-Fahad, Dr. Ali Al-Hassan
		7	THE ROLE OF MIDDLE EASTERN COUNTRIES IN THE UNIFICATION OF COLLISION OF LAW IN INTERNATIONAL TRADE	A. Al-Mansouri, N. Al-Jaber
		8	EXTENDING THE CONCEPTUAL NEIGHBORHOOD GRAPH OF THE RELATIONS FOR THE SEMANTIC ADAPTATION OF MULTIMEDIA DOCUMENTS	Ahmed Al-Mansouri, Assoc. Prof. Dr. Fatima Zohra Benkhedda

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HALL / SALON 3	**Assoc. Prof. Dr. Kwame Ndlovu**	1	PUBLIC SERVICE ETHICS IN THE MIDDLE EAST: AN EMPIRICAL STUDY	Omar Al-Mansouri Leila Al-Farsi Tariq Al-Hashmi
		2	DISTINCTIVE FEATURES OF LEGAL RELATIONS IN THE AREA OF SUBSOIL USE, RENEWAL AND PROTECTION IN THE MIDDLE EAST :	F. Al-Mohammad, L. Al-Saleh, R. Al-Hassan
		3	THE CONCEPT AND PRACTICE OF GOOD GOVERNANCE IN AFRICA	Assoc. Prof. Dr. Kwame Ndlovu Dr. Fatima Diallo
		4	A FRAMEWORK FOR KNOWLEDGE MANAGEMENT APPLICATION IN PUBLIC ORGANIZATIONS IN AFRICA	Dr. Kwame Mensah, Dr. Amina Ouedraogo
		5	E-GOVERNMENT, DIGITAL TRANSFORMATION, AND THE ONE BELT ONE ROAD INITIATIVE: AFRICA'S OPPORTUNITY	Dr. Amina Coulibaly
		6	CONCEPTUALIZING PRIORITIES IN THE DYNAMICS OF PUBLIC ADMINISTRATION CONTEMPORARY REFORMS	Kwame Osei Fatima Mbatha Amina Diallo Thabo Ndlovu
		7	THE IMPLEMENTATION OF MANDATORY ELECTRONIC DOCUMENT EXCHANGE IN PUBLIC ADMINISTRATION: EXPECTATIONS VERSUS REALITY	Dr. Samuel Njoroge Dr. Amina Diallo
		8	UTILIZING KNOWLEDGE MANAGEMENT TO FOSTER A KNOWLEDGE SOCIETY THROUGH E-GOVERNMENT SERVICES IN AFRICAN NATIONS	Dr. Samuel Njoroge Dr. Aisha Abubakar

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HALL / SALON 4	**Adebayo Okonkwo**	1	ANALYSIS OF THE EVOLUTION OF IN-SERVICE TRAINING IN PUBLIC ADMINISTRATION: FROM PERSONNEL MANAGEMENT TO HUMAN RESOURCE DEVELOPMENT	Dr. Wei-Lun Zhang Dr. Noriko Tanaka
		2	ENHANCING ACCOUNTABILITY IN THE PUBLIC SECTOR: LESSONS FROM A CORRUPTION CASE IN NIGERIA	Adebayo Okonkwo
		3	EVALUATION OF MEDICATION ADMINISTRATION PROCESS IN A PAEDIATRIC WARD	Hiroshi Takahashi Mei Lin Zhang Joon-Soo Park Nguyen Thanh Binh
		4	IMPLEMENTING COLLABORATIVE BUSINESS PROCESSES TO MITIGATE INFORMATION LOSS IN PUBLIC ADMINISTRATION	H. Nakamura S. Liang, K. Tham
		5	A LEGAL OPINION ON MITIGATION AND ADAPTATION AIR POLLUTION STRATEGIES FOR LOCAL GOVERNMENTS IN EAST ASIA	Hiroshi Tanaka Mei Lin Zhang
		6	FROM SEPARATISM TO COALITION: VARIANTS IN LANGUAGE POLITICS AND LEADERSHIP PATTERN IN DRAVIDIAN MOVEMENT	Takeshi Yamamoto Li Wei Min Ji
		7	HOW DO POLITICIANS RECOVER THEIR COSTS? THE POLITICAL ECONOMY OF REPRESENTATIVE DEMOCRACY IN ASIAN POLITICS	Mei Ling Zhao Rajiv Kumar
		8	THE ROLE OF REGIONAL CONCEPTS IN PUBLIC POLICY: A STUDY ON THE SOUTH ASIAN CONTEXT	Rajeev Kumar Mei Li Zhang, Amira K. Sulaiman
		9	CONTROLLING YOUTHS' PARTICIPATION IN POLITICS IN YANGON: A CONSTRUCTIVE INCLUSIVENESS FOR GOOD GOVERNANCE IN MYANMAR	Aung Kyaw Zin Mai Thein Lwin

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HALL / SALON 5	**Assis .Prof. Dr. Yumi Tanaka**	1	FINITE-SUM OPTIMIZATION: ADAPTIVITY TO SMOOTHNESS AND LOOPLESS VARIANCE REDUCTION	Sungmin Park Dr. Jiawei Zhang
		2	A MODEL OF A NON-EXPANDING UNIVERSE DRIVEN BY THE VACUUM SPACE PROPERTIES	Ryuji Takahashi Ahmed Al-Farsi Zhang Wei
		3	GENERALIZATION OF TSALLIS ENTROPY THROUGH Q-DEFORMED ARITHMETIC	A. P. Kundu R. J. Singh S. M. Patel T. H. Zhou
		4	ESTIMATION OF FUNCTIONAL RESPONSE MODEL USING SUPERVISED FUNCTIONAL PRINCIPAL COMPONENT ANALYSIS	Haruto Kobayashi Assis .Prof. Dr. Yumi Tanaka
		5	CLOSED-FORM SOLUTION OF SECOND ORDER LINEAR ORDINARY DIFFERENTIAL EQUATIONS	Ahmed Hassan Assoc. Prof. Dr. Layla Abdallah
		6	ECONOMIC FORECASTING MODEL IN PRACTICE USING REGRESSION ANALYSIS: THE RELATIONSHIP BETWEEN PRICE, DOMESTIC OUTPUT, GROSS NATIONAL PRODUCT, AND TREND VARIABLES IN OIL PRODUCTION	Kwame Adom, Amina Osei, Dr. Kofi Baidoo
		7	OPTIMIZING SPATIAL INTERPOLATION USING A MULTI-LAYER INVERSE DISTANCE WEIGHTING MODEL FOR ADVANCED REGRESSION AND CLASSIFICATION TASKS IN SPATIAL DATA ANALYSIS	Kwame Adebayo, Chipo Mutasa, Samuel Okello, Nia Ncube

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HALL / SALON 6	**Jomo Kenyatta**	1	APPLICATION OF LEGENDRE TRANSFORMATION TO PORTFOLIO OPTIMIZATION	Kwame Adom, Amina Bello, Chijioke N. Okoye
		2	ON DECOMPOSITION OF MAXIMAL PREFIX CODES IN DATA CLASSIFICATION	Chijioke Okafor, Amina Boukari
		3	APPROXIMATION TO THE HARDY OPERATOR IN TOPOLOGICAL SPACES	Amina K. Ndong, Ibrahim A. Mohammed
		4	LOCALIZED MESHFREE METHODS FOR SOLVING 3D HELMHOLTZ EQUATION	Ahmed S. Alim, John M. Nkrumah
		5	IDENTIFYING ENVIRONMENTAL FACTORS AFFECTING THE SPREAD OF MALARIA IN AFRICA: A REGRESSION APPROACH	Kwame Nkrumah Amina Kofi
		6	THE ANALOGUE OF PISOT NUMBERS IN FORMAL POWER SERIES FIELDS OVER FINITE FIELDS	Assis.Prof. Dr.Thierno S. Diallo Dr. Amina F. Kone
			ARTIFICIAL NEURAL NETWORK FOR OPTIMAL INVENTORY MANAGEMENT IN AFRICAN MARKETS	Amina B. N'Diaye, Samuel T. Akoua
		7	IDENTIFYING ENVIRONMENTAL AND SOCIOECONOMIC DETERMINANTS OF TYPHOID FEVER SPREAD IN EAST AFRICA: A REGRESSION ANALYSIS	Jomo Kenyatta Nia Akinyi

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HALL / SALON 7	**Assis. Prof. Dr. Jean-Michel Dıop**	1	A BIOLOGICAL MODEL FOR THREE SPECIES WITH CROWLEY–MARTIN FUNCTIONAL RESPONSE	Dr. Amina Zelıkovıc Prof. Dr. Roberto Martınho
		2	OPTIMIZING RELAXATION PARAMETERS FOR EFFICIENT ITERATIVE SOLUTIONS TO ELECTROMAGNETIC SCATTERING PROBLEMS	Prof. Dr. Li Zhao Dr. Amir Rahımı
		3	A COMPARATIVE ANALYSIS OF BAYESIAN AND REGRESSION MODELS FOR PUBLIC HEALTH SERVICE MODELING	Ana García Dr. Yuto Sato
		4	PURE SCALAR EQUILIBRIA IN NORMAL-FORM STRATEGIC GAMES"?	Dr. Mahir Khamıdov Jasmine Ugo
		5	QUANTITATIVE ANALYSIS OF STOCK PRICE FORECASTING IN FINANCIAL MARKETS USING THE GEOMETRIC BROWNIAN MOTION MODEL	Milena Tang Assis. Prof. Dr. Jean-Michel Dıop
		6	ENHANCED TRIPLE INTEGRAL INEQUALITIES OF HERMITE-HADAMARD TYPE	Lucas Araujo Nabila Rıahı
		7	A COMPREHENSIVE REVIEW OF HIGHER-ORDER SPLINE METHODS FOR SOLVING THE BURGERS EQUATION WITH B-SPLINE TECHNIQUES AND THEIR VARIATIONS	Dr. José Pereıra Carlos García
		8	A CONJECTURE ON THE ADAM OPTIMIZER	Chijioke Onuoha Sofia Rıvera Alhaji Dıop Dr. Saeed Hosseın

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HALL / SALON 8	**Assoc. Prof. Dr. Amadou Toure**	1	DEVELOPING A STRATEGY FOR ZERO ENERGY BUILDINGS: A STUDY ON CONVERTING AN OLD OFFICE BUILDING INTO A NET ZERO ENERGY BUILDING FOR HOT-HUMID CLIMATES	Marat K. Tuleubayev, Dr. Amina B. Khairullina
		2	THE FUTURE OF MEDICAL FACILITIES: A SYSTEMATIC REVIEW OF ARCHITECTURAL DESIGN WITH AN INNOVATIVE RESEARCH AND DEVELOPMENT PERSPECTIVE	Akilbek Toktogulov, Aizada Ibragimova, Yerbolat Saduov, Gulzhanat Mukhtarova, Nurlan Esenov
		3	THE EVOLVING IMPACT OF BUILDING FAÇADES IN URBAN SPACES: A COMPARATIVE STUDY OF BAKU	Assis. Prof. Dr. Elvin Mammadov Dr. Leyla Farzalieva
		4	ENERGY CONSERVATION THROUGH ADAPTABLE ARCHITECTURE	Sibusiso Dlamini Thabo Mokoena Amina K. Nguvama, Kwame Adom
		5	DEVELOPING A COMPREHENSIVE APPROACH FOR SUSTAINABILITY ASSESSMENT OF BUILDING ELEMENTS	Dr. Kwame Asante, Lecture Femi Alabi, Dr. Imani Ndlovu
		6	AMBITIOUS ARCHITECTURE: A FRAMEWORK FOR FLOOD RISK MITIGATION	Ibrahim B. Ndlovu, Fatima K. Moyo
		7	BETWEEN ALEXIS NOSSITER AND SAID ALI: AN ‘AFFINITARIAN’ ARCHITECTURAL EXPLORATION	Mariama Doumbia, Assoc. Prof. Dr. Amadou Toure
		8	A PROPOSAL FOR TEMPORARY SHELTERS FOR DISPLACED COMMUNITIES	L. Dupont, M. Faure, T. Charpentier,

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HALL / SALON 9	**Assis .Prof. Dr. Klooster Wouters**	1	EXPERT SOLUTIONS TO AFFORDABLE HOUSING FINANCE CHALLENGES IN DEVELOPING ECONOMIES	Lukas Müller, Sophie Vandenberg
		2	ARCHITECTURAL INNOVATION IN THE FACE OF THE CLIMATE CRISIS	Sophia Dubois, Assoc. Prof. Dr. Lucas Martin
		3	DESIGNING ACCESSIBLE HOUSING TO IMPROVE LIVING CONDITIONS FOR PEOPLE WITH DIVERSE NEEDS	Van den Broeck, Assis .Prof. Dr. Klooster Wouters
		4	ASSESSMENT OF FIRE RISKS ASSOCIATED WITH FUEL STATIONS IN THE CITY OF ANTWERP AND EVALUATING RISK MANAGEMENT IN URBAN PLANNING	J. Meier L. Vandenbroeck
		5	THE ROLE OF PERSPECTIVE IN RENAISSANCE ART AND ARCHITECTURE IN EUROPE	Sophie Dupont Marc Lefevre
		6	ACCURACY OF PEAK DEMAND ESTIMATES IN OFFICE BUILDINGS USING ENERGY PLUS SIMULATOR	Lukas Vermeulen, Anna Janssen, Peter De Smet, Michel Van der Velde

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HALL / SALON 10	**Assis .Prof. Dr. Akhmetzhanov Dauren,**	1	DIGITAL TWINS IN THE BUILT ENVIRONMENT: A FRAMEWORK FOR INTEGRATION AND DEVELOPMENT	Henrik Jansen Anna Vandereycken Tom Duval Laura Casteleyn
		2	FACTORS INFLUENCING THE ADOPTION OF SUSTAINABLE CONSTRUCTION PRACTICES IN EUROPEAN RESIDENTIAL BUILDINGS	Luca Rossi Maria Gonzalez Benjamin Schmidt Sophie Laurent
		3	ADAPTING SPACES TO PANDEMIC CONDITIONS: A FIVE-SCALE DESIGN APPROACH TO PREPARE AND RESPOND	Laura Schmidt Andreas Meier
		4	THE RISE OF CONSTRUCTION MAFIAS IN CENTRAL ASIA: IMPACTS ON THE CONSTRUCTION SECTOR	Timurbek Aslanov Alimzhan Akhmetov Dastan Bekzhanov
		5	A STRATEGY FOR ACHIEVING ENERGY SUSTAINABILITY IN ENTERPRISES	Zhanarbek Toleubekov, Aslanbek Bekzhanov Dr. Alina Syzdykova Ms. Timur Nuraliev
		6	CULTURAL SUSTAINABILITY IN MODERN ARCHITECTURAL DESIGN: CASE STUDY OF ALMATY INTERNATIONAL AIRPORT	A. Tursunov, Dr. R. Dzhumabayev
		7	CROWDINIG FOR SUSTAINABLE ENERGY INITIATIVES IN SOUTHERN AFRICAN COUNTRIES	Themba Moyo Lerato Nkosi Sipho Dlamin Nandi Mthembu
		8	A QUANTITATIVE APPROACH TO ASSESSING THE AREA OF CORE AND STRUCTURAL SYSTEM ELEMENTS IN TALL OFFICE BUILDINGS	Assis .Prof. Dr. Akhmetzhanov Dauren, Zhanibekova Altynai

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HALL / SALON 11	**Dr. Adebayo Olumide,**	1	THE APPLICATION OF DRAMA EDUCATION METHODS AMONG EARLY CHILDHOOD EDUCATORS IN CENTRAL ASIA	Nurzhanov Akylbek Aygul Zhanat, Bolatbek Toktarov, Dastan Asanov
		2	THE ROLE OF DRAMA EDUCATION IN ENHANCING CREATIVITY IN PRESCHOOLERS	Aibek Akhmetov, Gulnar Ibraeva
		3	THE SIGNIFICANCE OF MANDATORY EARLY CHILDHOOD EDUCATION FROM THE PARENTS' PERSPECTIVE IN KENYA	Peter Njoroge, Alice Mwangi
		4	PARENTS' PERSPECTIVES ON MANDATORY PRESCHOOL ATTENDANCE IN KENYA	James Mwangi, Faith Njeri
		5	THE ROLE OF PARENTAL ENGAGEMENT IN THE DEVELOPMENT OF PRESCHOOL CHILDREN WITH DISABILITIES	Dr. Adebayo Olumide, Sarah N'Dri
		6	ASSESSMENT OF PSYCHOMOTOR DEVELOPMENT IN PRESCHOOL CHILDREN: A REVIEW OF DEVELOPMENTAL TOOLS	Kwame Amoah, Amina Osei, Kwabena Asante
		7	COMPARING TWO MATH INTERVENTIONS FOR PRESCHOOLERS WITH AUTISM	Assoc. Prof. Dr. Thabo Modise, Assis. Prof. Dr. Amina Sekou
		8	INTERACTIVE ROBOTIC TOOL FOR EARLY LEARNING OF MATHEMATICAL AND COLOUR CONCEPTS IN PRESCHOOLERS	David O. Okafor, Grace O. Omoregie,
		9	DEVELOPING A MORAL EDUCATION MODULE FOR PRESCHOOL TEACHERS USING A MODIFIED DELPHI TECHNIQUE	Amina Diallo Dr. Kwame Mensah

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HALL / SALON 12	**Dr. Julia Jansen**	1	THE CURRICULUM OF ETHICAL EDUCATION IN POLAND	Jan Kowalski Agnieszka Nowak
		2	HOME EDUCATION IN THE EUROPEAN CONTEXT	M. Dubois, L. Mertens
		3	THE ROLE OF EARLY EDUCATION IN DEVELOPING COMMUNICATION AND SOCIAL SKILLS: A FOCUS ON PRESCHOOLERS AND THEIR IMPACT ON CAREERS AND HIGHER EDUCATION	Lukas Janssens Dr. Isabelle Dupont
		4	CASE STUDY: INTEGRATING CAREER EDUCATION WITH UNIVERSITY EDUCATION IN GERMANY	Matthias Fischer Anna Schmidt
		5	COMPUTER-ASSISTED EVALUATION OF INDIVIDUAL EDUCATION PLANS IN SPECIAL EDUCATION SETTINGS	Laura De Bruyn Pieter Janssens
		6	FROM MONOLINGUALISM TO MULTILINGUALISM IN EUROPEAN HIGHER EDUCATION	Lucas P. Jansen Sofia M. De Vries
		7	ESTABLISHING A NEW EDUCATION STRATEGY IN A DIGITAL AGE: THE ROLE OF STUDENT FEEDBACK	Maria Dubois Asssi. Prof. Dr. Jean Dupont
		8	THE ROLE OF ART AND PUBLIC COMMUNICATION IN SOCIAL EDUCATION	Luca D'Amico Sofia Moretti
		9	MODELING CHILD DEVELOPMENT FACTORS FOR THE EARLY INTRODUCTION OF ICTs IN SCHOOLS	M. T. Gossens L. P. Sevens
		10	ETIQUETTE LEARNING AND PUBLIC SPEAKING: IMPACT OF EARLY TRAINING ON HIGHER EDUCATION AND PROFESSIONAL SUCCESS	Anna Van der Meer, Dr. Julia Jansen
		11	MODELING CHILD DEVELOPMENT FACTORS FOR THE EARLY INTRODUCTION OF ICTS IN SCHOOLS	M. L. Dupont, F. H. Garcia

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HALL / SALON 1	**Prof. Dr. RAMAZAN BİÇER**	1	HIRİSTİYAN TEOLOJİSİNİN TEŞEKKÜLÜNDE PAVLOS'UN YERİ VE ÖNEMİ	Prof. Dr., RECEP ÖNAL YL Öğrencisi, Muhammed Berad ÇULHA
		2	ACADEMIC STUDIES IN NORWAY ON ISLAMOPHOBIA AND INTERRELIGIOUS DIALOGUE	Prof. Dr., RECEP ÖNAL
		3	GÜNÜMÜZ TEFSİR MESELELERİ HAKKINDA BAZI TEZLER	Dr. Araştırma Görevlisi Hasan Can ATEŞ
		4	LİBERAL İNSAN HAKLARI KURAMININ ÇÖKÜŞÜ: GAZZE SONRASI DÜNYADA ''EVRENSEL'' BEYANNAMEYİ SORGULAMAK	Dr. Araştırma Görevlisi Hasan Can ATEŞ
		5	PLANT INTELLIGENCE IN THE CONTEXT OF THE VERSE "THERE IS A GREAT LESSON TO BE LEARNED IN PLANTS" (QUR'AN 26/8)	Prof. Dr. RAMAZAN BİÇER
		6	NEW ACROPOLIS, A NEW AGE RELIGIOUS MOVEMENT	Prof. Dr. RAMAZAN BİÇER
		7	THE RELATIONSHIP BETWEEN RELIGION AND SCIENCE IN THE PRIMARY EDUCATION RELIGIOUS CULTURE AND MORAL KNOWLEDGE CURRICULUM OF THE CENTURY OF TURKIYE MAARIF MODEL	Sümeyye Özdoğan Asst. Prof. Dr. Mehmet Yıldız
		8	AN EXAMINATION OF THE PROBLEM OF BELONGING IN WORDS ATTRIBUTED TO SUFIS ON SOCIAL MEDIA	Dr. Öğr. Üyesi Mahmut Ulu

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HALL / SALON 2	**Doç. Dr., Sezai ENGİN**	1	Kur'an'ın Mucizeleri ve Onun Hukuk, Ahlak ve Toplum Üzerindeki Etkisi	Azhar Khudhaır Abbas AL-AZZAWI Dr. Öğr. Üyesi, Vedat YETKİN
		2	Abese Suresi'nin İniş Sebepleri ve Ayetlerin Anlamına Etkisi: Analitik Bir İnceleme	Mohamad ALDAHER Dr. Öğr. Üyesi, Vedat YETKİN
		3	HUKUK FAKÜLTELERİNDE İSLAM HUKUKU EĞİTİMİ: SORUNLAR VE ÇÖZÜM ÖNERİLERİ	Dr. Öğr. Üyesi, Meryem CİHANGİR
		4	İSLÂM HUKUKUNUN TÜRK AİLE HUKUKUNA ETKİSİ: NİKÂH, TALÂK VE NAFAKA ÜZERİNE BİR İNCELEME	Dr. Öğr. Üyesi, Meryem CİHANGİR
		5	İmam Mâtürîdî'nin Kudret-İrâde Anlayışı ve Toplumsal Kaderle İlişkisi	RAMAZAN SEZER
		6	Memlük Dönemi Hadis Şerh Yazıcılığı ve Literatüründe İbn Mülakkın (ö. 804/1401)	Doç. Dr., Sezai ENGİN
		7	IMAM MĀTURĪDĪ's UNDERSTANDING of GREAT SIN and INTERCESSION	KÜBRA AKTİ
		8	Kur'an'daki "Ey İman Edenler" Hitabının Psikolojik Tefsir Çerçevesinde Analizi	Sedat ÖZMEN Dr. Öğr. Üyesi, Vedat YETKİN

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HALL / SALON 3	**Assoc. Prof. Dr. Nihal TAŞ**	1	TEACHING MATHEMATICS: COMBINING TRADITIONAL AND MODERN APPROACHES	Nuride ORUCOVA Elgayid ALİZADE
		2	SOME PROPERTIES OF GENERALIZED *b*-KANNAN TYPE MAPPINGS	Assoc. Prof. Dr. Nihal TAŞ Asst. Prof. Elif KAPLAN
		3	SOME INTEGRAL TYPE FIXED-CIRCLE RESULTS ON G-METRIC SPACES	Assoc. Prof. Dr. Nihal TAŞ
		4	BANACH CONTRACTION THEOREM IN TRIPLE CONTROLLED S-METRIC TYPE SPACES	Asst. Prof. Dr. ELİF KAPLAN Assoc. Prof. Dr. NİHAL TAŞ
		5	A NEW PRECONDITIONING REFLECTED FORWARD-BACKWARD-FORWARD ALGORITHM FOR MONOTONE INCLUSION PROBLEM AND ITS APPLICATION	Asst. Prof. Ebru ALTIPARMAK
		6	ON CONTROLLED PARTIAL METRIC SPACES	Assist. Prof. Dr. Elif GÜNER Prof. Dr. Halis AYGÜN
		7	NOVEL ENTROPY-BASED TOPSIS METHOD FOR DECISION-MAKING PROBLEMS IN LINEAR DIOPHANTINE SPHERICAL FUZZY ENVIRONMENT	Assist. Prof. Dr. Elif GÜNER Prof. Dr. Halis AYGÜN
		8	DİL EVRİM TEORİSİ İÇİN MATEMATİKSEL BİR YAKLAŞIM	Dr, EMİLE F. DOUNGMO GOUFO Dr, M KHUMALO Dr, IGNACE TCHANGOU TOUDJEU Dr, AHMET YILDIRIM

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HALL / SALON 4	**Prof. Dr. Nilgün GÜNEROĞLU**	1	Typomorphology of Green Spaces: Plants Role in Creating Cultural and Ecological identity on University Campuses	Prof. Dr., CENGİZ ACAR Landscape Architect, LAYA MOSTOFI
		2	EVALUATION OF URBAN AGRICULTURE STUDIES AND PRACTICES IN THE CONTEXT OF LANDSCAPE ARCHITECTURE	Prof. Dr. Habibe ACAR Prof. Dr. Nilgün GÜNEROĞLU
		3	THE USE OF RENEWABLE ENERGY SOURCES IN LANDSCAPE DESIGN	Prof. Dr. Nilgün GÜNEROĞLU Prof. Dr. Habibe ACAR
		4	ZAMANIN GÖLGESİNDE BİR SİLÜET; VAN İSKELE YATILI İLKÖĞRETİM BÖLGE OKULU (YİBO)	Dr. Öğr. Üyesi Yaşar SUBAŞI DİREK
		5	ANTİK ÇAĞDAN İTİBAREN KENT FORMU ANLATISININ SİLİFKE ÖRNEKLEMİ ÜZERİNDEN DEĞERLENDİRİLMESİ	Öğr. Gör. Dr., MELTEM AKYÜREK ALGIN

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HALL / SALON 5	**Dr. Öğretim Üyesi SELCEN NUR KIŞLA**	1	MERMİ ÇEKİRDEKELERİ ÜZERİNDEKİ BALİSTİK KARAKTERİSTİK İZLERE TOPRAK ETKİSİNİN ZAMANA BAĞLI OLARAK İNCELENMESİ	Prof. Dr. AYLİN YALÇIN SARIBEY EZGİ KARACA
		2	GÖÇMEN İŞÇİNİN HUKUKİ STATÜSÜNE İLİŞKİN AVRUPA SÖZLEŞMESİ ÇERÇEVESİNDE GÖÇMEN İŞÇİLERİN HAKLARININ KORUNMASI	Dr. Öğretim Üyesi SELCEN NUR KIŞLA
		3	THE ROLE OF THE UN SECURITY COUNCIL IN THE IMPLEMENTATION OF THE PROVISIONAL MEASURES OF THE INTERNATIONAL COURT OF JUSTICE	Dr. Öğretim Üyesi SEHER ÇAKAN
		4	9 MM ÇAPINDA TABANCAYLA YAPILAN ATIŞLARDA KUMAŞ YÜZEYLER ÜZERİNDEKİ ATIŞ ARTIKLARININ ZAMANA BAĞLI DEĞİŞİMİNİN İNCELENMESİ	PROF. DR. AYLİN YALÇIN SARIBEY RUMEYSANUR SAVAŞ
		5	ISIYA MARUZ KALMIŞ BULGULAR ÜZERİNDEKİ PARMAK İZLERİNİN İNCELENMESİ	PROF. DR. AYLİN YALÇIN SARIBEY SIDAL KAYA
		6	TOPRAK YÜZEYLER ÜZERİNDE KAN LEKESİ MODEL ANALİZİ VE FOURIER DÖNÜŞÜMLÜ KIZILÖTESİ SPEKTROSKOPİSİ (FTIR) İLE İNCELENMESİ	PROF. DR. AYLİN YALÇIN SARIBEY DİLEK KIZILBOĞA
		7	6390 SAYILI KANUNUN KÖY ORTA MALLARININ HUKUKİ STATÜSÜ VE USUL HUKUKUNA ETKİSİ	Dr. Öğretim Üyesi, İlker KARAÖNDER
		8	SUYA EL ATMANIN ÖNLENMESİ DAVALARINDA GENEL SU-ÖZEL SU AYRIMININ SONUÇLARI	Dr. Öğretim Üyesi, İlker KARAÖNDER

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HALL / SALON 6	**Prof. Dr. Ali BİLGİLİ**	1	A Case of Toxidermia Associated with Metronidazole and Terbinafine Use	Saadi Fatima Zohra
		2	The Impact of Early Detection on Acetaminophen Toxicity : A Case Study Analysis	BESSAID Kamilia, TOUAMI Fadila, MILOUD ABID Dalila, KRID Meriem, ABOUREJAL Nesrine,
		3	Pediatric Tebufenpyrad Toxicity: A Case Report of Accidental Ingestion	TOUAMI Fadila, BESSAID Kamilia, MILOUD ABID Dalila, KRID Meriem, ABOUREJAL Nesrine
		4	TREATMENT OF ARTICULATIO CUBITI LUXATION WITH LINEAR TYPE IA EXTERNAL FIXATION IN A CAT: A CASE REPORT	Dr. Öğr. Üyesi, Kerem YENER Doç. Dr., Ünal YAVUZ
		5	Walnut Green Husk Extract as a Sustainable Feed Additive in Ruminant Nutrition	Res. Asst. Atakan BUNDUR Prof. Dr. Özge SIZMAZ,
		6	Ammonia Emissions in Poultry: Environmental Impacts and Mitigation Strategies	Res. Asst. Atakan BUNDUR Prof. Dr. Özge SIZMAZ,
		7	ANTIFUNGAL POTENTIAL OF *RICINUS COMMUNIS* EXTRACTS AGAINST SOIL-BORNE PATHOGENS	Dr. Öğr. Üyesi RAZİYE KOÇAK Dr. Öğr. Üyesi ÖZDEN SALMAN
		8	MEDICINES USED IN IRREGULAR HEART RHYTHMS IN CATS AND DOGS	PhD Student Bülent Burak DOĞAN Prof. Dr. Ali BİLGİLİ

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HALL / SALON 7	**Assoc. Prof. Itır ERKAN**	1	ASSESSMENT OF BIOLOGICAL AND ENVIRONMENTAL FACTORS AFFECTING VIOLENCE BEHAVIOUR IN FORENSIC SCIENCES	Assoc. Prof. Itır ERKAN
		2	Vital Security Interests of States in International Law	Assist. Prof. Heidar Piri
		3	ABUSE OF DUTY IN THE PUBLIC SECTOR: A COMPARATIVE ANALYSIS ACROSS HEALTHCARE, EDUCATION, AND LAW ENFORCEMENT IN EUROPE	Ilma Bici Adrian Gashi
		4	TÜRK HUKUK SİSTEMİNE UYGUN YAPAY ZEKÂ DESTEKLİ HUKUKİ KARAR DESTEK SİSTEMİ: KURAMSAL ÇERÇEVE VE MİMARİ ÖNERİ	Öğr. Gör. Dr. MUHAMMED BURAK GÖRENTAŞ
		5	GENDER CHANGE IN ACCORDANCE WITH CREATION ACCORDING TO ISLAMIC LAW	Arş. Gör. Dr. MUSTAFA ÜNAL
		6	SUÇ EĞİLİMLERİNİN NLP İLE TESPİTİ: KRİMİNAL DÜŞÜNCE VERİ SETİNİN OLUŞTURULMASI VE ROBERTA MODELİNİN EĞİTİLMESİ	Arş. Gör. Adli Psikolog HAKKI HALİL BABACAN Avukat, Yls Öğr., SERHAT KAAN SEVSAY

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HALL / SALON 8	**Doç. Dr. Fatih GÜLER**	1	The Sources of Inheritance Laws in the Facilitation Treatise by Muhammad ibn Abi Bakr al-Mar'ashi, Sajqili Zadeh (1150 h.)	Doktora Öğrencisi Shahinah Hameed Abdullah Prof. Dr. Ali Rıza Gül
		2	RELEASE IN THE PRACTICE OF KASÂME IN OTTOMAN CRIMINAL LAW	Dr. Öğr. Üyesi Abdsussamed ATASOY
		3	FUNCTIONS OF COLLECTION ENDORSEMENT IN BILLS OF EXCHANGE AND THE SITUATION PRESENTED BY PERSONAL DEFENSES	Dr. Öğr. Üyesi, BUKET ÇATAKOĞLU AYDIN
		4	EXAMINATION OF THE IMPACT OF DATA COLLECTED THROUGH THE INTERNET ON STATE SOVEREIGNTY FROM THE PERSPECTIVE OF INTERNATIONAL LAW	Assoc. Prof. Dr. Süleyman DOST Habibe Betül YAVUZ
		5	THE IMPACT OF THE CONSTITUTIONAL COURT ON CONDOMINIUM LAW	Doç. Dr. Fatih GÜLER
		6	ANAYASAL BİR ORGAN OLARAK MAHALLİ İDARELERİN SEÇİMLERİNDE MUHASEBE MESLEK MENSUPLARININ ADAYLIK VE SEÇİLME ORANLARI	Rabia GÜLER Doç. Dr. Fatih GÜLER
		7	TÜKETİCİ HUKUKU KAPSAMINDA AVUKATLIK SÖZLEŞMELERİNDEN KAYNAKLANAN UYUŞMAZLIKLARDA ARABULUCULUK	Dr. Öğr. Üyesi Gaye TUĞ LEVENT

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HALL / SALON 9	**Dr. arlos Eduardo Martins**	1	THE RISE OF CYBER FRAUD IN FINANCIAL REPORTING: A CALL FOR FORENSIC ACCOUNTING SOLUTIONS	M. Ahmed Farooq,
		2	INTEGRATING KNOWLEDGE MANAGEMENT INTO FORENSIC SCIENCE PRACTICE	Laila Hossain,
		3	THE IMPACT OF INEFFICIENT DATA STORAGE ON MEMORY UTILIZATION	Tan Kien Hwa, Siti Nabilah Ahmad,
		4	MANAGING FORENSIC INVESTIGATIONS IN THE AFTERMATH OF A STRUCTURAL DISASTER: THE COLLAPSE OF THE SÃO PAULO SHOPPING MALL	Dr. arlos Eduardo Martins
		5	OVERCOMING BARRIERS IN DIGITAL EVIDENCE COLLECTION: THE PATH TO ADMISSIBILITY	Chia Su Ling,
		6	FORENSIC SCIENCE IN GHANA'S LEGAL FRAMEWORK: A STUDY ON PATHOLOGICAL TRUTHS	Assoc. Prof. Dr. Kwame Nkrumah Owusu
		7	LEVERAGING HEURISTIC MODELS FOR DETECTING MONEY LAUNDERING ACTIVITIES IN FINANCIAL INSTITUTIONS	Vincent Tano,
		8	THE ROLE OF ARMED GROUPS IN INTERNAL CONFLICTS: A STUDY OF THE SYRIAN CIVIL WAR	Dr. Zainab Khalil,
		9	AUTOMATING DIGITAL FORENSICS INVESTIGATIONS: THE ROLE OF ONTOLOGY FRAMEWORKS IN ENHANCING EFFICIENCY	Ramesh Natarajan,

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HALL / SALON 10	**Assis. Prof. Dr. Ayesha Karim**	1	RELATIONSHIP BETWEEN CRIMINAL BEHAVIOR AND MENTAL ILLNESS IN TEENAGERS	S. Rahman, A. Sayed, M. Hassan, K. Abdullah
		2	RIMINAL LAW INSTRUMENTS TO COUNTER CORPORATE CRIMES IN SOUTH AFRICA	Thando Mhlongo
		3	SEXUAL AND GENDER BASED CRIMES IN INTERNATIONAL CRIMINAL LAW: MOVING FORWARDS OR BACKWARDS?	Assis. Prof. Dr. Ayesha Karim
		4	THE NATURE OF ORIGIN OF NEW CRIMINAL OCCURRENCES IN THE WEST BANK REGION: CULTURAL AND CRIMINOLOGICAL “INTERSECTION” IN 2010-2020	Lecture Dr. Sami Al-Najjar
		5	SMUGGLING OF MIGRANTS AS AN INFLUENTIAL FACTOR ON NATIONAL SECURITY, ECONOMIC AND SOCIAL LIFE IN TURKEY	Samuel Kibaki
		6	CYBER SECURITY IN KENYA: A COLLABORATION BETWEEN COMMUNITIES AND PROFESSIONALS	Esther Muthoni, Juma Njoroge,
		7	Psychopathic Disorders and Judges Sentencing: Can Neurosciences Change This Aggravating Factor in a Mitigating Factor?	Dr. Ahmed Fathi
		8	THE CONDUCT OF LAUNDERING MONEY THROUGH TRANSPORT OF CASH IN THE MIDDLE EAST AND NORTH AFRICA REGION	Ali Mansour

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HALL / SALON 11	**Prof. Dr. Mariana Fernández**	1	THE ROLE OF LEGAL INTERPRETATION IN SHAPING A HIGHLY QUALIFIED JUDICIARY IN ARGENTINA	Prof. Dr. Mariana Fernández
		2	THE DEFENSE ATTORNEY'S ROLE IN THE CRIMINAL JUSTICE SYSTEM OF EGYPT, CAIRO 2020	Dr. Ahmed Hassan Hamed Al. Jobeyir
		3	SEXUAL AND GENDER-BASED VIOLENCE IN INTERNATIONAL LAW: MOVING TOWARDS JUSTICE OR RETREATING?	Amina Belhaj
		4	JUDICIAL REFORMS IN A POST-CONFLICT COUNTRY: BUILDING LEGITIMACY THROUGH SYSTEMATIC CHANGE	Assoc. Prof. Dr. Samuel Kofi Asare
		5	THE BALANCE BETWEEN LEGAL AUTHORITY AND KNOWLEDGE IN THE NIGERIAN SUPREME COURT Authors:	Tunde Adedeji
		6	LEGAL TOOLS TO COMBAT CORPORATE CRIMES IN SOUTH AFRICA	Dr. Nkosi Mthembu
		7	KNOWLEDGE MANAGEMENT IN FORENSIC SCIENCE: A GLOBAL PERSPECTIVE	Ahmed Al-Mansoori Mei-Ling Wang
		8	THE DEVELOPMENT AND EXECUTION OF THE VISION FOR FORENSIC SCIENCE 2025 IN KENYA"	Amina Ouma, Samuel Ndegwa, Grace Wambui, David Odhiambo
		9	FINANCIAL STATEMENT FRAUD: A CALL FOR INTEGRATING FORENSIC ACCOUNTING IN CORPORATE PRACTICES	Mariama Diop

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HALL / SALON 1	**Assoc. Prof. Dr. M. K. Niyazov**	1	FOSTERING ISLAMIC EDUCATIONAL VALUES IN EARLY CHILDHOOD THROUGH NARRATIVE TECHNIQUES	Samuel Kofi Appiah, Amara Zahra Al-Hassan
		2	GENDER DYNAMICS AND ISLAMIC EDUCATION IN CONTEMPORARY GEORGIA: INSIGHTS FROM KVEMO KARTLI	A. Omotoso, Assis. Prof. Dr. M. Zhang, K. Amari
		3	EXPLORING THE SIGNIFICANCE OF NAMES AMONG THAI MUSLIM STUDENTS: AN EXAMINATION OF VALUES AND IDENTITY	Iman Al-Farouq, Mônica da Silva, Dr. Kenji Nakamura
		4	INTERACTIONS BETWEEN MALAY AND CHINESE COMMUNITIES: A CIVILIZATIONAL ANALYSIS	Aisha Alimova, Dr. Liu Yanjun
		5	THE EMERGENCE OF ISLAMIC TOURISM IN KAZAKHSTAN: A NEW TREND OR A RELIGIOUS REVIVAL?	Assoc. Prof. Dr. M. K. Niyazov
		6	REVISITING APOSTASY LAWS: A CONTEMPORARY PERSPECTIVE	Sara Kofi, Lecture Dr. Ibrahim Ahmed
		7	ZAMZAM WATER AS CORROSION INHIBITOR FOR STEEL REBAR IN RAINWATER AND SIMULATED ACID RAIN	Ahmed A. Elshami, Stéphanie Bonnet, Abdelhafid Khelidj
		8	ISLAM, GENDER AND EDUCATION IN CONTEMPORARY GEORGIA: THE EXAMPLE OF KVEMO KARTL	N. Gelovani, D. Ismailov, S. Bochorishvili

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HALL / SALON 2	**Assoc. Prof Dr. Farida Al-Mansoori**	1	EXPLORING THE INTERACTIONS BETWEEN POLITICS AND RELIGION IN CONSTITUTIONS: A CROSS-NATIONAL COMPARISON	Dr. Mei-Ling Zhou Dr. Samuel Okoro Rachid Benali
		2	FAITH AND CULTURAL IDENTITY IN ASIA AND AFRICA: COMPARATIVE INSIGHTS FROM BUDDHISM AND CHRISTIANITY	Assoc. Prof Dr. Farida Al-Mansoori
		3	THE IMPACT OF ISLAM ON SOCIO-ECONOMIC DEVELOPMENT: A COMPARATIVE STUDY ACROSS COUNTRIES	Wang Wei Hassan Bahrami
		4	RELIGIOUS INFLUENCE IN THE JUDICIAL SYSTEM: A STUDY OF FAMILY COURTS IN SOUTH ASIA	Rajesh Kumar Fatima Al-Zahra
		5	ISLAMIC VIEWS ON WOMEN'S HEALTH AND REPRODUCTIVE RIGHTS: PERSPECTIVES FROM MIDDLE EASTERN COUNTRIES	Dr. Yara Al-Farsi Dr. Yunus Al-Rahman
		6	THE INTERPLAY BETWEEN RELIGION AND POLITICS IN MODERN EGYPTIAN SOCIETY	Ahmed Zaki Yasmin Khoury
		7	DEMOCRATIC PROCESSES AND RELIGION: A STUDY OF THE INFLUENCE OF CHRISTIANITY IN LATIN AMERICA	Francisco Torres Dr. Natalia Ramirez
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HALL / SALON 3	**Assis. Prof. Dr. Sofia Rodrigues**	1	THE IMPACT OF EARLY ETIQUETTE LEARNING ON PUBLIC SPEAKING AND RELIGIOUS INTERPRETATION IN EUROPEAN CONSTITUTIONS	Alexander Dubois Emilie Lefèvre
		2	THE INFLUENCE OF EARLY LEARNING ON PUBLIC SPEAKING AND CULTURAL AND RELIGIOUS IDENTITIES: A COMPARATIVE STUDY OF EUROPEAN PERSPECTIVES	Lucie Moreau Dr. Thierry Dubois
		3	THE EXAMINATION OF THE INTERCONNECTION BETWEEN RELIGION AND DEVELOPMENT: FOCUSING ON CHRISTIANITY	Lucas Fernandez Prof. Dr. Ana Maria Silva
		4	UNDERSTANDING THE SILENCE: WHEN COURTS AVOID RELIGION	Assis. Prof. Dr. Sofia Rodrigues
		5	ISLAM AND THE VALUES OF UZBEK CULTURE	Mukhammadali Buzroev, Jamshid Djalilov, Nodira Tursunova, Zafarbek Abduzayev
		6	MAINTENANCE OF PHILOSOPHICAL, HUMANISTIC, AND RELIGIOUS VALUES IN THE SECURITY OF THE UZBEK NATION	D. A. Karimov, M. K. Muminov, R. S. Tursunov, N. B. Shamsiev
		7	WHOEEAISM: A CONCEPT OF RELIGION ORIGIN AMONG THE KAZAKH PEOPLE	Nurzhan K. Kudaibergenov, Aida Z. Yessentayeva

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HALL / SALON 4	**Prof. Dr. Rika Santoso**	1	USING INFORMATION THEORY TO ANALYZE COGNITIVE SYSTEMS IN HUMANS AND MACHINES	Timur Akhmetov, Aygul Tursunbekova, Bekzat Zhanibekov
		2	USING ARTIFICIAL INTELLIGENCE TO IMPROVE DECISION-MAKING IN SYSTEMS ENGINEERING: A CASE STUDY IN MACHINE VISION	Ahmed A. Al-Hassan, Fatima B. Al-Sayed
		3	USING ARTIFICIAL INTELLIGENCE TO IMPROVE DECISION-MAKING IN SYSTEMS ENGINEERING: A CASE STUDY IN MACHINE VISION	Ahmed A. Al-Hassan, Fatima B. Al-Sayed
		4	ADVANCES IN ARTIFICIAL INTELLIGENCE FOR SPEECH RECOGNITION TECHNOLOGY	Ahmed A. Al-Sabah Layla M. Al-Farsi
		5	DEVELOPING INTELLIGENT ENTERPRISE SOLUTIONS USING REFERENCE ARCHITECTURE	Dimas Prasetya, Prof. Dr. Rika Santoso
		6	PREDICTING BANK TELEMARKETING SUCCESS USING ARTIFICIAL NEURAL NETWORKS	Lecture. Dr. Dmitry Ivanov, Dr. Sergey Petrov
		7	ATTITUDE OF UNIVERSITY STUDENTS TOWARDS THE USE OF ARTIFICIAL INTELLIGENCE IN EDUCATION	T. Nguyen, P. Tran, L. Hoang, V. Pham
		8	A PROACTIVE APPROACH TO INNOVATION MANAGEMENT	Maria Ionescu, Dr. Radu Popescu
		9	COMPARATIVE STUDY ON THREE ARTIFICIAL INTELLIGENCE TECHNIQUES FOR PRECIPITATION FORECASTING IN RAIN DOMAIN	Minh Nguyen, Ha Thi Lan, Thanh Nguyen, Quang Duy Le

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HALL / SALON 5	**Eleni Papadopoulos**	1	REIMAGINING INTELLIGENCE: INSIGHTS FROM INFORMATION THEORY	Dr. Eduardo Silva, Akira Nakano
		2	LEVERAGING ARTIFICIAL INTELLIGENCE IN SYSTEMS ENGINEERING: INSIGHTS FROM A REMOTE SENSING APPLICATION	Amina Z. N'Guessan, Hiroshi T. Nakamura
		3	ENHANCING SPEECH RECOGNITION THROUGH ADVANCED STATISTICAL MODELS	Dr. Amina Al-Mohamed, Dr. Li Wei
		4	STRATEGIC DECISION-MAKING THROUGH ADVANCED DATA ANALYTICS	Amina Nkosi, Ryo Tanaka, Kofi Asante
		5	INTEGRATIVE FRAMEWORK FOR INTELLIGENT ENTERPRISE SYSTEMS	Maria Silva, Jun-Ho Lee
		6	FORECASTING TELEMARKETING SUCCESS IN BANKING USING DEEP LEARNING TECHNIQUES	Javier Morales, Liu Wei, Amara Ndiaye
		7	ENHANCING SOFTWARE RELIABILITY THROUGH ADVANCED COMPUTATIONAL TECHNIQUES	Aisha Nkosi, Hiroshi Tanaka, Pedro Lima, Eleni Papadopoulos
			ADVANCED APPROACHES FOR PRECIPITATION FORECASTING USING MACHINE LEARNING TECHNIQUES: A COMPARATIVE ANALYSIS	Léa Roussillon, Mikhail Ivanov, Amina Jalloh, Hiroshi Nakamura, Sofia Silva
			ADVANCEMENTS IN ARTIFICIAL INTELLIGENCE APPROACHES FOR DISSOLVED GAS ANALYSIS IN TRANSFORMERS: A COMPREHENSIVE REVIEW	Dr. Liang Wei, Dr. Emil Kato
		8	EXPLORING PROACTIVE STRATEGIES IN INNOVATION MANAGEMENT	Dr. Liang Wei, Dr. Emil Kato

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HALL / SALON 6	**Prof. Dr. Sophia Bernard**	1	HEALTHCARE WASTE MANAGEMENT PRACTICES IN ETHIOPIA: AN INVESTIGATIVE STUDY	F. Mulugeta Tadesse, A. Alemayehu Berhanu, S. Kibrom Tesfaye, M. Dawit, L. Tsegaye
		2	ASSESSING ENVIRONMENTAL RISKS AND THE PERCEPTION OF RISK TO IMPROVE HEALTH AND WELL-BEING IN POOR AREAS OF ADDIS ABABA	Tesfaye Mulugeta, Mekonnen Dibaba, Samuel Getachew, Muluye Ayenew, Teshome Gebremedhin
		3	EMERGENCY HEALTH MANAGEMENT AT A ROMANIAN UNIVERSITY	I. Popescu, M. Dumitrescu, L. P. Ionescu, V. R. Stanescu
		4	KNOWLEDGE MANAGEMENT: A COMPREHENSIVE MODEL FOR INNOVATION DIFFUSION IN THE PUBLIC HEALTH SECTOR	Dr. Lucie Dupont, Prof. Xavier Martin, Dr. Claire Lefevre
		5	DEVELOPMENT OF SPORTS NATION IN THE CONTEXT OF HEALTH MANAGEMENT	Charlotte Lemoine, Pierre Lefebvre, Elise François
		6	THE IMPACT OF INTERNET OF HEALTH THINGS IN IMPROVING SENIOR PATIENT-PHYSICIAN INTERACTIONS IN SHARED HEALTHCARE MANAGEMENT	Prof. Dr. Sophia Bernard
		7	THE IMPACT OF INADEQUATE MEDICAL WASTE MANAGEMENT ON HUMAN HEALTH AND THE ENVIRONMENT: A COMPREHENSIVE REVIEW	Lucie Dubois, Thomas Lefevre, Adrien Boucher, Isabelle Moreau
		8	STRATEGIC APPROACH TO MAINTENANCE MANAGEMENT IN ORGANISATIONS	Lucas M. Wehling, Isabelle V. Van Houten
		9	A COMBINED STRATEGY FOR THE MANAGEMENT OF DISEASES AND DIAGNOSTIC SYSTEM IN RURAL COMMUNITIES	M. T. Dubois, J. R. Lefevre

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HALL / SALON 7	**P Dr. J. De Smet**	1	MUNICIPAL SOLID WASTE MANAGEMENT CHALLENGES IN EUROPE: A NEW APPROACH TO KNOWLEDGE MANAGEMENT	Thomas De Smet, Isabelle Lemoine
		2	HOSPITAL WASTE MANAGEMENT IN EUROPE: A STUDY OF BELGIAN HOSPITALS	Dr. J. De Smet, A. Vermeulen
		3	CULTURAL INFLUENCE IN HUMAN RESOURCE MANAGEMENT: A COMMUNICATION PERSPECTIVE	M. Lemoine, T. De Smet
		4	COMMUNICATION AND HUMAN RESOURCE MANAGEMENT IN THE CONTEXT OF CULTURAL ALIGNMENT	A. Ali, S. Mahmoud
		5	HEALTHCARE WASTE MANAGEMENT IN TURKEY: A CASE STUDY IN ISTANBUL	Özlem Yılmaz, Assis. Prof .Dr. Abidin Fırncı, Murat Özdemir
		6	MANAGING CHANGE PROJECTS IN SUPPLY CHAINS: A CASE STUDY OF A LEBANESE TECHNICAL SERVICES FIRM	Rami Al-Hassan Layla Zoghbi Nabil Khoury
		7	MANAGING MULTIPLE CHANGE PROJECTS IN SUPPLY CHAINS: A CASE STUDY OF A QATARI MULTI-TECHNICAL SERVICES COMPANY	Khaled Al-Mansoori Layla Ahmed Hassan Fathi

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HALL / SALON 8	**Dr. Mina Mehani, Prof. Dr. Nasrin Salhi**	1	HARNESSING THE POWER OF GARLIC AND TURMERIC: AN ORGANIC SOLUTION FOR CONTROLLING TOMATO PESTS AND IMPROVING YIELD	Carlos Silva, João Pereira, Mariana Santos
		2	EXPLORING THE EFFICACY OF BANANA PEELS AS A BIOSORBENT FOR MANGANESE REMOVAL FROM AQUEOUS SOLUTIONS	Dr. Ahmed Hussein, Sara Ali, Mohammad Farooq
		3	INVESTIGATING THE BROAD-SPECTRUM ANTIMICROBIAL ACTIVITY OF EUCALYPTUS CAMENDULENSIS ESSENTIAL OIL AGAINST SELECTED BACTERIA AND FUNGI	Dr. Julia Vargas, Marta Delgado, Juan Gonzalez
		4	CRAFTING THE SQUARE WATERMELON MOLD: A MECHANICAL FORCE GAUGE DESIGN AND DEVELOPMENT JOURNEY	Dr. Mina Mehani, Prof. Dr. Nasrin Salhi
		5	UNVEILING FIBRINOLYTIC PROTEASE-PRODUCING ENDOPHYTIC FUNGI RESIDING IN HIBISCUS LEAVES FROM SHAH ALAM	Mohd Sidek, Zainon Mohd, Zaidah Zainal
		6	IMPACT OF BOVINE COLOSTRUM SUPPLEMENTATION ON INTESTINAL ENZYME ACTIVITY IN JUVENILE DOURADO SALMINUS BRASILIENSIS: A HISTOCHEMICAL INVESTIGATION	Ahmad Noor Ariffin, Aishah Shamsudin
		7	REVOLUTIONIZING SQUARE WATERMELON PRODUCTION: THE INNOVATIVE DESIGN AND DEVELOPMENT OF A MECHANICAL FORCE GAUGE	Tahere Valeria, Sara Ladjel

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		2	Evaluating the Stability and Imaging Quality of 18F-FDG: The Effect of Polyethylene Glycol in Nuclear Medicine	Hanan Al-Mansouri, Fatima Al-Harthy, Sultan Al-Dosari
		3	Development of Amino Acid-Based Biodegradable Micelles for Targeted Cancer Drug Delivery	Dr. Mohamed Amin, Prof. Ahmed Mansour
		4	Impact of Lost-to-Follow-Up on Health-Related Quality of Life in Tuberculosis Patients: A Case Study from Somalia	Dr. Fatima Abdulkadir, Ibrahim Mohamed
		5	Exploring the Antimicrobial Properties of Clove Oil: Synthesis, Characterization, and Efficacy Testing	Dr. Khadija Abdelrahman, Prof. Ibrahim Moussa
		6	Antibiotic Resistance in Acute Care Units: A Study on Prescription Practices and Intervention Strategies in Tunisia	Dr. Maher Ben Salah, Dr. Lina Amara, Omar Saad
		7	Evaluating the Hepatoprotective Effects of Cinnamomum verum in Animal Models: A Study on Carbon Tetrachloride-Induced Liver Injury	Dr. Khalid Saleh, Rasha Ahmed

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HALL / SALON 10	**A Assoc. Prof. Dr. Benaziz Dorbane**	1	UNVEILING CHLOROBUTANOL'S ANTIMICROBIAL PROWESS: A SYNTHESIS, CHARACTERIZATION, AND EFFICACY EVALUATION	Dr. Nazmul Mosaddik, Ashik Huda, Abdul Awal
		2	OPTIMIZING FUROSEMIDE DISPERSIBLE TABLETS FOR PEDIATRIC USE: A COMPREHENSIVE FORMULATION AND EVALUATION STUDY	Dr. Shafiqur Nabi, Rukhsana Shaheen, Mustofa Rahman
		3	UNVEILING THE ANTIFUNGAL POTENTIAL OF SOUTH AFRICAN MEDICINAL PLANTS: A TRADITIONAL KNOWLEDGE-GUIDED EXPLORATION	Nadia Bahdja, Thili Malha, Zahoua Taoufik, Mourad Marzouk, Hadjadj Mekacher
		4	NAVIGATING THE THERAPEUTIC LANDSCAPE OF TOXIC PLANTS: AN ETHNOBOTANICAL EXPLORATION OF TRADITIONAL MEDICINE PRACTICES IN TLEMCEN, ALGERIA	Assoc. Prof. Dr. Benaziz Dorbane
		5	HARNESSING THE ANTIBACTERIAL POWER OF SILVER DIAMINE FLUORIDE IN FISSURE SEALANTS: A COMPREHENSIVE EVALUATION	Assis. Prof. Dr. S. Djeraba
		6	REPLICATING HUMAN SKIN WITH SHED SNAKE SKINS: DEVELOPMENT OF A NOVEL MODEL MEMBRANE FOR PERCUTANEOUS ABSORPTION RESEARCH	Dr. Elyebdri Asma, Soumia Addoun
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DEVELOPMENT OF TIME SERIES BASED CALL COUNT PREDICTION MODELS FOR CALL CENTERS OF ELECTRONIC PAYMENT AND MONEY INSTITUTIONS

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ABSTRACT

Electronic payment and money institutions are companies that provide payment services and facilitate electronic money transfers. The number of customers of these institutions increase rapidly. To effectively manage this growing volume, call centers play a strategic role in ensuring the efficient handling of incoming calls. Particularly during periods of high call traffic, proper representative planning is essential for responding quickly and effectively to customer demands, ensuring transaction continuity, balancing workloads, and enhancing operational efficiency. This study aims to accurately estimate the number of incoming calls to determine the optimal number of representatives needed per operation in call centers of electronic payment and money institutions. To achieve this, call count prediction models have been developed using Deep Factorization Machine (DeepFM), Gated Recurrent Unit (GRU), Bi-Directional Long Short-Term Memory (Bi-LSTM), and Auto-Regressive Integrated Moving Average (ARIMA). The dataset has been obtained from United Payment's call center and includes 8798 rows of call data in hourly format. Prediction models have been developed for the period from July 7, 2024 to July 13, 2024 and from August 25, 2024 to August 31, 2024. Model performance has been evaluated using Mean Absolute Error (MAE). Among the models developed for July, the lowest MAE has been achieved with the DeepFM model whereas the most successful prediction performance has been achieved with the Bi-LSTM model for August. These findings demonstrate that time series methods are effective for call count prediction.

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Keywords: Machine Learning, Call Center, Electronic Payment and Money Institution

1. INTRODUCTION

Electronic payment refers to money transfers and payment transactions carried out in a digital environment. Electronic payment institutions provide the necessary infrastructure for storing and transferring money in this digital space, offering users fast and secure financial transactions. With the rapid development of financial technologies and the increasing trend of digitalization in recent years, the transaction volume of electronic payment institutions has risen significantly.

Call centers play a crucial role in electronic payment institutions to effectively handle this growing volume. They are vital in ensuring customer satisfaction and improving service quality. These centers optimize the customer experience and enhance user trust by resolving issues quickly and effectively. Moreover, call centers contribute to the continuous improvement of services by gathering customer feedback. Particularly in electronic payment processes, where situations involving security and transaction accuracy are sensitive, call centers play an essential role in resolving customer issues. In this context, the call centers of electronic payment companies are key in optimizing the customer experience and providing a competitive advantage. To maximize customer satisfaction and achieve cost optimization, it is crucial to have a sufficient number of qualified representatives available at specific times in call centers. Insufficient planning on busy days leads to extended customer waiting times, which results in dissatisfaction and harm to brand reputation. Conversely, having too many representatives incurs unnecessary costs. Therefore, providing the right number of personnel at the right time for efficient and cost-effective call center operations requires careful workforce planning. Accurate call count prediction is one of the fundamental components of effective workforce planning. The ability to predict the number of calls in advance provides essential data for determining the number of representatives, while also contributing to the enhancement of service quality. Call count prediction helps minimize customer waiting times, balance the workload among representatives, and increase overall call center efficiency. Accurate predictions enable call center managers to make more informed decisions, which positively impacts customer satisfaction.

The aim of this study to provide cost optimization with effective work planning in call centers of electronic money institutions by providing accurate call count predictions that will enable agent planning in order to save time and allocate resources in the most efficient way. For this purpose, DeepFM, BiLSTM, GRU and ARIMA based call prediction models have been developed.

This study is organized as follows: Section 2 includes relevant literature. Section 3 presents datasets overview. Methodology is presented in Section 4. Results and discussion are given in Section 5. Section 6 concludes the paper.

2. LITERATURE REVIEW

(Omer Faruk Kandaz and Tuncay Ozcan, 2024) aimed to make effective personnel planning in the cargo call center by using the Arena simulation program. In this context, data related to call

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center operations were collected and a simulation model was created using discrete event simulation techniques. In addition, bottleneck analysis was carried out in order to improve the system. (Nadide Çağlayan Özaydın, 2024) aimed to estimate the number of calls coming to the call center of the electricity distribution company by using Artificial Neural Networks and Multi-Layer Perceptron. Variables such as seasonality, planned maintenance and special days were used as inputs. Model performance was evaluated with Mean Absolute Percentage Error (MAPE) and Coefficient of Determination. (Nauravira Amalina Rakhmatsyah et al., 2024) calculated the performance of the call center to determine the correct number of representatives. In this regard, the Erlang C formula has been applied. The two-month data for 2023 were examined from various aspects such as the probability of delay, service level, number of representatives, and average delay time, and inferences were made regarding the determination of the number of representatives. (Muhammet Ali Kadioglu and Bilal Alatas, 2023) presented a workforce optimization model to predict the future workload level and optimize the existing personnel resources. In this context, the Long Short-Term Memory (LSTM) model was trained, and integer programming techniques were used. (Kaan Kuzu et al., 2023) presented a semi-parametric model using a Bayesian framework to analyse call arrivals. The proposed model has been applied to two real calling service datasets. The results showed that the proposed model performed well for off-sample estimates. (Henry Chacón et al., 2023) compared the classical time series methods such as Holt-Winters, Exponential Smoothing (ES) and Seasonal Autoregressive Integrated Moving Average (SARIMA) and machine learning techniques such as Recurrent Neural Network (RNN) and Gradient Boosting with call arrival estimation. Real-life call data was used to test the models. (Jun Gui et al., 2023) proposed an iterative approach based on the ARIMA model to predict short-term call frequency. This approach consisted of three steps, two of which are modeling and the last is call frequency estimation. MAPE was used to analyze forecast performance. (Alaa Seder and Rawan Alnasser, 2023) proposed a time series forecasting model to accurately estimate the number of call center agents needed. In this context, FB Prophet and ARIMA models were applied, and the results were compared. (Samer Alsamadi et al., 2023) simulated different agent programs of a call center by anonymizing them with ANGUS using discrete event simulation. In this context, call center agent programs were evaluated according to the predicted results of the simulation. (Yue Xu and Xiuli Wang, 2022) proposed a two-stage approach for the personnel scheduling problem in call centers. In both stages of the proposed approach, the Artificial Bee Colony algorithm was used. It has been stated that this approach will help call centers make appropriate decisions for a given number of agents and shift types. (Wuttipong Kumwilaisak et al., 2022) presented a new call center workforce management model based on Deep Neural Network, LSTM and Reinforcement Learning. Service metrics such as call abandonment probability and average response time were calculated with the Erlang A model. Q-Learning Algorithm was applied within the scope of reinforcement learning in order to determine the optimum start time of call agents.

3. DATASET

The dataset covers the time period 01.09.2023-17.09.2024 with data obtained from United Payment's call center. The attributes in the dataset used to develop the call count prediction

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models are the count of past calls, time data (year, month, day, season, special day, weekday, weekend, etc.), exchange rate data (Euro opening, Euro closing, minimum Euro, maximum Euro, USD opening, USD closing, minimum USD, maximum USD) and Borsa Istanbul data (BIST100 and BIST30 opening and closing).

4. METHODOLOGY

4.1. Deep Factorization Machine

DeepFM integrates factorization machines for recommendation with deep learning for feature extraction within a novel neural network design. Unlike Google's latest Wide & Deep model, DeepFM utilizes a shared raw feature input for both its "wide" and "deep" components, eliminating the need for additional feature engineering beyond the raw features (Huifeng Guo et al., 2018).

4.2. Bi-Directional Long-Short Term Memory

The Bi-LSTM neural network consists of LSTM units functioning in both forward and backward directions to incorporate context from both the past and future. Unlike standard LSTMs, Bi-LSTM effectively captures long-term dependencies without retaining redundant contextual information. This makes it highly suitable for text classification and sequential modeling tasks. Unlike a regular LSTM network, Bi-LSTM features two parallel layers that process information in opposite directions through forward and backward passes, enabling it to capture dependencies from both contexts. (Beakcheol Jang et al., 2020).

4.3. Gated Recurrent Unit

GRU is a type of RNN that consists of two main gates: the update gate and the reset gate. The update gate determines what information should be retained, discarded, or updated with new data. The reset gate controls how much of the past information should be forgotten (Shivarudraiah Basavarajaiah and Raju Garudachar, 2024).

4.4. Auto Regressive Integrated Moving Average

ARIMA is based on three key concepts: moving average, integration, and autoregression. By 1970, Box and Jenkins had developed the ARIMA model, which serves as a dynamic predictor by connecting past and present data to future estimates. ARIMA is particularly effective for short-term forecasting and has been widely applied to analyze various independent micro and macroeconomic dynamics. (Hamzeh F. Assous et al., 2020).

5. RESULTS AND DISCUSSION

The graphs comparing the real and forecasted values of the models developed using DeepFM, BiLSTM, GRU and ARIMA for call count for 07.07.2024-13.07.2024 and 25.08.2024-31.08.2024 are presented in Figures 1-8. The horizontal axis representing the time periods is called the time interval, which denotes the hourly intervals within a week and consists of 168 units in total.

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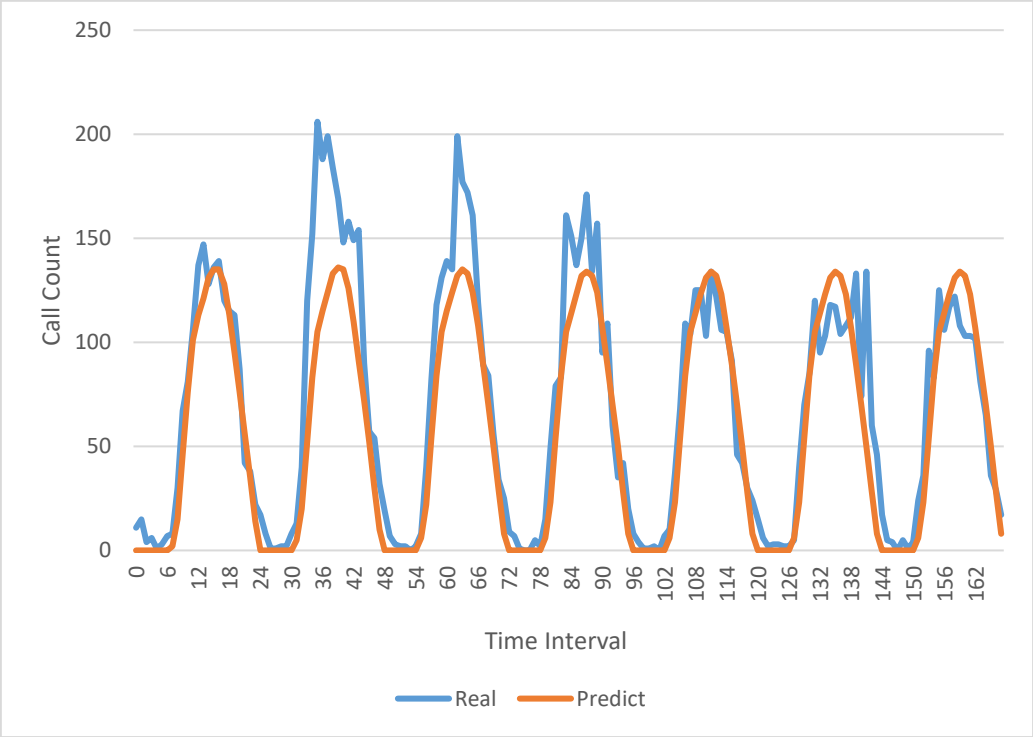

Figure 1. Real and predicted values using DeepFM for 07.07.2024-13.07.2024

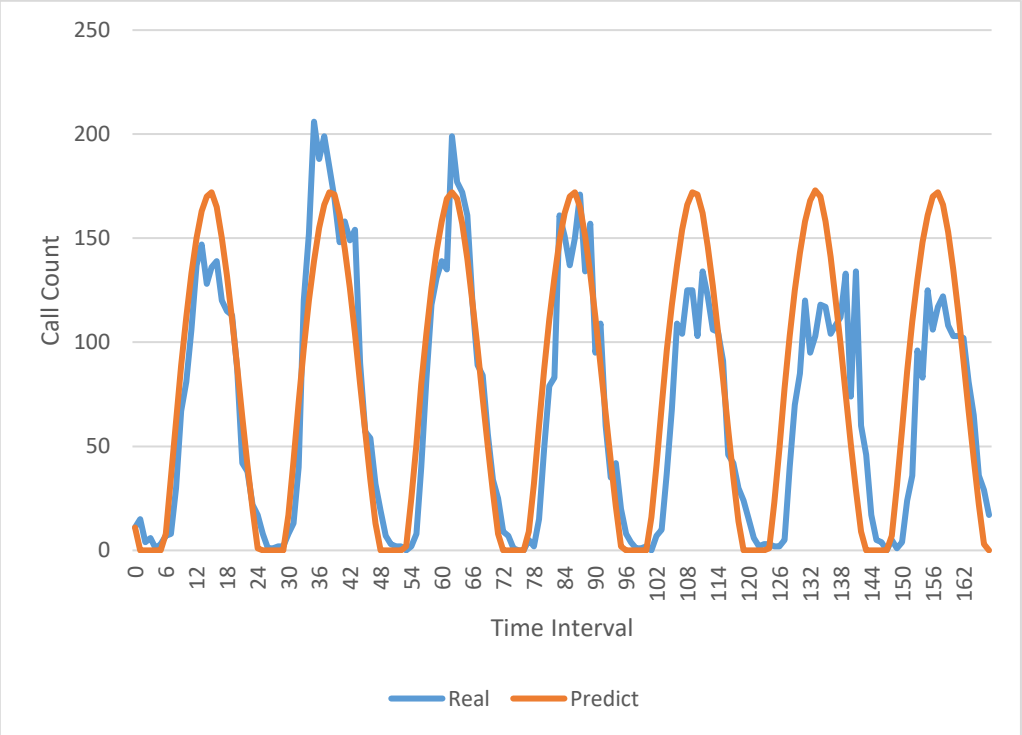

Figure 2. Real and predicted values using BiLSTM for 07.07.2024-13.07.2024

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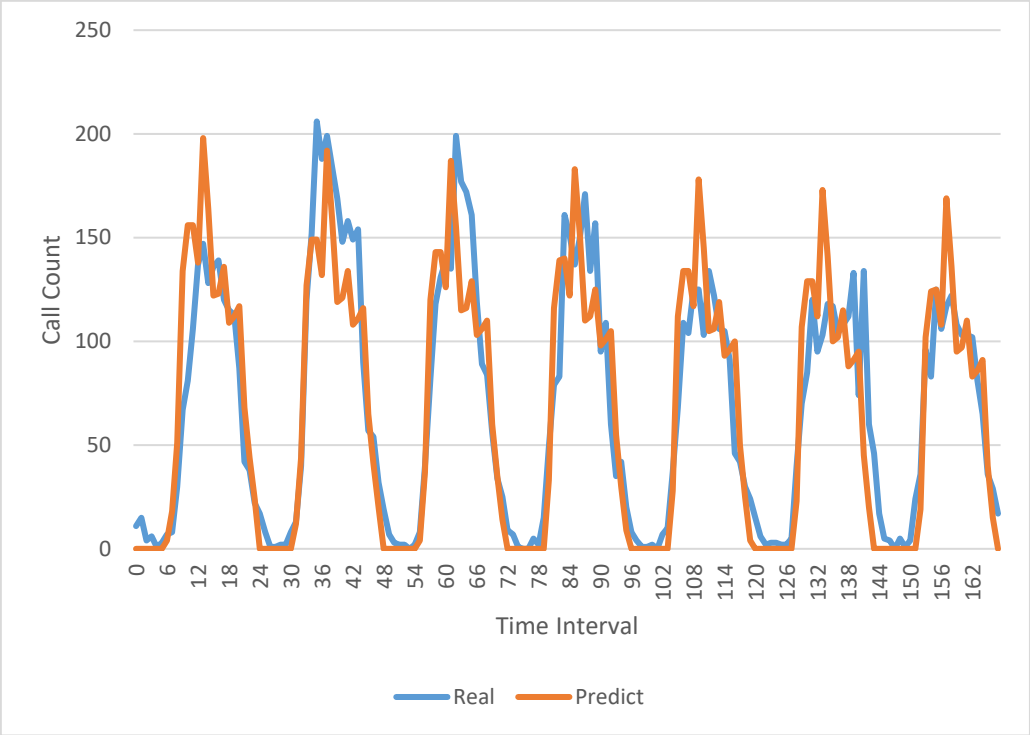

Figure 3. Real and predicted values using GRU for 07.07.2024-13.07.2024

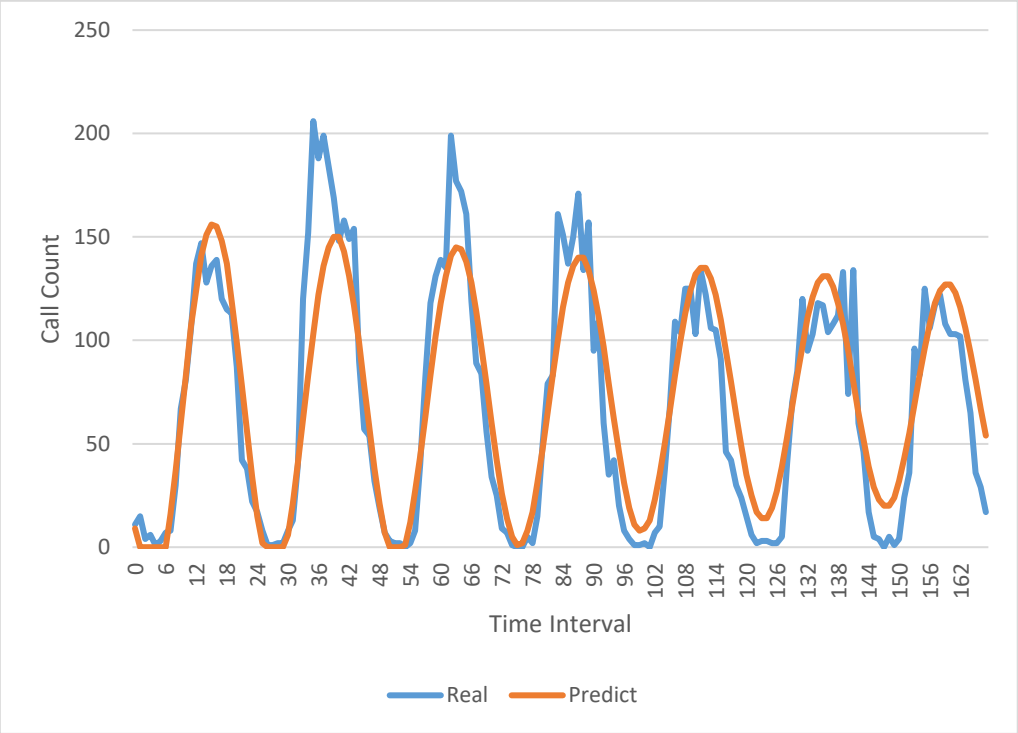

Figure 4. Real and predicted values using ARIMA for 07.07.2024-13.07.2024

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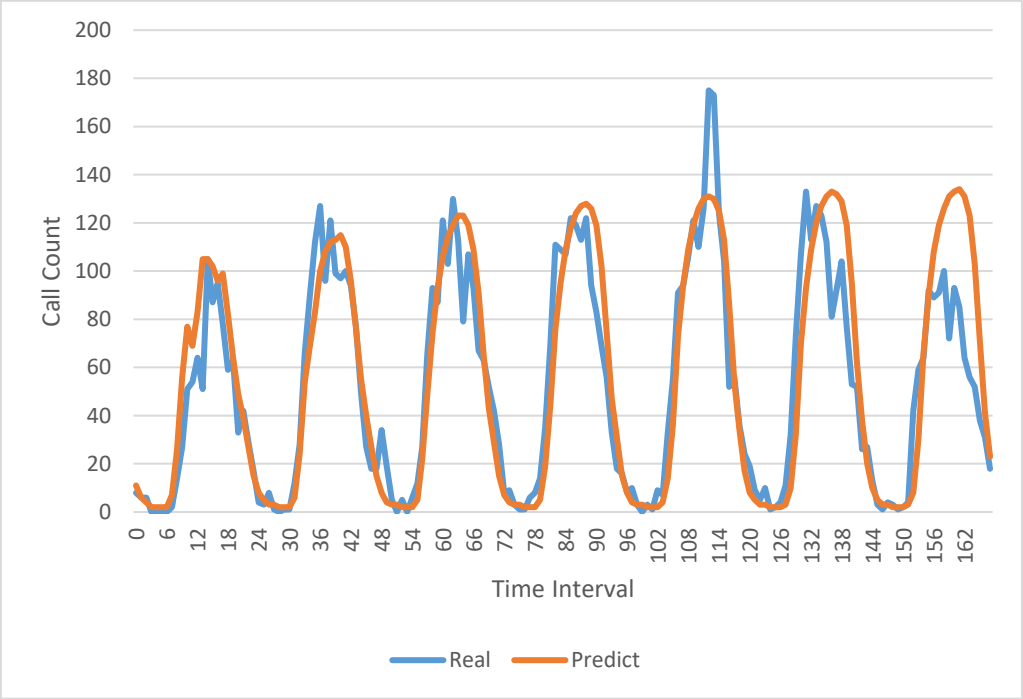

Figure 5. Real and predicted values using DeepFM for 25.08.2024-31.08.2024

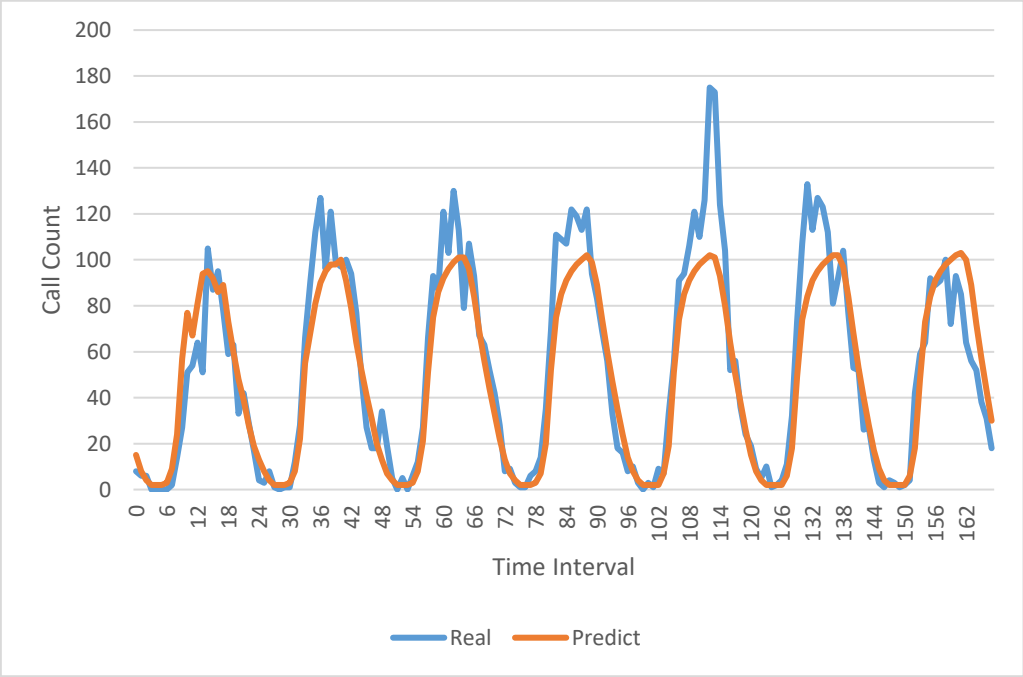

Figure 6. Real and predicted values using BiLSTM for 25.08.2024-31.08.2024

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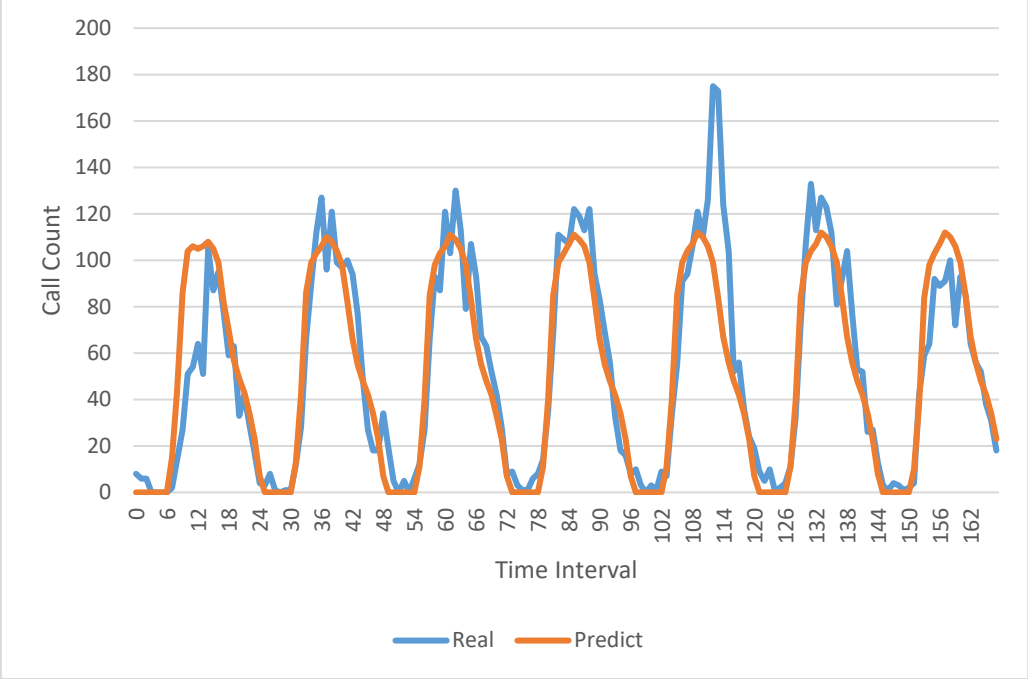

Figure 7. Real and predicted values using GRU for 25.08.2024-31.08.2024

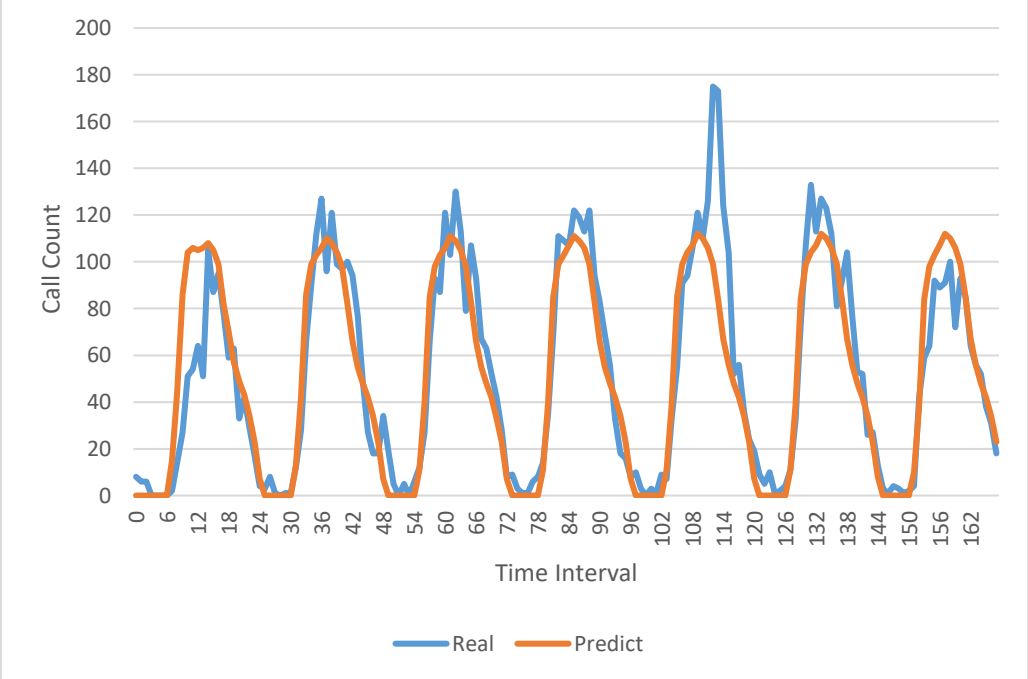

Figure 8. Real and predicted values using ARIMA for 25.08.2024-31.08.2024

The MAE values of the models developed for 07.07.2024-13.07.2024 have been presented in Table 1, while those for 25.08.2024-31.08.2024 have been shown in Table 2.

Table 1. MAE's of the models developed for 07.07.2024-13.07.2024

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Method	MAE
DeepFM	15.65
BiLSTM	23.36
GRU	18.31
ARIMA	17.8

Table 2. MAE's of the models developed for 25.08.2024-31.08.2024

Method	MAE
DeepFM	13.52
BiLSTM	11.46
GRU	11.79
ARIMA	13.28

Based on the results,

- The DeepFM model demonstrated the highest performance for the week of 07.07.2024–13.07.2024, whereas for the week of 25.08.2024–31.08.2024, the most successful prediction model has been developed using Bi-LSTM. Furthermore, the GRU model exhibited performance comparable to that of the Bi-LSTM.
- The models developed for the week of 25.08.2024-31.08.2024 exhibit higher prediction performance compared to those developed for the week of 07.07.2024-13.07.2024.
- The ARIMA model outperformed two deep learning-based prediction models for the week of 07.07.2024-13.07.2024. In contrast, for the week of 25.08.2024-31.08.2024, ARIMA exhibit lower prediction performance.

6. CONCLUSION

Electronic payment institutions provide digital infrastructure for money storage and transfers, allowing users to carry out their financial transactions quickly and securely. Nowadays, these institutions handle high transaction volumes. Call centers play a critical role in maintaining service efficiency and enhancing customer satisfaction within payment companies. Strategic workforce planning in call centers within electronic payment institutions is essential for allocating the appropriate number of personnel at the right times. In this context, making accurate call count predictions is a crucial step in workforce planning. In this study, call count prediction models have been developed using DeepFM, BiLSTM, GRU, and ARIMA. The performance of these models has been evaluated using the MAE metric. According to the obtained results, the Bi-LSTM model demonstrated the lowest MAE value for the period 25.08.2024 - 31.08.2024, exhibiting superior performance.

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DELIVERY TIME PREDICTION FOR THE E-COMMERCE SECTOR

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ABSTRACT

In the contemporary e-commerce landscape, the sector is rapidly evolving, and the competitive environment is becoming increasingly intense. For this reason, e-commerce businesses must implement various strategic actions to stand out from their competitors. Delivery time is a critical factor in customer satisfaction. A shipment delivered after the promised date negatively impacts both customer satisfaction and supply chain optimization. Knowing the delivery time in advance helps manage expectations and maintain competitiveness by providing the opportunity to change suppliers based on actual delivery times. It also plays a significant role in enhancing the customer experience and optimizing supply chain operations. The aim of this study is to accurately predict delivery time in the e-commerce sector. For this purpose, delivery time prediction models have been developed using Gradient Boosting (GB) and Ridge Regression (RR). The dataset has been obtained from Kaggle and includes 5114 delivery data between February 14, 2019, and July 13, 2020. Categorical variables in the dataset have been converted into numerical values using One-Hot encoding. The Minimum Redundancy-Maximum Relevance (mRMR) algorithm has been used to assess its impact on model performance. To ensure the models provide more robust and reliable results, 5-fold cross-validation has been applied. The performance of the developed prediction models has been evaluated using Mean Absolute Percentage Error (MAPE). The most successful prediction performance among the models has been achieved with GB. Also, the impact of the mRMR feature selection algorithm on prediction performance has been shown to be minimal.

Keywords: Delivery Time Prediction, Machine Learning, E-Commerce

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1. INTRODUCTION

With the rise of digital sales channels, the e-commerce sector is growing and expanding rapidly. The convenience, wide range of products, and competitive prices offered by online shopping are driving consumers toward digital platforms. Platforms such as mobile applications and social media stores provide brands with the opportunity to reach wider audiences while also giving consumers the freedom to shop 24/7. The global expansion of internet access and the advancement of digital payment systems further support the growth of e-commerce. As a result, the e-commerce sector is rapidly expanding, and competition among companies is intensifying. In this context, businesses must take various strategic steps to differentiate themselves from their competitors.

Satisfied customers tend to make more purchases, thereby increasing their loyalty to the business, and are also more likely to attract new potential customers. In this context, ensuring and maintaining customer satisfaction is a strategic priority for businesses. To maximize customer satisfaction, several key factors must be considered. Among these, the timely and complete delivery of products stands out as a critical factor that fosters customer trust. Customers place great importance on whether their orders arrive within the promised timeframe. The growing demand for fast delivery, particularly for Generation Z, has led e-commerce brands to place greater emphasis on delivery times in supply chain management. However, since each brand has a unique product range and customer base, delivery times may vary. While fast delivery tends to generate positive feedback in major cities, long delivery times in certain regions can result in customer loss. In this context, accurately prediction delivery times in the e-commerce sector plays a critical role in both enhancing the customer experience and optimizing supply chain operations.

Accurate delivery time predictions help prevent lost sales and improve customer satisfaction, ultimately fostering brand loyalty. Adherence to predicted delivery times not only enhances customer experience but also increases the efficiency of supply chain processes. Meeting customer expectations and reinforcing trust boosts the likelihood of repeat purchases, while fast and reliable delivery strengthens brand reputation and minimizes customer attrition.

The aim of this study is to develop delivery time prediction models that provide e-commerce businesses with the ability to maximize their profits by increasing customer loyalty, gain a competitive advantage, and enhance their brand awareness. To achieve this, delivery time prediction models have been developed using RR and GB.

This study is organized as follows: Section 2 covers relevant literature. The methodology is presented in Section 3. The dataset has been described in Section 4. Section 5 presents results and discussion. Section 6 concludes the paper.

2. LITERATURE REVIEW

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[1] aimed to evaluate the performance of various machine learning and ensemble learning models in classifying delivery times using Amazon delivery data and at performing real-time predictive modelling. A dataset consisting of 43,739 delivery records with 15 features was used in the research. Machine learning techniques such as K Nearest Neighbour, Support Vector Machine (SVM), and Logistic Regression, along with ensemble methods like Extremely Randomized Trees (ExtraTrees) and Adaptive Boosting, were systematically compared based on Accuracy, Precision, Recall, and F-Score. Ensemble learning models, which used SVM, Naive Bayes, and Linear Discriminant Analysis as base models and ExtraTrees as a meta-model, achieved the highest Accuracy (99.89%) and F-Score (99.89%), demonstrating significant potential in optimizing logistics operations, reducing delays, and improving customer satisfaction. [2] presented an innovative approach for predicting late delivery risks in supply chains and developed a framework that combines clustering with multi-class classification techniques. In the multi-class classification phase, five different deep learning models were used: Generative Adversarial Networks, Convolutional Neural Network Long Short-Term Memory (CNN-LSTM), ensemble learning such as bagging stacking, and boosting. A systematic evaluation of various models within the late delivery prediction risk framework was presented, demonstrating that stacking achieved highest performance with an Accuracy of 0.926, showcasing its success in precise predictions. Regression metrics determined that stacking and bagging had superior error minimization, with Mean Squared Error at 0.11 and Mean Absolute Error (MAE) at 0.09. [3] aimed to overcome the challenge that delivery time predictions depend on the unknown actual delivery route at the time of prediction. A new Knowledge Distillation Graph-based Estimated Time of Arrival (KDG-ETA) model was proposed which uses past delivery routes to transfer knowledge to Origin-Destination (OD) pairs during training. In KDG-ETA, a multi-tier trajectory graph model is introduced to comprehensively utilize trajectory data at the node, edge, and path levels. The model combined the OD representations, enriched with trajectory knowledge, with context embeddings from the feature extraction module to predict delivery times through an adaptive attention mechanism. KDG-ETA consistently outperformed current leading OD-based ETA prediction techniques across three real-world Alibaba datasets, reducing the MAE by 3.0%–39.1%, as demonstrated in our comprehensive empirical evaluation. [4] proposed a new Heterogeneous Hypergraph Neural Network (H^2-GNN) to predict the package arrival time. To better capture the interactions between orders and attributes, a heterogeneous hypergraph was created, using hyperedges to represent orders and nodes to represent attributes. The hypergraph learning was extended for large-scale e-commerce data using Hypergraph Sampling and Aggregation Graph Convolutional Network. Overall, H²-GNN provided informative representations of packages by combining the structure-based information of the hypergraph with the feature-based information of the Transformer. Experimental results on Alibaba logistics data validated the superior performance of H^2-GNN. [5] proposed a new Shipment Status Time Prediction (STP) approach to predict shipment status durations. In the first phase, a machine learning model was created to predict shipment statuses using real-world data, and Extreme Gradient Boosting (XGBoost) was compared with other popular machine learning algorithms. XGBoost demonstrated the best performance, achieving an Accuracy of 99.92% for the training set and

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96.16% for the test set in shipment status prediction. In the second phase, an improved version of the Marine Predators Algorithm (MPA), called STPMPA, was introduced. The STPMPA algorithm was first tested on numerical benchmark problems, where it outperformed all other algorithms. Next, optimizers used the XGBoost model to find the most feasible shipment status times. The STPMPA algorithm demonstrated superior performance for the STP problem compared to other optimization methods. [6] proposed a prediction model to assess the challenge of efficient meal delivery management by predicting delivery times. Exploratory Data Analysis (EDA) facilitated the identification of relevant predictors by examining relationships between parameters. In the prediction modeling phase, Linear Regression, Lasso, Decision Tree (DT), XGBoost, and Random Forest (RF) methods were applied. Hyperparameter tuning was performed using Grid Search to optimize model performance. [7] developed a machine learning-based regression model to predict the severity of late deliveries by suppliers. In this study, a detailed understanding of the manufacturer's supply process was formed, relevant features were identified, and different machine learning algorithms were compared. It was observed that the inclusion of information such as component descriptors improved the prediction quality. [8] developed a method to predict real-time e-order arrivals at distribution centers, enabling third-party logistics providers to manage hourly e-order arrival rates more effectively. A new machine learning prediction method was developed by integrating the Adaptive Neuro-Fuzzy Inference System (ANFIS). By creating a method to predict real-time e-order arrivals at distribution centers, it enabled third-party logistics providers to handle hourly e-order arrival rates more efficiently. [9] aimed to solve the problem of transaction time prediction for medical supply orders placed through a large e-pharmacy using artificial intelligence and machine learning techniques. A machine learning regressor ensemble was used to predict the transaction times of medical supply orders, and a machine learning classifier ensemble was used to predict the shipment times of deliveries. [10] developed the prediction models travel times for goods and document shipments made by a company to various islands. The RF method was used. When evaluating the prediction results obtained with RF in this study, it was determined that 83.86% of the average of four trials achieved a high Accuracy rate, and the RF method was found as a correct choice for managing the current data model in this study. [11] examined the Estimated Arrival Time (EAT) in intermodal transportation chains using machine learning in logistics. First, an approach for the methodological procedure of applying EAT predictions and a definition of the key development stages were presented. Then, an actor-based prediction approach for containers in the port area, specifically for combined road-rail transportation, was designed, and machine learning-based prediction models for specific logistics processes were prototyped and evaluated. Finally, an outlook on future research directions was provided. [12] proposed a one-dimensional CNN model to accurately predict the arrival/departure times of ships waiting for instructions at the port by collecting ship and weather data. It was confirmed that the proposed deep learning model improved by more than 5.9% compared to other ensemble machine learning models. It was determined that predicting the time required for a ship to enter and leave the port was possible under various conditions, and therefore, the model should assist operators in providing accurate information to the ship and determining the waiting sequence.

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3. METHODOLOGY

3.1. Ridge Regression

Ridge regression, a modified form of least squares, addresses estimation issues by producing a biased estimator with low variance. It helps manage multicollinearity and prevents overfitting by reducing variance in exchange for slight bias, leading to more reliable coefficient estimates. Unlike Lasso, Ridge regression shrinks correlated predictors rather than eliminating them, allowing them to share influence. From a Bayesian perspective, its penalty is effective when multiple predictors have nonzero coefficients. Key considerations include variance, bias, and the mean square error function [13]

3.2. Gradient Boosting

The core principle of machine learning is to establish a functional relationship between given input data and corresponding output targets. Once new input data is introduced, the output value can be determined using this predefined relationship. GB is a widely used ensemble method that constructs weak learners in the direction of the gradient to achieve optimal results in the shortest time possible. This approach addresses optimization problems in function space by mimicking the gradient descent technique used in numerical space [14].

4. DATASET

The dataset obtained from Kaggle [15] consists of 5113 rows, containing historical delivery data for the 16-month period between February 14, 2019, and June 13, 2020. Categorical variables in the dataset have been converted to numerical values using One Hot Coding. The attributes used in the study included campaign data, pick-up point, delivery point (where the product will be delivered), shipping cost per kilogram, gross weight in kilograms, fixed cost per delivery, delivery method, delivery company, and the time it takes for the product to reach the destination.

5. RESULTS AND DISCUSSION

The delivery time prediction models have been developed using GB and RR. The mRMR has been used to observe the effect of feature selection on model performance. 5-fold cross validation has been applied for each method. The performance of the developed prediction models has been evaluated with MAPE. The MAPE's obtained with the developed prediction models are given in Table 1.

Table 1. MAPE's of the delivery time prediction models

Method	Fold 1	Fold 2	Fold 3	Fold 4	Fold 5	Average
Gradient Boosting	21.29%	18.93%	17.69%	19.12%	18.56%	19.10%

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Ridge Regression	28.02%	27.93%	26.71%	27.39%	27.59%	27.53%
Gradient Boosting + mRMR	20.62%	19.56%	17.92%	18.15%	18.76%	19.00%
Ridge Regression+ mRMR	28.49%	28.11%	26.67%	27.42%	27.56%	27.65%

Based on the results, the following comments can be made:

- GB-based models demonstrated higher prediction performance than RR-based models.
- The implementation of the mRMR algorithm did not improve the performance of the models.

6. CONCLUSION

With the widespread use of digitalization and the internet, consumers can make their purchases quickly and easily. In this context, the e-commerce sector is continuously evolving, driven by technological advancements, improvements in logistics infrastructure, and changes in customer demand. This shift has created the need for e-commerce companies to respond more rapidly to customer demands. Customers experience a more positive shopping trip when provided with fast delivery times and on-time delivery guarantees, which, in turn, enhances customer loyalty. In this context, the accurate prediction of delivery times not only boosts customer satisfaction but also facilitates the more efficient management of operational processes. In this study, delivery time prediction models have been developed using the GB and RR. The mRMR algorithm has been implemented to assess the impact of feature selection on model performance. The performance of the developed prediction models has been evaluated using the MAPE. The results of the study indicated that the GB-based prediction models demonstrated superior performance.

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ENERJİ YÖNETİMİNDE PARÇACIK SÜRÜ OPTİMİZASONU UYGULAMASI

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ÖZET

Bu çalışmada, yeşil lojistik kapsamında enerji tüketiminin optimize edilmesi amacıyla Parçacık Sürü Optimizasyonu (PSO) algoritmasının uygulanması ele alınmıştır. Bu çalışma, öncelikle yeşil lojistik ve enerji yönetimi kavramlarına genel bir bakış sunarak, mevcut teknolojik gelişmeler ve literatürdeki uygulamaların incelenmesiyle başlamaktadır. Ardından, PSO algoritmasının temel prensipleri, bileşenleri ve işleyişi detaylı bir şekilde anlatılmaktadır. Python dili ile geliştirilen modelde, başlangıçta rastgele oluşturulan parçacıklar ve hız değerleri ile optimizasyon süreci başlatılmıştır. Her iterasyonda, her parçacığın kişisel en iyi konumu ile tüm parçacıklar arasındaki global en iyi çözüm güncellenmiş; böylece enerji tüketimi minimize edilmeye çalışılmıştır. Sonuç olarak, bu çalışma PSO algoritmasının yeşil lojistikte enerji yönetimini iyileştirmedeki potansiyelini ortaya koymaktadır. Gelecek çalışmalar, modelin gerçek zamanlı verilerle desteklenmesi ve daha kapsamlı lojistik sistemlere entegre edilmesiyle, sürdürülebilir taşımacılık çözümlerinin geliştirilmesine katkı sağlayacaktır. Çalışmanın sonuçları, PSO algoritmasının enerji yönetimi optimizasyonunda ne kadar etkin olduğunu açıkça ortaya koymaktadır.

Anahtar Kelimeler: Yeşil Lojistik, Parçacık Sürü Optimizasyonu, Python Programlama.

1. GİRİŞ

Enerji tüketimi, lojistik operasyonlarda önemli bir maliyet unsuru olarak öne çıkmakta ve verimli enerji yönetimi sistemleri, çevresel etkiyi azaltmada kritik bir rol oynamaktadır. Bu nedenle, doğru optimizasyon tekniklerinin kullanılması, hem maliyetlerin düşürülmesi hem de sürdürülebilir taşımacılığın desteklenmesi açısından büyük önem taşımaktadır.

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Lojistik ve yük taşımacılığı faaliyetlerinin çevresel sürdürülebilirlik ilkelerine uygun hale getirilmesi, lojistik ağlarının ve dağıtım sistemlerinin çevreci yaklaşımlarla tasarlanmasını, ayrıca taşımacılık ve depolama süreçlerinin bu doğrultuda yönetilmesini gerektirir. Stratejik düzeyde, çevre dostu lojistik hedefleri arasında sürdürülebilir taşıma filolarının ve lojistik hizmet sağlayıcılarının seçilmesi ile uygun dağıtım politikalarının oluşturulması yer alır. Taktiksel ve operasyonel aşamalarda ise çevreci rota optimizasyonu, teslimat planlarının entegrasyonu ve verimli envanter yönetimi gibi unsurlar öncelikli konular arasındadır (Fahimnia v.d., 2015).

2. PARÇACIK SÜRÜ OPTİMİZASYONU

Parçacık Sürü Optimizasyonu (PSO), doğadan esinlenerek geliştirilmiş bir küresel optimizasyon tekniğidir. Bu yöntem, çözüme ulaşmak için bir grup "parçacık" (çözüm adayı) kullanır. Her bir parçacık, çözüm uzayındaki konumunu ve hızını güncelleyerek en iyi çözümü bulmaya çalışır. PSO, her parçacığın kendi en iyi çözümünü (pakat) ve grup içindeki en iyi çözümü (güçlü lider) takip etmesine olanak tanır, böylece çözüm uzayında etkili bir şekilde hareket eder (Kennedy & Eberhart, 1995).

1. Parçacıklar ve Başlangıç Koşulları PSO algoritmasında, her parçacık çözüm uzayında bir konum ve hızla temsil edilir. Başlangıçta, her parçacık rastgele bir konum ve hızla yerleştirilir. Parçacık sayısı, problemin doğasına ve algoritmanın başarısına bağlı olarak belirlenir. Bu başlangıç koşulları, PSO'nun performansını doğrudan etkileyebilir ve genellikle deneysel olarak seçilir (Shi & Eberhart, 1998).

2. 2. Pozisyon ve Hız Güncelleme PSO'daki her parçacık, zamanla kendi pozisyonunu ve hızını günceller. Bu güncellemeler, her parçacığın geçmişteki en iyi çözümüne ve grup içindeki en iyi çözüme dayanarak yapılır. Böylece, her parçacık hem kişisel başarılarını hem de grup içindeki başarıları dikkate alarak çözüm uzayında hareket eder. Parçacıklar, hızlarını belirlerken ivme katsayıları ve kişisel ile sosyal etkiyi kontrol eden katsayılarla yönlendirilir (Clerc & Kennedy, 2002).

3. Fırlatma ve Güncelleme İterasyonları PSO, belirli bir iterasyon sayısına veya durma kriterine ulaşana kadar devam eder. Her iterasyonda, her parçacık çözüm uzayındaki konumunu güncelleyerek global optimuma daha yakın bir noktaya ulaşmaya çalışır. Algoritma, her adımda en iyi çözümü takip eder (Kennedy & Eberhart, 1995).

4. Sonuçların Değerlendirilmesi PSO'nun performansı, hem çözüm kalitesi hem de zaman verimliliği açısından incelenir. Algoritmanın başarılı olup olmadığını, global optimuma ne

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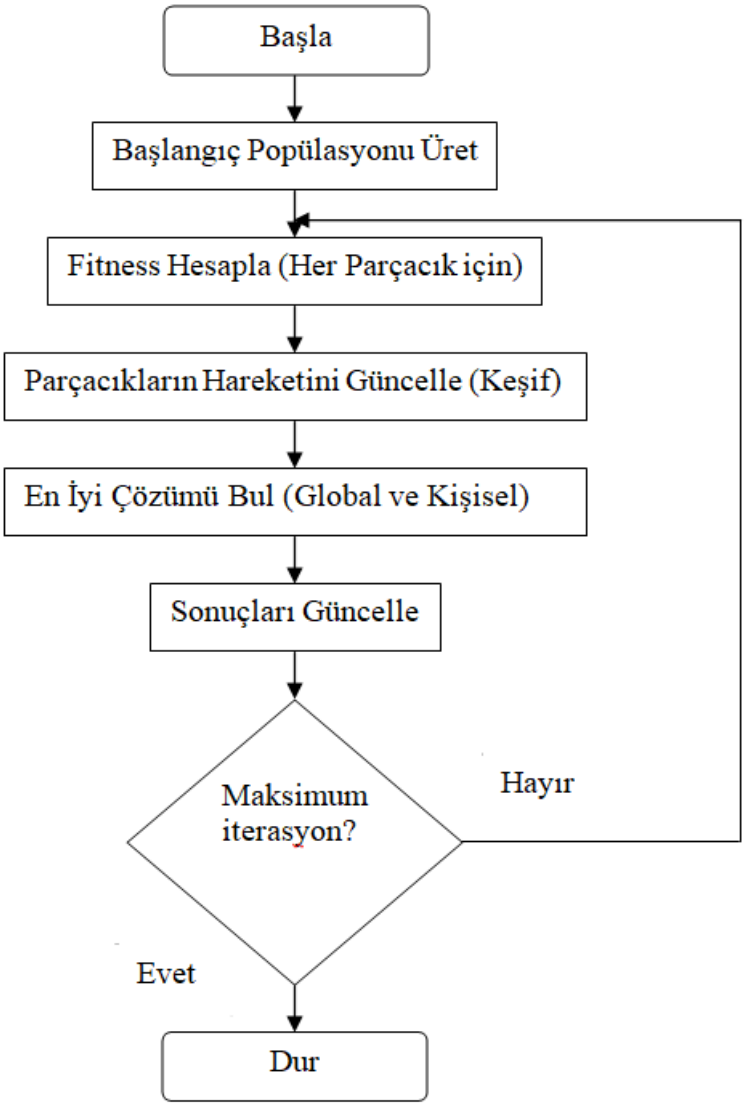
kadar yakın bir çözüm bulduğuna bakarak değerlendiririz. Ayrıca, PSO'nun farklı uygulamalarda test edilmesi, algoritmanın esnekliğini ve çeşitli problemlere uyum sağlama yeteneğini ortaya koyar (Poli, Kennedy, & Blackwell, 2007; Shi & Eberhart, 1998).

3. UYGULAMA

Problemin çözümü için Python programlama dilinde Parçacık Sürü Optimizasyonu Algoritması ile çözüm bulabilen bir program geliştirilmiştir. Bu çalışmada, yeşil lojistik kapsamında enerji tüketiminin optimize edilmesi amacıyla Parçacık Sürü Optimizasyonu (PSO) algoritmasının uygulanması ele alınmıştır.



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Görsel 1. PSO algoritması için Akış Çizgesi

Bu çalışmada, yeşil lojistik kapsamında enerji tüketiminin optimize edilmesi amacıyla Parçacık Sürü Optimizasyonu (PSO) algoritmasının uygulanması ele alınmıştır. Enerji tüketimi, lojistik operasyonlarda önemli bir maliyet unsuru olarak öne çıkmakta ve verimli enerji yönetimi sistemleri, çevresel etkiyi azaltmada kritik bir rol oynamaktadır. Bu problemde amaç, 5 araç ve 5 rota arasında en uygun atamayı sağlamaktır. Ancak, bu sefer her rotanın bir mesafesi ve her aracın güzergah için belirli bir yakıt tüketim değeri vardır. Bu çalışmanın amacı, hem mesafeleri hem de yakıt tüketimini minimize etmektir. Her aracın, 5 farklı güzergah için farklı yakıt tüketim değerleri ve mesafeleri vardır. Bu veriler, hem mesafeye hem de yakıt tüketimine dayalı olarak hesaplamalar yapılmasına olanak sağlar.
Yakıt tüketimi matrisi Çizelge 1'deki gibidir.

Çizelge 1. Yakıt Tüketimi Matrisi (Litre / km)

Araç / Güzergah	Güzergah 1	Güzergah 2	Güzergah 3	Güzergah 4	Güzergah 5
Araç 1	0.15	0.20	0.18	0.22	0.17
Araç 2	0.18	0.16	0.20	0.15	0.21
Araç 3	0.14	0.22	0.19	0.20	0.16
Araç 4	0.19	0.17	0.21	0.16	0.18
Araç 5	0.16	0.19	0.15	0.18	0.20

Mesafe matrisi Çizelge 2'deki gibidir.

Çizelge 2. Mesafe Matrisi

Güzergah	Mesafe (km)
Güzergah 1	10
Güzergah 2	15
Güzergah 3	12
Güzergah 4	18
Güzergah 5	20

Program çalıştırıldığında elde edilen bulgular aşağıdaki gibidir.
Rasgele Atama Yakıt Tüketimi: 13.95 litre
PSO Algoritması ile Yakıt Tüketimi: 13.26 litre
Tasarruf Miktarı: 0.69 litre

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PSO algoritmasının enerji tasarrufu sağlama potansiyelini gösterir. Rasgele atama, araçları güzergahlarla rastgele atar ve bu çözümde toplam yakıt tüketimi 13.95 litre olur.
PSO algoritması, araçları güzergahlarla optimize ederek, toplam yakıt tüketimini 13.26 litreye indirmektedir.

4. SONUÇ

PSO algoritması, araç-güzergah eşleştirmesini optimize ederek, 0.69 litre yakıt tasarrufu sağlamıştır. Bu sonuç, PSO algoritmasının enerji tasarrufu sağlama potansiyelini göstermektedir. Rasgele atama, araçları güzergahlarla rastgele atar ve bu çözümde toplam yakıt tüketimi 13.95 litre olmaktadır.
PSO algoritması, araçları güzergahlarla optimize ederek, toplam yakıt tüketimini 13.26 litreye indirmektedir. Bu optimizasyon, 0.69 litre tasarruf sağlamaktadır. PSO, çözümün verimliliğini artırarak enerji tasarrufu sağlamaktadır.
Bu model, esnek yapısı sayesinde farklı lojistik senaryolara uyarlanabilir ve gerçek uygulamalarda önemli tasarruflar sağlanabilir. Uygulama örneği, ileri düzey enerji verimliliği hedeflerine ulaşmada, yapay zekanın sunduğu potansiyelin somut bir göstergesidir. Geliştirilmiş modeller, sürdürülebilir taşımacılık alanında önemli ilerlemelere zemin hazırlamaktadır. Bu sonuçlar, yeşil lojistik uygulamalarında enerji verimliliğinin artırılmasına yönelik yenilikçi yaklaşımların uygulanabilirliğini desteklemektedir.

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LOJİSTİK YÖNETİMİ İÇİN YAPAY ARI KOLONİSİ OPTİMİZASYONU UYGULAMASI

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ÖZET

Bu çalışmada, Arı Kolonisi Optimizasyonu (ABC) algoritması kullanılarak lojistik süreçlerin iyileştirilmesine yönelik bir model geliştirilmiş ve Python programlama dili ile uygulanmıştır. Arı Kolonisi Optimizasyonu, bal arılarının doğal besin arama mekanizmalarından esinlenerek geliştirilen bir optimizasyon algoritmasıdır. Algoritma, işçi arılar, gözcü arılar ve keşifçi arılar olmak üzere üç temel bileşenden oluşmakta ve problem çözüm sürecinde bu bileşenlerin iş birliği ile en uygun çözümler elde edilmektedir. Lojistik yönetimi bağlamında ABC, taşıma rotalarının optimizasyonu, depo yerleşim planlaması, envanter yönetimi ve dağıtım ağlarının etkinleştirilmesi gibi çeşitli problemlerin çözümünde başarıyla uygulanmıştır. Bu çalışmada, ABC algoritması ile lojistik süreçlerin iyileştirilmesi amacıyla bir model geliştirilmiştir. Öncelikle lojistik yönetiminde karşılaşılan belirli bir problem tanımlanmış ve bu problem için ABC tabanlı bir optimizasyon modeli oluşturulmuştur. Python programlama dili kullanılarak algoritma uygulanmış ve elde edilen sonuçlar analiz edilmiştir. Çözüm sürecinde algoritmanın işlem süresi, maliyet avantajı ve çözüm kalitesi gibi temel performans ölçütleri değerlendirilmiş, geleneksel yöntemlerle karşılaştırmalar yapılmıştır. Yapılan analizler sonucunda, ABC algoritmasının lojistik yönetimi süreçlerinde önemli iyileştirmeler sağladığı gözlenmiştir.

Anahtar Kelimeler: Lojistik Yönetimi, Yapay Arı Kolonisi Optimizasyonu, Python Programlama.

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1. GİRİŞ

Lojistik yönetimi, tedarik zinciri süreçlerinin verimli bir şekilde planlanmasını ve işletmelerin operasyonel performanslarının artırılmasını sağlayan kritik bir alandır. Günümüzde küresel rekabetin artması, müşteri taleplerinin değişkenlik göstermesi ve maliyet baskılarının yükselmesi, lojistik faaliyetlerin daha etkin yönetilmesini zorunlu kılmıştır. Bu kapsamda, sezgisel optimizasyon algoritmaları, karmaşık lojistik problemlerinin çözümünde önemli bir alternatif sunmaktadır.

Bu çalışmada, Arı Kolonisi Optimizasyonu (ABC) algoritması kullanılarak lojistik süreçlerin iyileştirilmesine yönelik bir model geliştirilmiş ve Python programlama dili ile uygulanmıştır.

2. YAPAY ARI KOLONİSİ OPTİMİZASYONU

Arı Kolonisi (Artificial Bee Colony, ABC) algoritması, doğadaki arıların beslenme alışkanlıklarından esinlenerek geliştirilmiş bir optimizasyon tekniğidir. 2005 yılında Karaboğa tarafından önerilen bu yöntem, küresel optimizasyon problemlerine etkili çözümler sunmasıyla tanınmaktadır. Yöntem Yapay Arı Kolonisi (ABC) algoritması, arıların doğal davranışlarını taklit eden bir optimizasyon tekniğidir (Karaboga & Basturk, 2008). Bu algoritma, çözüm uzayında "arılar" olarak adlandırılan bireylerin etkileşimlerini kullanarak en iyi çözümü bulmaya çalışır (Yang, 2014). ABC algoritmasında, her arı, çözüm uzayındaki bir pozisyonu temsil eder ve bu pozisyon, arının bulunduğu noktayı belirler (Karaboga & Basturk, 2008). Arıların koloni halinde hareket etmesi, algoritmanın global optimumu bulma çabasını destekler (Mirjalili & Lewis, 2016).

1. Arıların Temsili ve Başlangıç Koşulları ABC algoritmasında her bir arı, çözüm uzayında bir pozisyon ve buna karşılık gelen bir çözümle temsil edilir (Karaboga & Basturk, 2008). Başlangıçta, her arı rastgele bir pozisyonla çözüm uzayına yerleştirilir ve arıların sayısı, problemi çözme kapasitesini belirler (Karaboga & Basturk, 2008). Başlangıç koşulları, algoritmanın başarılı bir şekilde çalışabilmesi için oldukça kritik bir rol oynar ve doğru bir şekilde seçilmesi gerekir (Mirjalili & Lewis, 2016). Parçacıkların sayısı genellikle deneysel olarak optimize edilir (Neshat & Karaboga, 2020).

2. Arıların Hareketi ve Çözüm Güncelleme ABC algoritmasında, her arı, çözüm uzayında daha iyi çözümler bulmak için farklı hareket stratejileri uygular (Karaboga & Basturk, 2008). Keşif aşamasında, her arı rastgele yeni çözümler üretir ve bunları değerlendirir (Karaboga & Basturk, 2008). Yerel arama aşamasında ise mevcut çözümün etrafında bir arama yaparak daha iyi

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çözümler arar (Yang, 2014). Bu süreç, arıların kişisel başarıları ile grup başarıları arasında bir denge kurmalarını sağlar (Mirjalili & Lewis, 2016.)

3. Dengeleme ve İterasyonlar ABC algoritması, iterasyonlar boyunca çözüm uzayında daha iyi çözümler arayışındadır (Neshat & Karaboga, 2020). Her bir iterasyonda, arılar mevcut çözümlerini değerlendirir ve daha iyi bir çözüm bulmak için çaba gösterir (Karaboga & Basturk, 2008). Koloni, en iyi çözümü belirlemek amacıyla her arının kendi en iyi çözümünü ve grubun en iyi çözümünü takip eder (Karaboga & Basturk, 2008).

4. Sonuçların Değerlendirilmesi ABC algoritmasının başarısı, genellikle global optimuma ne kadar yakın bir çözüm bulabildiğine göre değerlendirilir (Yang, 2014). Algoritmanın verimliliği, çözüm kalitesi ve işlem süresi gibi kriterler kullanılarak ölçülmektedir (Mirjalili & Lewis, 2016). Ayrıca, ABC algoritması çeşitli uygulamalarda test edilmiş ve birçok probleme etkili çözümler sunmuştur (Neshat & Karaboga, 2020).

3. UYGULAMA

Bu çalışmada, Arı Kolonisi Optimizasyonu (ABC) algoritması kullanılarak lojistik süreçlerin iyileştirilmesine yönelik bir model geliştirilmiş ve Python programlama dili ile uygulanmıştır. Algoritmanın temel işleyişi ve bu problemlere yönelik uygulama alanları detaylı bir şekilde incelenmektedir.

Günümüzde lojistik firmaları, müşteri taleplerini zamanında ve en düşük maliyetle karşılamak için çeşitli optimizasyon teknikleri kullanmaktadır. Taşıma süreçlerinde mesafelerin minimize edilmesi, hem yakıt tüketimini azaltarak maliyetleri düşürmekte hem de çevresel sürdürülebilirliği desteklemektedir.

Bu çalışmada, Yapay Arı Kolonisi (Artificial Bee Colony - ABC) Algoritması kullanılarak lojistik ağında en kısa teslimat rotasının belirlenmesi amaçlanmaktadır. Firma, merkezi bir depo konumundan (0,0) başlayarak, belirli müşteri noktalarına ürün teslimatı yapmakta ve teslimat tamamlandıktan sonra tekrar depoya dönmektedir.

Amaç, tüm müşteri noktalarına uğrayarak toplam taşınan mesafeyi minimize eden en iyi rotayı belirlemektir.

Başlangıç Konumları

Depo Konumu: (0, 0)

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Müşteri Konumları:

1. (5, 8)

2. (7, 9)

3. (17, 12)

4. (6, 11)

5. (8, 11)

Depo, başlangıç noktası olarak kabul edilmekte olup, müşterilere belirli bir sıra ile uğranarak teslimat tamamlanmaktadır. ABC Algoritması, arı kolonilerinin doğadaki yiyecek arama davranışını taklit ederek en iyi rotayı belirlemeye çalışmaktadır.

Çizelge 1. Depodan Müşterilere Mesafeler (km)

Müşteri Konumları	Mesafe
Depo → (5,8)	9.43 km
Depo → (7,9)	11.40 km
Depo → (17,12)	20.81 km
Depo → (6,11)	12.53 km
Depo → (8,11)	13.60 km

Algoritma, başlangıçta rastgele üretilen teslimat rotalarını değerlendirir ve daha iyi çözümler bulmak için iteratif olarak güncellenmiş rotalar oluşturmaktadır. Bu süreçte arıların keşif, gözlemci ve izci rolleri sayesinde çözümler geliştirilerek toplam mesafe optimize edilmektedir.

Bu çalışmada Lojistik Yönetimi için kullanılan Arı Kolonisi Algoritması Python programlama dili ile geliştirilmiştir. Arı Kolonisi Algoritması, popülasyon tabanlı bir sezgisel optimizasyon yöntemidir.

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Bu algoritma, bal arılarının yiyecek arama ve toplama davranışlarından ilham alır. Atama problemleri gibi optimizasyon görevlerinde Arı Kolonisi Algoritması, çözüm alanındaki en iyi çözümleri bulmak için arıların yerel ve küresel arama yöntemlerini kullanır.

En iyi rota:

[(7, 9), (17, 12), (8, 11), (6, 11), (5, 8)]

Minimum mesafe: 45.49370469026433

Program çalıştırıldığında minimum mesafe 45.49 km olarak hesaplanmıştır. En iyi rota; ikinci müşteriden üçüncü müşteriye, üçüncü müşteriden beşinci müşteriye, beşinci müşteriden dördüncü müşteriye, dördüncü müşteriden birinci müşteriye dağıtım planlanmalıdır.

4. SONUÇ

Bu optimizasyon yaklaşımı, lojistik yönetiminde taşıma maliyetlerini azaltmak, zaman tasarrufu sağlamak ve operasyonel verimliliği artırmak için etkili bir yöntem sunmaktadır. Bu çalışmanın gelecekte daha büyük ölçekli lojistik ağlarında veya dinamik müşteri taleplerine göre güncellenen rotalar için uygulanması, algoritmanın pratik kullanım potansiyelini artırabilir. Sonuç olarak, bu çalışma lojistik süreçlerde ABC'nun etkin bir şekilde uygulanabileceğini ortaya koymuştur. Optimizasyon sürecinde elde edilen bulgular, lojistik yönetiminde karar destek mekanizmalarının güçlendirilmesi ve sezgisel algoritmaların kullanımı açısından değerli katkılar sunmuştur. Bu tür optimizasyon yöntemlerinin benimsenmesi, lojistik süreçlerin daha verimli hale getirilmesine ve işletmelerin rekabet gücünün artırılmasına katkıda bulunacaktır.

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İNSAN KAYNAKLARINDA METAVERSE: SANAL GERÇEKLİK İLE İŞE ALIM ÜZERİNE NİTEL BİR İNCELEME

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ÖZET

Dijitalleşme ve teknolojik yenilikler, insan kaynakları (İK) yönetiminde köklü değişimlere yol açmaktadır. Son yıllarda ortaya çıkan Metaverse kavramı, işe alım süreçlerinde sanal gerçeklik (VR) ve artırılmış gerçeklik (AR) teknolojilerinin kullanımını mümkün kılarak yeni fırsatlar sunmaktadır. Bu çalışma, Metaverse tabanlı işe alım süreçlerinin avantajlarını, zorluklarını ve insan kaynakları profesyonelleri üzerindeki etkilerini nitel bir araştırma yöntemiyle incelemeyi amaçlamaktadır. Metaverse tabanlı işe alım süreçleri, geleneksel mülakat yöntemlerinden farklı olarak sanal ofislerde, avatarlar aracılığıyla gerçekleştirilmektedir. Adaylar, sanal iş ortamlarında etkileşime girerek pozisyonla ilgili yetkinliklerini pratik bir şekilde sergileyebilmekte ve işverenler tarafından çok boyutlu olarak değerlendirilebilmektedir. Ayrıca, yapay zekâ destekli değerlendirme sistemleri, adayların beden dili, konuşma tarzı ve problem çözme yetkinliklerini analiz ederek daha objektif sonuçlar sunabilmektedir. Bu araştırmada, Metaverse kullanan şirketlerin işe alım süreçlerine ilişkin deneyimlerini anlamak amacıyla doküman incelemesi yapılmıştır. Betimsel analiz yöntemiyle değerlendirilen veriler, Metaverse tabanlı işe alımın hem işverenler hem de adaylar açısından sunduğu olanakları ve karşılaşılan sınırlılıkları ortaya koymaktadır.

Çalışmanın bulguları, Metaverse'ün işe alım süreçlerine entegrasyonunun birçok avantaj sunduğunu göstermektedir. Öncelikle, coğrafi kısıtlamaları ortadan kaldırarak küresel yeteneklere erişimi kolaylaştırmaktadır. Ayrıca, aday deneyimini artırarak işe alım sürecini daha ilgi çekici ve etkileşimli hale getirmektedir. Örneğin, adaylar sanal ofis ortamında simüle edilmiş görevleri yerine getirerek yetkinliklerini doğrudan sergileyebilmekte ve işverenler bu süreci daha iyi gözlemleyebilmektedir. Öte yandan, Metaverse tabanlı işe alım süreçlerinin bazı zorlukları da bulunmaktadır. Altyapı gereksinimleri, teknik bilgi eksikliği ve siber güvenlik riskleri, bu yeni sistemin yaygınlaşmasının önündeki temel engeller olarak belirlenmiştir. Ayrıca, adayların dijital okuryazarlık seviyelerinin farklı olması ve sanal mülakatlara uyum sağlamakta zorlanmaları gibi faktörler, sürecin etkinliğini azaltabilmektedir. Sonuç olarak, Metaverse tabanlı işe alım süreçleri, geleneksel yöntemlere kıyasla yenilikçi ve etkili bir yaklaşım sunmaktadır. Ancak, başarılı bir uygulama için şirketlerin altyapı yatırımları yapması, insan kaynakları ekiplerini dijital beceriler konusunda eğitmesi ve güvenlik politikalarını güçlendirmesi gerekmektedir. Bu çalışma, Metaverse'ün işe alım süreçlerine etkilerini nitel bir bakış açısıyla ele alarak gelecekteki araştırmalara katkı sağlamayı hedeflemektedir.

Anahtar Kelimeler: İnsan Kaynakları Yönetimi, Metaverse, Sanal Gerçeklik, İşe Alım

HUMAN RESOURCES IN THE METAVERSE: A QUALITATIVE STUDY ON RECRUITMENT THROUGH VIRTUAL REALITY

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Abstract

Digitalization and technological innovations are leading to profound changes in human resource (HR) management. The recently emerging concept of the Metaverse has created new opportunities by enabling the use of virtual reality (VR) and augmented reality (AR) technologies in recruitment processes. This study aims to explore the advantages, challenges, and impacts of Metaverse-based recruitment processes on human resources professionals through qualitative research methods.

Metaverse-based recruitment processes differ from traditional interview methods by being conducted in virtual offices through avatars. Candidates can interact within virtual work environments, showcasing their competencies related to the position practically, while being assessed multidimensionally by employers. Furthermore, artificial intelligence (AI)-supported evaluation systems analyze candidates' body language, speaking style, and problem-solving skills, providing more objective results.

In this research, document analysis was conducted to understand the experiences of companies using the Metaverse in their recruitment processes. The data, evaluated through descriptive analysis, reveal both the opportunities and limitations of Metaverse-based recruitment from the perspectives of both employers and candidates.

The findings of the study indicate that the integration of the Metaverse into recruitment processes offers numerous advantages. First, it eliminates geographical limitations, making it easier to access global talent. Additionally, it enhances the candidate experience by making the recruitment process more engaging and interactive. For instance, candidates can perform simulated tasks in virtual office environments, demonstrating their competencies directly, and employers can better observe this process.

However, there are several challenges associated with Metaverse-based recruitment processes. Infrastructure requirements, lack of technical knowledge, and cybersecurity risks have been identified as major barriers to the widespread adoption of this new system. Additionally, variations in candidates' digital literacy levels and difficulties in adapting to virtual interviews may reduce the effectiveness of the process.

In conclusion, Metaverse-based recruitment processes offer an innovative and effective approach compared to traditional methods. However, for successful implementation, companies need to invest in infrastructure, train HR teams in digital skills, and strengthen security policies. This study aims to contribute to future research by presenting a qualitative perspective on the impacts of the Metaverse on recruitment processes.

Keywords: Human Resources Management, Metaverse, Virtual Reality, Recruitment

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1- METAVERSE KAVRAMI ve KÜRESEL GELİŞİMİ

Metaverse kavramı, Yunanca "sonra, öte" anlamına gelen "meta" ile İngilizcedeki "universe" kelimesinin birleşiminden türemiştir. Türkçede "evrenötesi" olarak karşılık bulan bu terim, tüm dijital dünyaların birleşimiyle meydana gelen bir sanal paylaşım alanını tanımlamaktadır. Dijital unsurların bir araya gelmesiyle oluşan sınırsız bir evreni ifade eden bu yapı, gerçeklik teknolojileri aracılığıyla erişilebilir hale gelmektedir (Demirbağ, 2020: 100).

Gerçeklik teknolojileri iki ana kategoriye ayrılmaktadır: sanal gerçeklik ve artırılmış gerçeklik. Son yıllarda bilişim dünyasında dikkat çeken önemli yeniliklerden biri de Artırılmış Gerçeklik (Augmented Reality) teknolojisidir. Gelişen bu sistem, günlük yaşamda giderek daha fazla yer edinmeye başlamıştır. Artırılmış gerçeklik, fiziksel dünya ile bağlantısını sürdürerek, gerçek zamanlı görüntülere eklenen dijital unsurlarla, sanal ve gerçek nesnelerin aynı ortamda algılanmasını mümkün kılar. Öte yandan sanal gerçeklik, kullanıcının içinde bulunduğu dünyayla bağını tamamen kopardığı, genellikle üç boyutlu simülasyonlarla oluşturulan bir ortam olarak tanımlanabilir (İçten ve Bal, 2017: 111).

Metaverse, çeşitli yeni teknolojileri kendi yapısına dahil ederek oluşturulmuş bir internet uygulaması ve sosyal etkileşim platformu olarak öne çıkmaktadır. Artırılmış gerçeklik teknolojisiyle entegre edilmiş bu sistem, kullanıcılarına sürükleyici bir dijital evren sunmaktadır. Aynı zamanda blok zincir (blockchain) altyapısıyla çalışan ekonomik bir model geliştirilerek, sanal dünya ile fiziksel ekonomi arasında bir köprü kurulmakta ve bireylerin içerik oluşturup yönetmesine olanak tanınmaktadır (Ning vd, 2021:1).

Teknolojik gelişmeler doğrultusunda, insanlık tarihindeki iletişim biçimleri sürekli değişim göstermektedir. Zaman içinde farklı yeniliklerin ortaya çıkmasıyla, birçok yeni teknoloji ve internet tabanlı uygulama geliştirilmiştir. 17. yüzyılda telefon ve fax gibi araçların icadı, insanlar arasındaki iletişimi önemli bir noktaya taşırken, ticari anlamda da büyük bir dönüşüm yaşanmasına sebep olmuştur. 1999 yılında QQ adlı anlık mesajlaşma hizmetinin kullanıma sunulması, ardından 2004'te Facebook'un ortaya çıkışı ve 2011'de WeChat ile sesli ve yazılı mesajların yaygınlaşması, iletişim tarihinde dönüm noktaları olmuştur. 2019'da Kovid-19 pandemisinin küresel ölçekte etkisini göstermesi, insanları alternatif iletişim yöntemleri kullanmaya yönlendirmiştir. Bu süreçte, uzaktan bağlantı ve sanal etkileşim kavramları büyük önem kazanmıştır. 2021 yılına gelindiğinde ise metaverse kavramı iletişim alanında yeni bir çığır açarak, insanlara farklı bir deneyim sunmuştur.

Görsel 1. İletişim Metotlarının Gelişim Süreci

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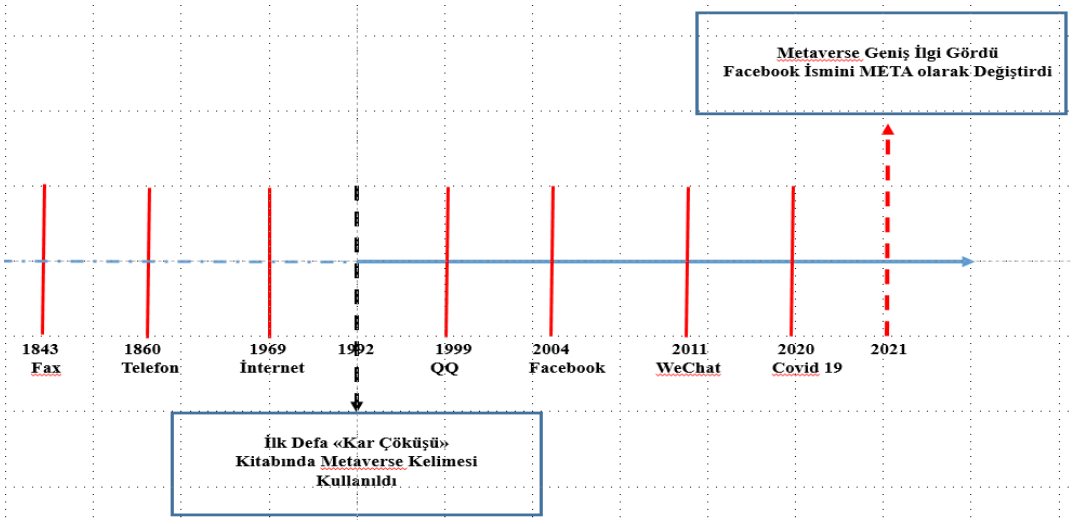

Kaynak: (Ning vd, 2021:1).

Şekil 1, iletişim teknolojilerinin tarihsel gelişimini ve metaverse kavramının ortaya çıkışını görselleştiren bir akış sunmaktadır. İlk olarak, 1843 yılında fax teknolojisinin icadıyla başlayan bu süreç, 1860 yılında telefonun geliştirilmesiyle iletişimin daha hızlı ve erişilebilir hale gelmesine katkı sağlamıştır. 1969 yılı, internetin ortaya çıkışıyla dijital çağın başlangıcı olarak kabul edilir. Bu gelişme, bilgiye erişimi kolaylaştırarak, dünya genelinde insanların birbirine bağlanmasını sağlamıştır. 1992 yılında Neal Stephenson'un *Snow Crash* adlı kitabında "metaverse" kelimesinin ilk kez kullanılması, bu kavramın gelecekte nasıl bir dönüşüm geçireceğinin sinyallerini vermiştir.

1999 yılında Çin merkezli anlık mesajlaşma platformu QQ'nun piyasaya sürülmesi, çevrimiçi iletişimde yeni bir dönemi başlatmıştır. 2004 yılında Facebook'un kurulması ise sosyal medya devrimini tetikleyerek, sanal iletişim biçimlerini daha da ileriye taşımıştır. 2011 yılında WeChat'in piyasaya sürülmesi, hem yazılı hem de sesli mesajlaşma imkânlarıyla kullanıcı deneyimini zenginleştirmiştir. 2020 yılında tüm dünyayı etkisi altına alan Kovid-19 pandemisi, uzaktan çalışma ve sanal iletişimin önemini artırmıştır. İnsanlar, fiziksel etkileşim yerine dijital platformlara yönelerek sosyalleşme ve çalışma biçimlerini değiştirmiştir. Bu dönemde, metaverse kavramına olan ilgi de artmıştır. Son olarak, 2021 yılında Facebook'un ismini "Meta" olarak değiştirmesi, metaverse evrenine olan ilgiyi daha da artırmıştır. Bu değişim, gelecekte sanal dünyaların ve dijital ekonominin daha büyük bir yer edineceğine işaret etmektedir.

Metaverse kavramına yönelik farklı ülkeler ve uluslararası kuruluşlar değişik politikalar benimsemektedir. Devletlerin ve örgütlerin bu konuya yaklaşımlarında siyasi, ekonomik ve ulusal çıkarlar etkili olmaktadır. Metaverse'in temel yapı taşlarından biri olan blok zincir tabanlı dijital ekonomi, ülkelerin teknolojiye bakış açısını doğrudan şekillendirmektedir. Yapay zeka, etkileşimli sistemler ve bulut bilişim gibi yenilikçi teknolojiler, metaverse'in gelişiminde büyük rol oynamaktadır. Ancak, dünya çapında bu alanlara ilişkin ortak bir strateji henüz oluşturulmuş değildir.

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Amerika Birleşik Devletleri: Ülkede sağlık sektöründe blok zincir teknolojisinin kullanımına yönelik çalışmalar yürütülmektedir. Dönemin hükümeti, blok zincir sistemine dair kamu sektöründe değerlendirmeler yapılması gerektiğini vurgulamış, ardından Blockchain Karar Komitesi oluşturulmuştur. Menkul Kıymetler ve Borsa Komisyonu, dijital varlıkların menkul kıymet statüsüne sahip olduğunu, ancak mevcut yasal çerçevede para birimi olarak değerlendirilmediğini açıklamıştır.

Çin: 2016 yılında düzenlenen ulusal planlamada, blok zincir teknolojisi stratejik bir alan olarak ele alınmıştır. Sanayi ve Bilgi Teknolojileri Bakanlığı, ilgili teknolojilerin uygulanmasına yönelik belgeler yayımlamış, 2021'de ise sektörde gelişimi hızlandırmak amacıyla yeni düzenlemeler duyurmuştur. 2023 yılına kadar ülke genelinde nüfusun büyük kısmının 5G altyapısından faydalanacağı açıklanmıştır.

Güney Kore: Metaverse alanında küresel lider olmayı hedefleyen hükümet, ilgili teknolojilere yatırım yapacak şirketlere destek vermektedir. Teknik standartları belirleme konusunda çalışmalar yürüten ülke, eğitim sistemine sanal gerçeklik ve yapay zeka temelli dersleri ekleyerek, geleceğe yönelik bir adım atmıştır.

Birleşik Arap Emirlikleri: 2016 yılında Dubai'de küresel blok zincir komitesi kurulmuş, 2021'de düzenlenen Blockchain Zirvesi'nde metaverse ekonomisine geçiş konusunda iş birlikleri ele alınmıştır. 2023-2026 yılları arasında finans sektörünü dijital hale getirmeyi hedefleyen ülke, Körfez bölgesinde 5G altyapısını genişletme planlarını açıklamıştır.

Bunların yanı sıra, **Uluslararası Telekomünikasyon Birliği (ITU)**, blok zincir ve 5G teknolojileri üzerine küresel çalışmalar yürütmektedir. **Elektrik ve Elektronik Mühendisleri Enstitüsü (IEEE)**, dijital varlık ticaretine yönelik komite kurulmasını desteklemiş, 2021'de en önemli teknolojik gelişmelerin nesnelerin interneti ve 5G olduğunu raporlamıştır. **World Wide Web (WWW)** organizasyonu ise blok zincir tabanlı bir internet altyapısının gerekliliğine dikkat çekmiştir.

Günümüzde rekabetin yoğun olduğu piyasalarda, birçok şirket metaverse evrenine büyük yatırımlar yapmaktadır. Kullanıcıların sosyalleşebileceği, ticaret yapabileceği ve farklı deneyimler yaşayabileceği sanal ortamlar, gerçek dünyadaki alışkanlıkları yeni bir boyuta taşımaktadır. Giyim, barınma ve seyahat gibi temel ihtiyaçların dijital ortamda karşılanabileceği bu ekosistemde, büyük ölçekli firmalar stratejik yatırımlarla yer almaktadır.

2- İNSAN KAYNAKLARI YÖNETİMİNDE METAVERSE

Teknolojinin hızla gelişmesi, iş dünyasında pek çok yeniliği beraberinde getirmiştir. Bu yeniliklerden biri de, sanal dünyaların birleşiminden oluşan metaverse kavramıdır. Metaverse, fiziksel ve dijital dünyaların birleştiği bir ortamda kullanıcıların etkileşimde bulunduğu sanal bir evren olarak tanımlanabilir. Son yıllarda, özellikle pandemi sonrası dijitalleşmenin hız kazanmasıyla birlikte, metaverse uygulamaları daha fazla ilgi görmeye başlamıştır. Bu değişim, insan kaynakları (İK) yönetimi alanında da yeni fırsatlar ve zorluklar yaratmaktadır. İnsan kaynakları yönetiminin metaverse ile entegrasyonu, çalışan deneyiminden işe alım süreçlerine kadar geniş bir yelpazede etkiler yaratmaktadır.

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Metaverse, insan kaynakları yönetimini birçok açıdan dönüştürebilir. Öncelikle, sanal iş görüşmeleri ve işe alım süreçleri bu yeni dünyada hızla yayılmaktadır. İşe alım süreçlerinde, metaverse platformları kullanılarak adaylarla sanal ortamlarda görüşmeler yapılabilir, bu sayede coğrafi engeller aşılabilir ve adaylar daha geniş bir kitleye ulaşabilir. Özellikle küresel şirketler için, metaverse iş görüşmeleri iş gücüne erişim konusunda büyük bir avantaj sağlamaktadır. Ayrıca, sanal gerçeklik (VR) ve artırılmış gerçeklik (AR) teknolojilerinin kullanımı ile adayların yetkinlikleri daha etkin bir şekilde değerlendirilebilir. Bu, işe alımda daha objektif ve kapsamlı bir değerlendirme süreci yaratabilir (Smith, 2023: 45-59).

Bunun dışında, metaverse platformları iş yerindeki eğitim süreçlerinde de devrim yaratabilir. Çalışanların sanal gerçeklik ile eğitilmesi, onları gerçek iş ortamlarına daha yakın bir deneyimle hazırlayabilir. Örneğin, sanal ortamda yapılan simülasyonlar sayesinde çalışanlar, gerçek hayatta karşılaşabilecekleri durumları güvenli bir ortamda deneyimleyebilirler. Bu, özellikle tecrübe gerektiren alanlarda büyük bir fayda sağlayabilir. Ayrıca, metaverse ortamında yapılan eğitimler, çalışanlar için daha etkileşimli ve eğlenceli hale gelebilir, bu da öğrenmeyi daha etkili kılabilir (Roberts ve Wang, 2022: 101-115).

İnsan kaynakları yönetimi aynı zamanda çalışan bağlılığını artırma konusunda da metaverse'ten faydalanabilir. Fiziksel ofislerin kapanması ve uzaktan çalışma modelinin yaygınlaşması ile birlikte, çalışanlar arasındaki sosyal etkileşimler azalmıştır. Metaverse, çalışanların sanal ortamda birbirleriyle etkileşime girmelerini sağlayarak, sosyal bağlantıları güçlendirebilir. Sanal ofislerde bir araya gelen çalışanlar, iş dışı etkinlikler düzenleyebilir, sanal kahve molaları yapabilir veya sosyal etkinliklere katılabilirler. Bu tür etkinlikler, çalışanlar arasındaki aidiyet duygusunu güçlendirebilir ve organizasyon kültürünü pekiştirebilir (Jones ve Carter, 2021: 121-135).

Metaverse ayrıca, çalışanların psikolojik sağlıklarını desteklemek için de kullanılabilir. Sanal terapi seansları, meditasyon odaları ve stres yönetimi programları gibi uygulamalar, çalışanların ruhsal sağlıklarını iyileştirmek için metaverse ortamında sunulabilir. Çalışanların iş ve özel yaşam dengesini sağlamalarına yardımcı olabilecek çeşitli uygulamalar da, metaverse ile mümkün hale gelebilir. Böylece, çalışanlar hem profesyonel hem de kişisel gelişimlerini destekleyici bir ortamda bulunabilirler. Bu, çalışanların motivasyonlarını artırabilir ve organizasyonlarına olan bağlılıklarını güçlendirebilir (Lee ve Kim, 2023: 22-39).

Bir diğer önemli alan ise, metaverse'in insan kaynakları departmanlarında veri yönetimi ve analizine katkı sağlamasıdır. İnsan kaynakları departmanları, çalışanlar hakkında büyük veriler toplar ve analiz eder. Bu veriler, çalışanların performansını, iş tatminini, motivasyon düzeylerini ve diğer birçok faktörü içerir. Metaverse, bu verilerin daha etkin bir şekilde toplanmasını ve analiz edilmesini mümkün kılabilir. Sanal ortamda çalışanlar hakkında daha fazla veri toplamak ve bu verilerle daha doğru analizler yapmak mümkün olabilir. Bu da, daha hedeflenmiş ve kişiselleştirilmiş insan kaynakları stratejilerinin oluşturulmasını sağlayabilir (Thompson, 2024: 67-82).

Ancak, metaverse'in insan kaynakları yönetimine entegrasyonunun bazı zorlukları da vardır. Öncelikle, metaverse uygulamalarının yaygınlaşması, şirketlerin teknolojik altyapılarını

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güncellemelerini gerektirebilir. Bu, özellikle küçük ve orta ölçekli işletmeler için büyük bir yatırım anlamına gelebilir. Ayrıca, metaverse platformlarının etik ve güvenlik sorunları da göz önünde bulundurulmalıdır. Çalışanların kişisel bilgileri, sanal dünyada da korunmalıdır. Sanal ortamda yapılan etkileşimlerin etik sınırları, şirketlerin dikkatle ele alması gereken bir diğer konudur. Metaverse'in iş dünyasında daha fazla yer almasıyla birlikte, bu yeni ortamın düzenlenmesi ve denetlenmesi de önem kazanacaktır (Roberts ve Wang, 2022: 101-115).

Metaverse'in insan kaynakları yönetimi üzerinde önemli bir etkisi bulunmaktadır. Metaverse, işe alım, eğitim, çalışan bağlılığı ve veri analizi gibi birçok alanda yenilikçi fırsatlar sunmaktadır. Ancak, bu fırsatların etkili bir şekilde kullanılabilmesi için, şirketlerin teknolojik altyapılarını güçlendirmeleri ve etik sorunlara dikkat etmeleri gerekmektedir. İnsan kaynakları yönetimi, metaverse'i doğru bir şekilde entegre ederek, hem çalışanlar hem de organizasyonlar için değer yaratabilir. Bu yeni dijital dünyaya uyum sağlamak, gelecekte iş dünyasının daha verimli, daha etkileşimli ve daha insana odaklı bir hale gelmesini sağlayabilir.

3- SANAL GERÇEKLİK İLE İŞE ALIM

İşe alım süreçleri, organizasyonlar için kritik öneme sahiptir ve son yıllarda bu süreçler, teknolojinin gelişimi ile önemli bir dönüşüm yaşamıştır. Sanal gerçeklik (VR), artırılmış gerçeklik (AR) ve diğer dijital araçlar, işe alım süreçlerini daha etkileşimli, verimli ve geniş çaplı hale getirebilmektedir. Sanal gerçeklik, adayların yetkinliklerini değerlendirmek, onları daha iyi tanımak ve şirketlere daha etkili işe alım kararları almak konusunda önemli fırsatlar sunmaktadır. Özellikle sanal gerçeklik teknolojisinin iş dünyasına entegrasyonu, işe alım süreçlerinin daha objektif, erişilebilir ve etkili hale gelmesini sağlamaktadır.

Sanal gerçeklik teknolojisinin işe alım süreçlerinde kullanılmasının en belirgin faydalarından biri, adaylara gerçekçi bir iş simülasyonu sunabilmesidir. Geleneksel mülakatlar genellikle teorik ve sınırlı bir etkileşim sunar, ancak sanal gerçeklik, adaylara gerçek bir iş ortamında ne tür durumlarla karşılaşacaklarını deneyimleme fırsatı verir. Örneğin, bir yazılım geliştiricisinin işe alım sürecinde, sanal gerçeklik ortamında bir yazılım geliştirme süreci simüle edilebilir. Aday, sanal ortamda çeşitli yazılım problemleriyle karşılaşabilir ve bu durumlar üzerinden becerileri değerlendirilir. Bu tür uygulamalar, adayların iş deneyimlerini ve becerilerini daha doğru bir şekilde ortaya koymalarını sağlayabilir (Bain ve Lucas, 2023: 78-92).

Ayrıca, sanal gerçeklik, coğrafi engelleri aşarak global alanda işe alım süreçlerinin daha geniş bir kitleye ulaşmasını sağlar. Geleneksel işe alım süreçlerinde, coğrafi konumlar ve seyahat maliyetleri önemli engeller yaratabilir. Ancak sanal gerçeklik platformları sayesinde, dünyanın dört bir yanındaki adaylar sanal ortamda mülakata katılabilir ve şirketler, yerel olmayan yeteneklere kolayca erişim sağlayabilir. Bu, özellikle çok uluslu şirketler ve küresel iş gücüne sahip organizasyonlar için büyük bir avantaj sunar. Ayrıca, bu süreçlerin daha az zaman alması ve maliyetli seyahatlerden kaçınılması, şirketlere önemli bir maliyet tasarrufu sağlar (Harrison ve Keller, 2022: 115-130).

Sanal gerçeklik teknolojisinin işe alım süreçlerinde sunduğu bir diğer önemli fayda, objektif ve tarafsız bir değerlendirme ortamı yaratabilmesidir. Geleneksel mülakatlar, bazen işe

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alım kararlarını etkileyebilecek bilinçli veya bilinçsiz önyargılara neden olabilir. Ancak sanal gerçeklik, adayların sadece becerilerini ve performanslarını ölçmeye odaklanarak, daha objektif bir değerlendirme sağlar. Adayların davranışları ve becerileri, sanal simülasyonlarda gösterdikleri performansa dayalı olarak değerlendirilir. Bu, özellikle çeşitliliği artırmaya çalışan şirketler için önemli bir avantaj sağlar, çünkü önyargılar ve kişisel izlenimler yerine sadece yetenekler ön planda tutulur (Davis ve Thomas, 2023: 56-70).

Sanal gerçeklik, aynı zamanda işe alım süreçlerini daha etkileşimli hale getirerek adayların deneyimini iyileştirir. Geleneksel mülakatlar genellikle stresli bir deneyim olabilir ve adayların gerçek potansiyellerini sergileyememelerine yol açabilir. Ancak sanal gerçeklik, adaylara daha rahat bir ortamda, gerçek iş görevlerini simüle ederek, performanslarını sergileme fırsatı verir. Ayrıca, bu etkileşimli ortamlar, adayların şirketin kültürü hakkında daha fazla bilgi edinmelerini sağlar. Örneğin, bir aday sanal gerçeklik aracılığıyla şirketin çalışma ortamını keşfedebilir, çalışanlarla etkileşime geçebilir ve şirketin değerlerini daha iyi anlayabilir. Bu tür etkileşimler, adayların organizasyona uygunluklarını daha doğru bir şekilde değerlendirmenin yanı sıra, adayların da şirket hakkında daha derin bir bilgi sahibi olmalarını sağlar (Brown ve Green, 2022: 102-118).

Bir diğer önemli kullanım alanı, sanal gerçeklik ile aday eğitimi ve oryantasyon süreçlerinin iyileştirilmesidir. İşe alım sürecinin yalnızca adayları değerlendirmekle kalmayıp, aynı zamanda onları işe alım sonrası oryantasyona hazırlamak için de kullanılabilir. Adaylar, sanal gerçeklik simülasyonları aracılığıyla işe başlamadan önce, şirket içindeki rolü hakkında bilgi edinebilir ve iş ortamına sanal olarak adapte olabilir. Bu, yeni çalışanların daha hızlı uyum sağlamalarını ve daha verimli bir şekilde işlerine başlamalarını sağlar (Martin ve Reed, 2023: 91-104).

Ancak, sanal gerçeklik ile işe alım süreçlerinin uygulanması, bazı zorluklar da doğurabilir. İlk olarak, bu teknolojinin yüksek maliyetleri, küçük ve orta ölçekli işletmeler için bir engel olabilir. Ayrıca, sanal gerçeklik deneyimlerinin tasarımı ve uygulanması teknik bilgi ve altyapı gerektirir. Bu durum, organizasyonların teknolojiye yatırım yapmalarını ve çalışanlarını bu yeni sistemlere adapte etmelerini zorlaştırabilir. Ek olarak, sanal ortamda yapılan değerlendirmelerin güvenilirliği de bazı endişelere yol açabilir. Gerçek bir iş ortamındaki etkileşimlerin tamamen sanal ortamda yeniden yaratılması zordur ve bu nedenle, sanal gerçeklik değerlendirmelerinin sınırlamaları ve potansiyel hataları göz önünde bulundurulmalıdır (Bain ve Lucas, 2023: 78-92).

Sanal gerçeklik teknolojisinin işe alım süreçlerine entegrasyonu, organizasyonlar için birçok avantaj sunmaktadır. Bu teknoloji, daha geniş bir aday havuzuna ulaşılmasını, adayların yetkinliklerinin daha doğru bir şekilde değerlendirilmesini ve işe alım süreçlerinin daha objektif ve etkili hale gelmesini sağlamaktadır. Ancak, bu süreçlerin başarıyla uygulanabilmesi için, şirketlerin gerekli teknolojik altyapıya sahip olmaları ve sanal gerçeklik platformlarını etkin bir şekilde kullanabilecek uzmanlara sahip olmaları gerekmektedir. Sanal gerçeklik ile işe alım, gelecekte organizasyonların işe alım süreçlerini dönüştürmeye devam edecek ve daha verimli hale getirecektir.

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SONUÇ

Sanal gerçeklik teknolojisinin işe alım süreçlerine entegrasyonu, organizasyonlar açısından önemli avantajlar sunmakta ve işe alım süreçlerini daha nesnel, erişilebilir ve etkileşimli hale getirmektedir. Geleneksel işe alım yöntemlerine kıyasla daha gerçekçi iş simülasyonları sunabilmesi, adayların yetkinliklerini daha doğru bir şekilde değerlendirme imkânı tanımakta ve işe alım kararlarının daha isabetli olmasını sağlamaktadır. Bununla birlikte, coğrafi kısıtlamaları ortadan kaldırarak küresel iş gücüne erişimi kolaylaştırması, işe alım süreçlerinin maliyet ve zaman açısından daha verimli yönetilmesine katkıda bulunmaktadır.

Özellikle bilinçli veya bilinçsiz önyargıları minimize etmesi, işe alım süreçlerinin daha adil ve objektif bir şekilde yürütülmesine olanak tanımakta ve çeşitlilik politikalarını benimseyen organizasyonlar için stratejik bir avantaj sunmaktadır. Ayrıca, sanal gerçeklik teknolojisi, aday deneyimini iyileştirmekte ve işe alım sürecinin yalnızca değerlendirme aşamasıyla sınırlı kalmayıp oryantasyon süreçlerini de desteklemesine olanak tanımaktadır.

Bununla birlikte, sanal gerçeklik tabanlı işe alım süreçlerinin uygulanabilirliği, yüksek maliyetler, teknik altyapı gereksinimleri ve simülasyonların güvenilirliği gibi bazı zorluklarla karşı karşıya kalmaktadır. Bu nedenle, organizasyonların sanal gerçeklik teknolojisini etkili bir şekilde entegre edebilmesi için gerekli yatırımları yapması, teknik uzmanlık geliştirmesi ve sistemlerin doğruluğunu artıracak mekanizmalar oluşturması gerekmektedir.

Sonuç olarak, sanal gerçeklik destekli işe alım süreçleri, organizasyonlara stratejik bir rekabet avantajı sunma potansiyeline sahiptir. Ancak bu teknolojinin etkin bir şekilde uygulanabilmesi, organizasyonların dijital dönüşüme uyum sağlamasına ve işe alım stratejilerini teknoloji odaklı bir yaklaşımla yeniden yapılandırmasına bağlıdır. Gelecekte sanal gerçeklik uygulamalarının yaygınlaşması ile birlikte, işe alım süreçlerinde daha inovatif ve veri odaklı değerlendirme yöntemlerinin geliştirilmesi kaçınılmaz olacaktır.

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ULTRA DÜŞÜK GÜÇLÜ IOT CİHAZLAR İÇİN GERÇEK ZAMANLI İŞLETİM SİSTEMİ TASARIMI VE GELİŞTİRİLMESİ

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ÖZET

Gömülü sistemler, özellikle Nesnelerin İnterneti (IoT), akıllı sayaçlar ve endüstriyel otomasyon gibi alanlarda düşük güç tüketimi ve gerçek zamanlı işlem gereksinimleri nedeniyle optimize edilmiş çözümler gerektirir. Geleneksel Gerçek Zamanlı İşletim Sistemleri (RTOS), karmaşık çekirdek yapıları ve görev planlama sırasında gereksiz işlem yükü oluşturan mekanizmalar nedeniyle enerji tüketimini artırabilmektedir. Bu çalışmada, çekirdek işlem yükünü azaltarak ve görev zamanlamasını optimize ederek ultra düşük güç tüketimli bir RTOS tasarlanmıştır.

Önerilen RTOS, öncelik tabanlı görev zamanlaması ve dinamik güç yönetimi teknikleri kullanarak işlem gücü ve enerji tüketimi arasında optimum dengeyi sağlamaktadır. Geleneksel RTOS'larda işlemci belirli zaman aralıklarında düzenli olarak uyanırken, geliştirilen sistem, tickless idle mekanizması ile gereksiz zamanlayıcı kesmelerini ortadan kaldırarak işlemcinin uzun süreli uyku modlarında kalmasına olanak tanımaktadır. Ayrıca, düşük güçlü zamanlayıcılar ile görevler arasında kesintisiz zaman senkronizasyonu sağlanmış ve çekirdek seviyesinde bağlam değişimleri en aza indirilmiştir.

Yapılan değerlendirmeler, önerilen RTOS'un enerji tüketimini yaklaşık %30 azalttığını, görev planlama verimliliğini yaklaşık %25 artırdığını ortaya koymaktadır. Modüler yapısı sayesinde farklı işlemci mimarilerine kolayca adapte edilebilir bir sistem olarak tasarlanan bu RTOS, düşük güç tüketimi gerektiren IoT cihazları için önemli bir alternatif oluşturmaktadır.

Anahtar Kelimeler: Gerçek Zamanlı İşletim Sistemi, RTOS, Düşük Güç, Gömülü Sistemler, Tickless Idle, Dinamik Güç Yönetimi.

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1. GİRİŞ

Nesnelerin İnterneti (IoT) genellikle enerji kısıtlı cihazlarda yaygın olarak kullanılmaktadır. Bu tür sistemlerde düşük güç tüketimi ve gerçek zamanlı işlem gereksinimleri, kullanılan işletim sistemlerinin optimize edilmiş ve verimli olmasını zorunlu kılmaktadır [1]. Geleneksel Gerçek Zamanlı İşletim Sistemleri (RTOS), çok sayıda çekirdek işlemi ve zamanlayıcı kesmeleri nedeniyle enerji tüketimini artırabilmektedir [2]. Bu durum, IoT cihazlarının uzun pil ömrüne sahip olmasını zorlaştırmakta ve sistemlerin sürdürülebilirliğini olumsuz etkilemektedir.

Bu çalışmada, çekirdek işlem yükünü azaltarak ve görev zamanlamasını optimize ederek ultra düşük güç tüketimli bir RTOS tasarlanmıştır. Geleneksel RTOS'larda işlemcinin belirli aralıklarla düzenli olarak uyanması gerekirken, geliştirilen sistemde tickless idle mekanizması kullanılarak gereksiz zamanlayıcı kesmeleri ortadan kaldırılmış ve işlemcinin uzun süreli uyku modlarında kalması sağlanmıştır. Bunun yanı sıra, düşük güçlü zamanlayıcılar kullanılarak görevler arasında kesintisiz zaman senkronizasyonu sağlanmış ve çekirdek seviyesinde bağlam değişimleri en aza indirilmiştir.

2. ULTRA DÜŞÜK GÜÇLÜ RTOS TASARIMI VE UYGULAMASI

Gerçek zamanlı işletim sistemleri (RTOS), gömülü sistemlerde görevlerin belirli zaman kısıtlarına uygun şekilde yürütülmesini sağlayan temel yazılım bileşenleridir. Ancak, özellikle ultra düşük güç tüketimi gerektiren IoT cihazları, akıllı sayaçlar ve endüstriyel otomasyon sistemleri gibi uygulamalarda, geleneksel RTOS çözümleri çeşitli sınırlamalara sahiptir. Geleneksel RTOS'lar, sürekli çalışan sistem saatine (tick-based scheduler) ve periyodik kesmelere dayalı olarak işlemciyi düzenli aralıklarla uyandırarak görev planlaması yapar. Bu durum, düşük güç tüketimi gerektiren uygulamalarda gereksiz enerji kaybına yol açmakta ve cihazların batarya ömrünü kısaltmaktadır [3].

Bu çalışmada geliştirilen ultra düşük güç tüketimli RTOS, özellikle işlemcinin mümkün olan en uzun süre düşük güç modlarında kalmasını sağlamak, çekirdek işlemlerini optimize etmek ve zamanlayıcı yönetimini daha verimli hale getirmek amacıyla tasarlanmıştır. Bu kapsamda, geleneksel RTOS'larda sıkça kullanılan karmaşık zamanlama algoritmaları ve çok katmanlı işlem süreçleri ortadan kaldırılmış, daha minimalist bir yapı benimsenmiştir. Tickless idle mekanizması, düşük güçlü zamanlayıcılar ve kesme bazlı olay yönetimi gibi çeşitli optimizasyon teknikleri kullanılarak sistem saatine olan bağımlılık en aza indirilmiştir [4].

Bununla birlikte, bellek yönetimi ve bağlam değiştirme süreleri gibi RTOS performansını doğrudan etkileyen faktörler de iyileştirilmiştir. Geleneksel RTOS'larda bellek tahsisi sırasında fazla güç tüketimi ve işlem süresi kaybı yaşanırken, geliştirilen sistemde dinamik bellek tahsisi ortadan kaldırılmış ve hafıza kullanımını azaltan yöntemler uygulanmıştır. Bağlam değiştirme

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sürecindeki optimizasyonlar sayesinde görev geçişleri sırasında oluşan zaman kaybı düşürülmüş, böylece işlemcinin gereksiz yere aktif kalmasının önüne geçilmiştir.

Bu bölümde, geliştirilen RTOS'un donanım seçimi, genel mimarisi, görev yönetimi, güç tüketimi optimizasyonları ve haberleşme sürecinde enerji yönetimi gibi konular detaylı bir şekilde ele alınacaktır. Yapılan çalışmaların temel amacı, geleneksel RTOS çözümlerine kıyasla daha düşük güç tüketimi sağlayarak IoT cihazlarının batarya ömrünü uzatmak ve enerji verimliliğini artırmak olmuştur.

2.1. Donanım Seçimi ve Sistem Yapılandırması

Gömülü sistemlerde düşük güç tüketimi, bellek kullanımı ve haberleşme gereksinimleri donanım seçimi sürecini doğrudan etkiler. Bu çalışmada geliştirilen ultra düşük güçlü RTOS, ARM Cortex-M0+ tabanlı mikrodenetleyici üzerinde çalışacak şekilde tasarlanmıştır. İşlemcinin 256 KB Flash (ROM) ve 32 KB RAM kapasitesine sahip olması, sistemin hafif ve optimize edilmiş bir RTOS ile çalışmasını zorunlu hale getirmiştir. Bellek ve işlem yükü açısından yüksek verimlilik sunan Cortex-M0+ mimarisi, Thumb-2 komut seti ve dinamik saat frekansı değiştirme yeteneği gibi özellikler sunarak düşük enerji tüketimi gerektiren sistemler için uygun bir ortam sağlamaktadır.

Mikrodenetleyicinin enerji tüketiminin optimize edilmesi için güç yönetimi stratejileri uygulanmış, bu kapsamda supercap (süper kapasitör) destekli bir enerji yönetim altyapısı kullanılmıştır. Akıllı sayaç uygulamalarında uzun ömürlü pil gereksinimi olduğu için süper kapasitörler, ani güç kayıplarına karşı kısa süreli enerji desteği sağlamak amacıyla entegrasyon sürecine dahil edilmiştir. İşlemci, yalnızca belirli zaman aralıklarında veya kesme tabanlı olaylarla aktif hale gelecek şekilde programlanarak gereksiz güç tüketimi önlenmiştir.

3. ÖNERİLEN ULTRA DÜŞÜK GÜÇLÜ RTOS TASARIMI

Nesnelerin interneti cihazlarında düşük güç tüketimi, sistemin genel verimliliğini ve batarya ömrünü doğrudan etkileyen kritik bir faktördür. Halihazırda kullanılan RTOS çözümleri, sürekli çalışan zamanlayıcı kesmeleri, uzun süren bağlam değişimleri ve fazla çekirdek işlemleri nedeniyle fazla seviyede enerji tüketimine neden olmaktadır. Bundan dolayı ultra düşük güç tüketimine sahip bir RTOS geliştirmek için çekirdek işlem yükünün azaltılması, zamanlama mekanizmalarının optimize edilmesi ve güç yönetimi tekniklerinin uygulanması gerekmektedir [5].

Bu bölümde, önerilen gerçek zamanlı işletim sisteminin mimari tasarım ilkeleri, güç tüketimini azaltmaya yönelik stratejileri ve zamanlama optimizasyonları detaylı olarak ele alınmaktadır.

3.1. Mimari Tasarım İlkeleri

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Önerilen ultra düşük güç tüketimli RTOS, hafif, modüler ve optimize edilmiş bir mimari üzerine kurulmuştur. Geleneksel RTOS çözümlerinde çekirdek mekanizmaları gereksiz işlem yükü oluştururken, bu çalışmada daha minimalist bir yapı benimsenerek işlemcinin düşük güç tüketimiyle çalışması sağlanmıştır.

Önerilen RTOS'ta, çekirdek işlem yükünün azaltılması, modüler yapı kullanılarak gereksiz bileşenlerin devre dışı bırakılmasıyla sağlanmıştır. Sistem, Cortex-M0+ gibi ultra düşük güç tüketimli mikrodenetleyicilere uyarlanabilir şekilde tasarlanmış, işlemcinin yalnızca belirli olaylar meydana geldiğinde aktif olmasını sağlayarak gereksiz enerji tüketimi engellenmiştir. Bunun yanı sıra, RTOS'un güç yönetimi stratejileri geliştirilmiş, düşük güç modları ve enerji verimli zamanlama teknikleri kullanılarak batarya ömrü uzatılmıştır.

3.2. Çekirdek İşlem Yükünü Azaltma Stratejileri

Geleneksel RTOS çözümlerinde çekirdek işlemleri zaman içinde sistemin daha fazla enerji tüketmesine yol açabilmektedir. İşlemci, zamanlayıcı kesmeleri, görev zamanlama mekanizmaları ve bağlam değişimleri nedeniyle gereksiz yere aktif kalarak fazla güç tüketmektedir.

Önerilen RTOS'ta, çekirdek işlem yükünü azaltmak için optimize edilmiş görev yönetimi ve verimli kesme yönetimi kullanılmıştır. Öncelik tabanlı görev planlaması sayesinde, işlemcinin yalnızca gerektiğinde aktif hale gelmesi sağlanmıştır. Bunun yanı sıra, gereksiz kernel çağrıları ortadan kaldırılmış ve statik bellek tahsisi kullanılarak dinamik hafıza yönetiminde oluşabilecek ek işlem yükü azaltılmıştır. Geleneksel RTOS'larda sürekli çalışan zamanlayıcı kesmeleri yerine, olay tabanlı zamanlama uygulanarak işlemcinin uyku modunda daha uzun süre kalması sağlanmıştır.

3.3. Tickless Idle Mekanizması ile Güç Tüketiminin Optimize Edilmesi

Önerilen RTOS, tickless idle mekanizmasını kullanarak işlemcinin yalnızca gerekli olduğunda aktif hale gelmesini sağlar. Bu mekanizma sayesinde, zamanlayıcı kesmeleri azaltılarak batarya ömrü uzatılmış, işlemcinin uykuda kaldığı süre artırılmıştır. Standart RTOS'larda her görev değişiminde sistem saatinin güncellenmesi gerekirken, önerilen RTOS'ta yalnızca önemli görev değişikliklerinde zamanlayıcı güncellenmektedir. Bunun yanı sıra, özel LPTIMER (Low Power Timer) donanım bileşenleri ile senkronize edilerek güç tüketimi optimize edilmiştir

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Görsel 1. Tickless Idle Modu Akış Diyagramı

3.4. Bağlam Değiştirme Sürelerinin İyileştirilmesi

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Bağlam değiştirme süresi, bir görevden diğerine geçerken işlemcinin kaydetmesi ve geri yüklemesi gereken veriler nedeniyle belirli bir gecikmeye yol açmaktadır. Geleneksel RTOS çözümlerinde, bağlam değişim süresi yüksek olduğunda sistem verimi düşmekte ve işlemci gereksiz güç tüketmektedir.

Önerilen RTOS'ta, gereksiz bellek kopyalama işlemleri azaltılarak bağlam değiştirme süresi optimize edilmiştir. Bağlam değişimi sırasında yalnızca gerekli verilerin yedeklenmesi sağlanarak, işlemcinin yükü hafifletilmiştir. Yüksek öncelikli görevlerin bağlam değişim süresinin optimize edilmesiyle, kritik görevlerin kesintisiz çalışması sağlanmış ve düşük gecikme süresi elde edilmiştir. Cortex-M0+ gibi düşük güç tüketimli işlemciler için geliştirilen özel algoritmalar sayesinde, daha hızlı ve verimli görev geçişleri mümkün hale gelmiştir.

4. GERÇEKLEŞTİRİLEN PERFORMANS TESTLERİ VE KARŞILAŞTIRMALAR

Önerilen ultra düşük güç tüketimli RTOS'un performansını değerlendirmek amacıyla çeşitli testler gerçekleştirilmiştir. Bu testler, güç tüketimi, işlemci kullanımı, bağlam değiştirme süresi ve görev zamanlama performansını ölçmeye yöneliktir. Geleneksel RTOS çözümleri, yüksek işlem yükü, gereksiz bağlam değişimleri ve sürekli çalışan zamanlayıcı kesmeleri nedeniyle sistemin daha fazla güç tüketmesine neden olmaktadır.

Bu çalışmada geliştirilen RTOS, bu olumsuzlukları en aza indirerek daha verimli bir çalışma ortamı sunmayı hedeflemiştir. Bu bölümde, yapılan performans testleri, kullanılan test ortamı ve geliştirilen RTOS'un geleneksel RTOS çözümleri ile kıyaslanması ele alınacaktır.

4.1. Test Ortamı ve Kullanılan Donanım

Gerçekleştirilen testlerde ARM Cortex-M0+ tabanlı ultra düşük güç tüketimli bir mikrodenetleyici kullanılmıştır. Test sistemi, NB-IoT haberleşme modülü ile entegre edilmiş akıllı sayaç uygulaması üzerinde çalıştırılmıştır.

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Görsel 2. Testlerin Yapıldığı Akıllı Sayaç

4.2. Güç Tüketimi Testleri

Geliştirilen RTOS'un standby akımı, aktif mod akımı ve görev yürütme sırasında tüketilen enerji miktarı ölçülmüştür. Geleneksel RTOS çözümleriyle karşılaştırıldığında, önerilen RTOS'un daha düşük enerji tükettiği ve işlemcinin daha uzun süre düşük güç modunda kalmasını sağladığı gözlemlenmiştir.

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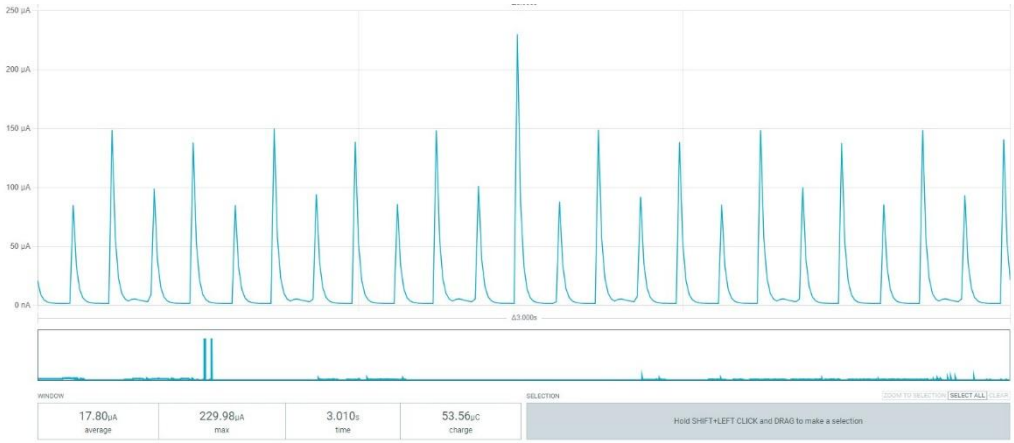
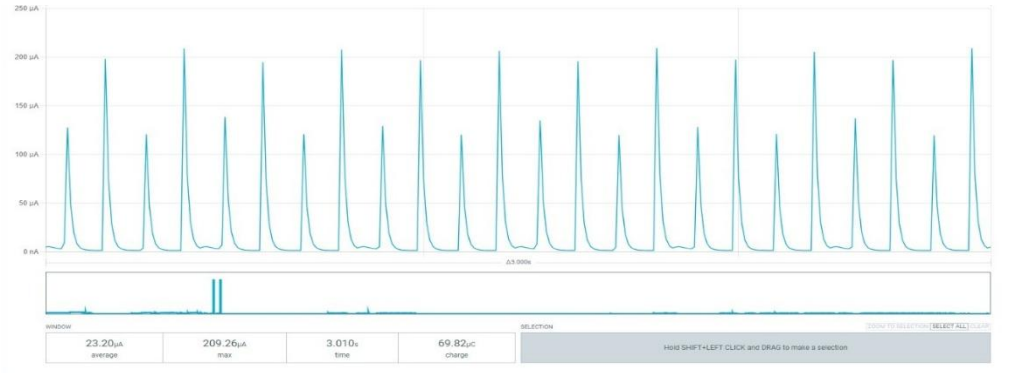


Görsel 3. Önerilen RTOS Standby Akım Grafiği



Görsel 4. Geleneksel RTOS Standby Akım Grafiği

Görsel 3 ve Görsel 4 karşılaştırıldığında önerilen RTOS, standby modunda %30 daha az güç tüketmektedir ve ayrıca aktif modda yaklaşık %40 daha az enerji harcamaktadır. Bu da cihazın batarya ömrünün önemli ölçüde uzamasını sağlamaktadır.

Çizelge 1. Modlara Göre Akım Değerleri

Mod Türü	**Geleneksel RTOS**	**Önerilen RTOS**
Stanby Akımı (µA)	23 µA	17 µA
Aktif Mod Akımı (mA)	4.3mA	3.1mA

4.3. Bağlam Değiştirme Sürelerinin İyileştirilmesi

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Bağlam değiştirme süresi, bir görevden diğerine geçerken işlemcinin kaydetmesi ve geri yüklemesi gereken veriler nedeniyle belirli bir gecikmeye yol açmaktadır. Geleneksel RTOS çözümlerinde, bağlam değişim süresi yüksek olduğunda sistemin genel verimliliği düşmekte, işlemci gereksiz yere güç tüketmekte ve gerçek zamanlı görevlerin yürütülmesi gecikmektedir. Bu durumu önlemek amacıyla, önerilen RTOS'ta bağlam değiştirme süresinin optimize edilmesine yönelik çeşitli stratejiler uygulanmıştır.

Gereksiz bellek kopyalama işlemlerinin azaltılması sayesinde bağlam değişimi sırasında yalnızca gerekli veriler yedeklenerek işlemcinin ekstra yük altında kalması önlenmiştir. Geleneksel RTOS'larda bağlam değişimi sırasında tüm işlemci kayıtları ve bellek alanları kaydedilirken, önerilen RTOS'ta yalnızca yürütülmekte olan göreve ait kritik verilerin saklanması sağlanarak işlem süresi kısaltılmıştır.

Öncelik bazlı kesme yönetimi, bağlam değişimi sırasında yüksek öncelikli görevlerin daha hızlı bir şekilde yürütülmesine olanak tanımaktadır. Böylece, kritik görevlerin zamanında tamamlanması sağlanmış ve sistemin gerçek zamanlı yanıt süresi iyileştirilmiştir. Geleneksel RTOS çözümlerinde düşük öncelikli görevler ile yüksek öncelikli görevler arasındaki geçiş süreleri uzun olabilmekteyken, önerilen RTOS'ta bu geçişler optimize edilerek zaman kaybı minimize edilmiştir.

Hafif görev yönetimi ile gereksiz çekirdek işlemleri ortadan kaldırılmış ve her bağlam değişiminde RTOS çekirdeğinin fazla işlem yapması engellenmiştir. Böylece, sistemin genel işlem kapasitesi artırılmış ve işlemcinin gereksiz işlem yükü nedeniyle fazla güç tüketmesinin önüne geçilmiştir.

Düşük güçlü işlemciler için optimize edilmiş algoritmalar kullanılarak bağlam değişimi süresince işlemcinin yalnızca en düşük güç tüketen modda çalışması sağlanmıştır. Cortex-M0+ gibi düşük güçlü mikrodenetleyicilerde yapılan optimizasyonlar ile bağlam değişimi süresi azaltılmış, böylece RTOS'un genel enerji verimliliği artırılmıştır.

Bu optimizasyonların sonucunda, Çizelge 2'de görüldüğü gibi önerilen RTOS'un bağlam değiştirme süresi geleneksel RTOS'lara kıyasla %43 oranında azaltılmıştır. Yapılan iyileştirmeler, hem güç tüketimini minimize etmekte hem de görevlerin daha hızlı ve etkin bir şekilde yürütülmesini sağlamaktadır.

Çizelge 2. Bağlam Değiştirme Süreleri

Mod Türü	**Geleneksel RTOS**	**Önerilen RTOS**
Bağlam Değiştirme Süresi (µs)	210 µS	120 µS

5. SONUÇ VE DEĞERLENDİRME

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Bu çalışmada, gömülü sistemler için ultra düşük güç tüketimli bir RTOS tasarlanmış ve geliştirilmiştir. Geleneksel RTOS'ların yüksek güç tüketimi, gereksiz bağlam değişimleri ve sürekli çalışan zamanlayıcı kesmeleri nedeniyle oluşan verimsizlikleri, önerilen RTOS ile ortadan kaldırılmıştır. Yapılan optimizasyonlar sayesinde, işlemci gereksiz yere aktif hale gelmeden görevleri yerine getirebilmekte ve sistemin güç tüketimi önemli ölçüde azaltılmaktadır.

Önerilen RTOS, modüler yapısı, düşük güç tüketimli zamanlayıcıları ve olay tabanlı görev yönetimi sayesinde akıllı sayaçlar, kablosuz sensör ağları ve IoT cihazları gibi pil ile çalışan enerji tasarrufu gerektiren sistemler için önemli bir çözüm sunmaktadır. Yapılan performans testlerinde, standby modunda %30 daha az güç tüketimi ve bağlam değiştirme süresinde %43 oranında iyileştirme sağlandığı gözlemlenmiştir.

5.1. Özet Değerlendirme ve Çalışmanın Katkıları

Önerilen RTOS, standby ve aktif çalışma modlarında daha az güç tüketerek pil ömrünü uzatmakta ve işlemcinin gereksiz yere aktif kalmasını önleyerek daha verimli bir çalışma ortamı sunmaktadır. Yapılan optimizasyonlar sayesinde, geleneksel RTOS çözümlerinin yüksek güç tüketimi ve zamanlama verimsizliği gibi dezavantajları büyük ölçüde giderilmiştir. Özellikle tickless idle mekanizmasının entegrasyonu, işlemcinin yalnızca gerektiğinde çalışmasını sağlayarak sistemin güç tüketimini ciddi anlamda azaltmıştır.

Bağlam değiştirme süresindeki iyileştirme, sistem yanıt süresini hızlandırırken, kesme yönetiminde yapılan optimizasyonlar da işlemcinin gereksiz yere uyanmasını engelleyerek toplam enerji tüketimini düşürmüştür. Öncelik tabanlı görev yönetimi, sistemin daha hassas ve verimli çalışmasını sağlayarak kritik görevlerin zamanında yürütülmesini garantilemiştir.

Bu çalışmanın en büyük katkılarından biri, RTOS'un modüler yapıya sahip olması ve farklı mikrodenetleyici platformlarına kolayca adapte edilebilmesidir. Modüler tasarım sayesinde, yalnızca ihtiyaç duyulan bileşenler etkinleştirilerek gereksiz işlem yükü ve güç tüketimi önlenmiştir. Geleneksel RTOS çözümlerinde sıkça karşılaşılan zamanlayıcı kesme yükü, gereksiz bağlam değişimleri ve yüksek standby akımı gibi sorunlar, önerilen sistemde minimize edilmiştir.

5.2. Önerilen RTOS'un Potansiyel Kullanım Alanları

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Geliştirilen ultra düşük güç tüketimli RTOS, uzun pil ömrü gerektiren gömülü sistemlerde önemli avantajlar sunmaktadır. Özellikle akıllı sayaçlar, kablosuz sensör ağları, IoT cihazları ve giyilebilir teknolojiler gibi alanlarda kullanıma uygundur.

Akıllı sayaç sistemlerinde, cihazların düşük güç tüketimiyle uzun süre çalışabilmesi esastır. Geleneksel RTOS çözümlerinde, sürekli aktif zamanlayıcı kesmeleri batarya ömrünü kısaltabilir. Önerilen RTOS, tickless idle mekanizması ve düşük güçlü zamanlayıcılar sayesinde bu sorunu çözerek enerji verimliliğini artırır.

Kablosuz sensör ağlarında, düşük güçlü iletişim protokolleri kullanıldığından, RTOS'un enerji verimliliği kritik öneme sahiptir. Geliştirilen RTOS, LoRaWAN, NB-IoT ve Zigbee gibi protokollerle uyumlu çalışarak enerji tüketimini en aza indirir. Bu sayede, sensör düğümlerinin pil ömrü uzatılarak ağın genel performansı ve güvenilirliği artırılır.

Endüstriyel otomasyon sistemlerinde, zamanlama hassasiyeti ve düşük gecikme süresi büyük önem taşır. Önerilen RTOS, öncelik tabanlı görev yönetimi ve optimize edilmiş bağlam değiştirme algoritmaları ile endüstriyel otomasyon uygulamalarında esnek bir yapı sunar. Bu özellikler, endüstriyel süreçlerin daha verimli ve güvenilir yönetilmesine katkı sağlar.

Tıbbi sensörler ve giyilebilir teknolojiler gibi alanlarda, RTOS'un düşük güç tüketimi avantajı, pil ile çalışan cihazların uzun süre kesintisiz çalışmasını destekler. Ayrıca, tarımsal izleme sistemleri gibi büyük ölçekli IoT çözümlerinde de bu RTOS kullanılabilir. Enerji hasatlayan kablosuz sensör ağları, tarım uygulamalarında veri toplama süreçlerini optimize ederek enerji verimliliğini artırır.

5.3. Genel Değerlendirme

Bu çalışmada, RTOS tasarımında güç tüketimini optimize eden teknikler detaylı olarak incelenmiş ve önerilen sistemin geleneksel RTOS çözümlerine kıyasla daha verimli olduğu gösterilmiştir. Gerçekleştirilen testler, RTOS'un düşük güç tüketimi sağlayarak batarya ömrünü önemli ölçüde uzattığını ve işlemci yükünü azalttığını kanıtlamaktadır.

Önerilen RTOS, IoT, akıllı sayaçlar ve düşük güçlü gömülü sistemler için önemli avantajlar sunmaktadır. Yapılan optimizasyonlar, sadece enerji tüketimini azaltmakla kalmayıp, aynı zamanda bağlam değiştirme süresini düşürerek sistemin genel performansını artırmaktadır.

Gelecekteki çalışmalar, güç yönetimini daha da geliştirmek, kablosuz haberleşme optimizasyonlarını genişletmek ve RTOS'un endüstriyel sistemlere adaptasyonunu sağlamak üzerine odaklanacaktır.

Sonuç olarak, geliştirilen RTOS, düşük enerji tüketimi gerektiren sistemler için etkin ve ölçeklenebilir bir çözüm sunmaktadır.

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DEEP LEARNING FOR FRACTURE DETECTION: ACHIEVING HIGH PRECISION AND SENSITIVITY ACROSS MULTI-REGION X-RAY IMAGES

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Bone fractures, which are based on manual interpretation by radiologists, require sensitive diagnostic methods. However, traditional methods used routinely increase workload and are prone to missing. This health problem requires sensitive diagnostic methods and computer-aided diagnostic algorithms. This work aims to create an automatic fracture detection system by performing image analysis and applying preprocessing techniques to X-ray images. In particular, CNN architectures are designed to provide high performance in a short time and meet the needs of doctors by using preprocessing and optimization techniques. A total of 4083 labeled X-ray images obtained from the FracAtlas dataset were used in the study. The images were divided into three separate groups: training (80%), validation (10%) and test (10%). In the study, ResNet50, MobileNetV2 and EfficientNet-B6 models were evaluated using the transfer learning method. Adam optimization algorithm, cross-entropy loss function and 0.0005 learning rate were used during the training of the models. As a result, in this study where the performances of different deep learning models such as ResNet50, MobileNetV2 and EfficientNet-B6 were compared, EfficientNet-B6 showed the highest success with 91.97% accuracy and 85.2% F1 score, respectively. While the MobileNetV2 model also stands out as a good alternative suitable for clinical use, the ResNet50 model showed lower performance than the other models, especially in terms of recall (67.1%). These findings reveal that CNN-based artificial intelligence systems can be used as auxiliary tools in the diagnostic processes of radiologists. In future studies, it is recommended to further improve the model performance by including larger data sets and different imaging methods and to support artificial intelligence systems with methods that can explain the decision-making mechanism.

Keywords : *deep learning, bone fracture, artificial intelligence, medical imaging*

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DEVELOPMENT OF A RULE-BASED SELLER CLUSTERING SYSTEM

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ABSTRACT

In the contemporary era, with the rapidly developing digital infrastructures and online platforms, the e-commerce sector has gained significant momentum and reached high sales figures and transaction volumes. The main objective of these platforms is to operate across a wide range, from order management and visitor behavior analysis to the effective management of cargo processes and optimization of all operational activities of sellers. On online platforms, numerous sellers operate across different product categories, each offering their unique services. Each seller has distinct characteristics and strategies, depending on the category they operate in and the products they offer. Examining the characteristic features of these sellers in detail, developing strategies tailored to these features, and providing them with customized targets is a crucial strategic approach that not only enhances customer satisfaction but also maximizes the overall efficiency and success of the platforms. This study aims to develop a rule-based system to boost sales by clustering sellers according to their characteristics and enabling customized actions for each cluster. To achieve this, all data sets related to sellers have been first identified, cleaned, and prepared for analysis through data pre-processing steps. The data cleaning and preparation processes have been conducted on the Apache Spark and Apache Flink platforms using the Scala programming language. The processed data was subsequently stored in the Hadoop Distributed File System and BigQuery environments. Rule sets have been

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generated using logical operators (e.g., 'and' and 'or'). With the developed system, real-time clustering has become feasible, enabling teams to take prompt action.

Keywords: Rule Based System, Seller Clustering, E-Commerce Platform

1. INTRODUCTION

Nowadays, with the rapid advancement of technology, online platforms are experiencing significant development. In this context, e-commerce companies are gaining substantial market share, achieving high sales, and continuing their operations with large transaction volumes. These companies bring together thousands of sellers, offering a wide range of products and services, which significantly increases the competitive environment. In this highly competitive setting, strategic actions aimed at differentiation emerge as key factors in determining success.

A detailed analysis of the characteristics of sellers not only enables the development of sales strategies, but also serves as an important strategic initiative that allows operational processes to be structured in a more efficient and targeted manner. Particularly, developing individualized solutions that align with the needs and goals of each seller does not only lead to increased sales but also makes significant contributions to strengthening long-term business partnerships. Such customized approaches help sellers secure a more solid position in the marketplace ecosystem by enhancing their commitment to the business. Moreover, setting targets that align with the characteristics of sellers and providing the necessary resources to achieve these targets form the foundation of a long-term, sustainable growth strategy that does not focus solely on short-term gains. By creating a business model that meets the expectations of both sellers and customers, e-commerce businesses can strengthen their positions in the market. In this context, optimizing seller performance not only enhances internal harmony but also contributes to the overall dynamism of the e-commerce ecosystem.

Currently, systems are predominantly based on manual processes, which bring various operational challenges. Specifically, when users wish to group sellers for a specific purpose, they must communicate these requests to the relevant teams and then wait for the seller groups to be prepared, which negatively affects the process's efficiency. During this waiting period, significant time is lost due to factors such as the teams' business priorities, which reduces the overall efficiency of business processes. Additionally, it is often unclear which data and methodology have been used to prepare the seller groups, posing a significant issue in terms of transparency and data reliability in decision-making processes. In addition to the time spent to achieve certain goals, repeated calculations of the same or similar data lead to unnecessary costs. These costs not only increase operational load but also have long-term negative effects on the operating budget.

This study aims to develop a system that uses a rule-based approach to create seller clusters based on user inputs and increase sales by recommending specialized actions for each cluster while working in harmony with flexible data models.

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This study is organized as follows: Section 2 includes relevant literature. The details of the system is presented in Section 3. Section 4 presents results of the study. Section 5 concludes the paper.

2. LITERATURE REVIEW

(Malay Sarkar et al., 2024) investigated the efficiency of the k-means clustering algorithm as a technique for consumer segmentation. The experimental results provided strong evidence of the algorithm's performance in consumer segmentation. The overall cluster purity was calculated at 0.95, indicating that the k-means clustering algorithm, integrated with Recency, Frequency, Monetary (RFM) analysis, achieved a high accuracy rate of 95% in precisely segmenting consumers based on their shared behaviors and characteristics. (Adam Wasilewski, 2024) presented a framework for comparing different clustering approaches, considering the business context. The proposed approach was validated by comparing three methods: K-Means, K-Medians, and Balanced Iterative Reducing and Clustering using Hierarchies. The results confirmed that the analyzed clustering techniques can show significant differences when analyzing e-commerce customer behavior data. (Pierfrancesco Bellini et al., 2022) proposed a recommendation system for fashion retail shops based on a multi-clustering approach for items and user profiles in both online and physical stores. Their solution relied on data mining techniques to predict the purchase behavior of newly acquired customers, addressing the cold start problem typical of state-of-the-art systems. The system was validated in-store and online. (Stepan Chalupa and Martin Petricek, 2022) employed Two-Step cluster analysis to identify market segments based on seven variables: length of stay, average room rate, distribution channel, reservation day, day of arrival, lead time, and payment conditions. They identified six clusters: Corporates, Early Bird Bookers, Last Minute Bookers, Product Seekers, Value Seekers, and Last Minute Bookers. Using log-log regression analysis, they calculated the price elasticity of demand for each segment to optimize pricing strategies. Data from a four-star hotel in Prague, Czech Republic, covering over 9,000 transactions, were used. Notably, the Last Minute Bookers segment exhibited positive price elasticity, while Product Seekers had the highest price elasticity and average room rate. (Kayalvily Tabianan et al., 2022) analyzed groups of consumers with similar criteria to help sellers identify and focus on segments, ranging from high-profit to low-profit ones. A learning algorithm known as k-means clustering was used to process the collected data and segment customers. By grouping customers based on similar behavioral factors, the company was able to retain customers over the long term and increase business profits. (Yulin Deng and Qianying Gao, 2020) proposed the SAPK+K-means algorithm, combining Semi-supervised Affinity Propagation with K-means for e-commerce customer segmentation. The approach addressed the shortcomings of traditional K-means by improving clustering quality. When tested on standard datasets, SAPK+K-means achieved higher accuracy but required more clustering time. Applied to e-commerce customer data, the algorithm identified four customer types and provided strategies for each type, significantly enhancing the clustering effectiveness for e-commerce enterprises. (Li Bai et al., 2019) proposed a Hybrid Two-Phase Recommendation (HTPR) method combining clustering and collaborative filtering techniques. This method constructed a user-item category tendency matrix and clustered users to enable personalized recommendations. A parallelized strategy

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optimized the recommendation process. Experiments on real-world datasets showed that HTPR outperformed other methods, including traditional Collaborative Filtering (CF) and user-clustering-based CF. (Debaditya Barman and Nirmalya Chowdhury, 2019) proposed a clustering algorithm based on a self-organizing map and minimum spread tree for customer segmentation. They evaluated the clustering performance using various synthetic and real-life datasets. To demonstrate the effectiveness of their approach, a small number of classifiers were trained using groups extracted from a Portuguese banking institution's direct marketing campaign. The classification accuracy of these classifiers was observed to be superior compared to results obtained in previous studies where the full dataset was used to train the same classifiers. (Xiaojun Chen et al., 2018) introduced the personalized product tree, named the purchase tree, to represent customers' transaction records. They proposed a clustering algorithm, PurTreeClust, for rapid clustering of purchase trees and introduced a new distance metric to calculate the distance between trees. Aggregated purchase tree data were used to select representative customers, forming customer groups. Additionally, a gap statistics-based method was developed to evaluate the number of clusters. Experiments on 10 real-world transactional datasets demonstrated the proposed method's superior performance. (Chu Chai Henry Chan et al., 2016) used the RFM model to generate value-based information for clustering consumers using a Particle Swarm Optimization (PSO). An empirical study involving a retail automobile marketing campaign validated the PSO algorithm's effectiveness. The study compared PSO with other segmentation algorithms, such as K-means and Self-Organizing Maps (SOM), and hybrid algorithms. Results showed that the hybrid SOM, K-means, and PSO algorithm achieved the best performance. The study also proposed effective marketing strategies for two profitable customer segments. (Pedro Quelhas Brito et al., 2015) investigated two data mining approaches for customer segmentation: clustering and subgroup discovery. Their models produced six market segments and 49 rules, providing deeper insights into customer preferences for a highly customized fashion manufacturer/e-tailor. (Klas Hjort et al., 2013) analyzed transactional sales and return data to segment customers based on purchase and return behavior while measuring net contribution margins. This segmentation facilitated a differentiated service delivery approach, providing empirical support for the theory that customer buying and returning behaviors can guide more targeted service strategies.

3. DETAILS OF THE STUDY

In the initial stage, all data sets related to sellers have been identified and prepared for use through cleaning and data pre-processing procedures. These data sets primarily include sellers' orders, user visits, product favorites, and campaign data. Using the processed data, metrics such as total sales and visit numbers over time have been calculated, and correlations between the data have been analyzed in detail. Throughout these processes, data accuracy has been tested to ensure that the data has been prepared in the most appropriate format.

Data cleaning and preparation processes have been carried out on Apache Spark and Apache Flink platforms using the Scala programming language. The prepared data has been stored in Hadoop Distributed File System and BigQuery environments. Real-time data calculations have been performed using Apache Flink and subsequently stored in the Apache Cassandra database.

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Finally, the data has been shared with relevant teams through Apache Kafka and RESTful services.

The developed system is designed to be rule-based, capable of operating in real time, and has the capacity to process millions of data points while managing thousands of targets (segments/tags). It is built on an end-to-end scalable and distributed architecture. The rule-based system allows the creation of rule sets using logical operators (e.g., “and” or “or”). For instance, identifying sellers whose total orders exceed 600 in the last six months and/or whose total visits are below 1 million in the same period exemplifies an output of the rule-based system.

The rule-based system is composed of three fundamental layers:

1. Metric Layer: This layer handles data cleaning and prepares the data for rule-based segmentation.
2. Segment Calculation Layer: This layer processes the data and performs real-time segmentation.
3. Presentation Layer: This layer delivers the segmentation results to end users.

The data incorporated into the system is determined based on user needs. Given the high diversity of data, the rule-based system is designed to operate seamlessly with various data structures. The overall architecture of the developed system is presented in Figure 1.

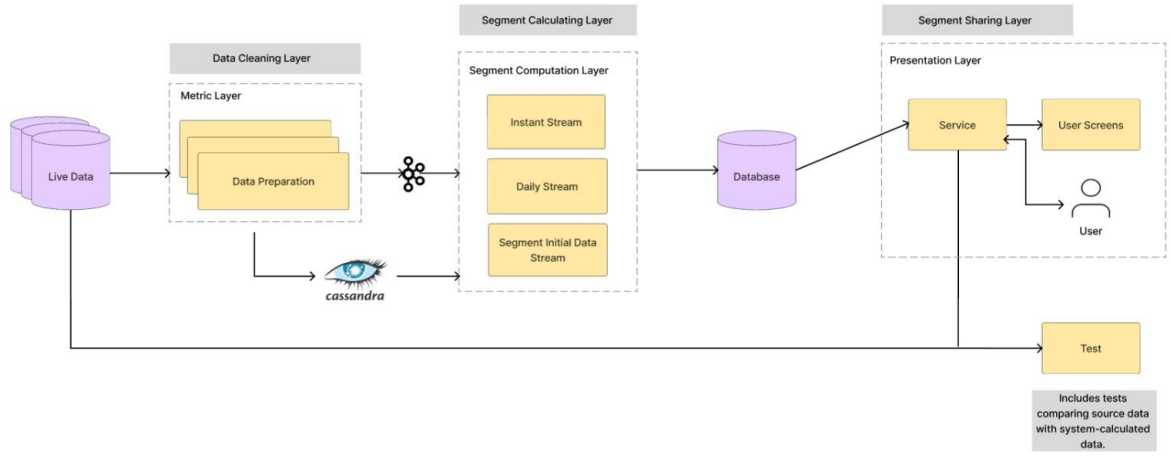

Figure 1. System architecture

Live data refers to the real-time data source processed by the system. In the initial stage, live data is sent to the Data Cleaning Layer, where it undergoes various processing steps. Within this layer, there is a sub-layer called the Metric Layer, which is responsible for performing metric calculations and preparing the data. During the data preparation process, the data is cleaned and prepared. The prepared data is then transferred to the Segment Calculation Layer. The Segment Calculation Layer is responsible for computing segments and processes three distinct data streams: Instant Stream, Daily Stream, and Segment Initial Data Stream. After processing, the data is stored in a database. The calculated and stored segment data is then delivered to the end-user screens via the Service. Furthermore, test mechanisms are employed during this process to compare the source data with the data calculated by the system, ensuring data accuracy.

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The user interface includes functionalities such as screens for defining segment rules, an authorized user feature, the deletion of expired segments, and the selection of segment-specific update periods. Sample screenshots of the system interface are provided in Figure 2 and Figure 3.

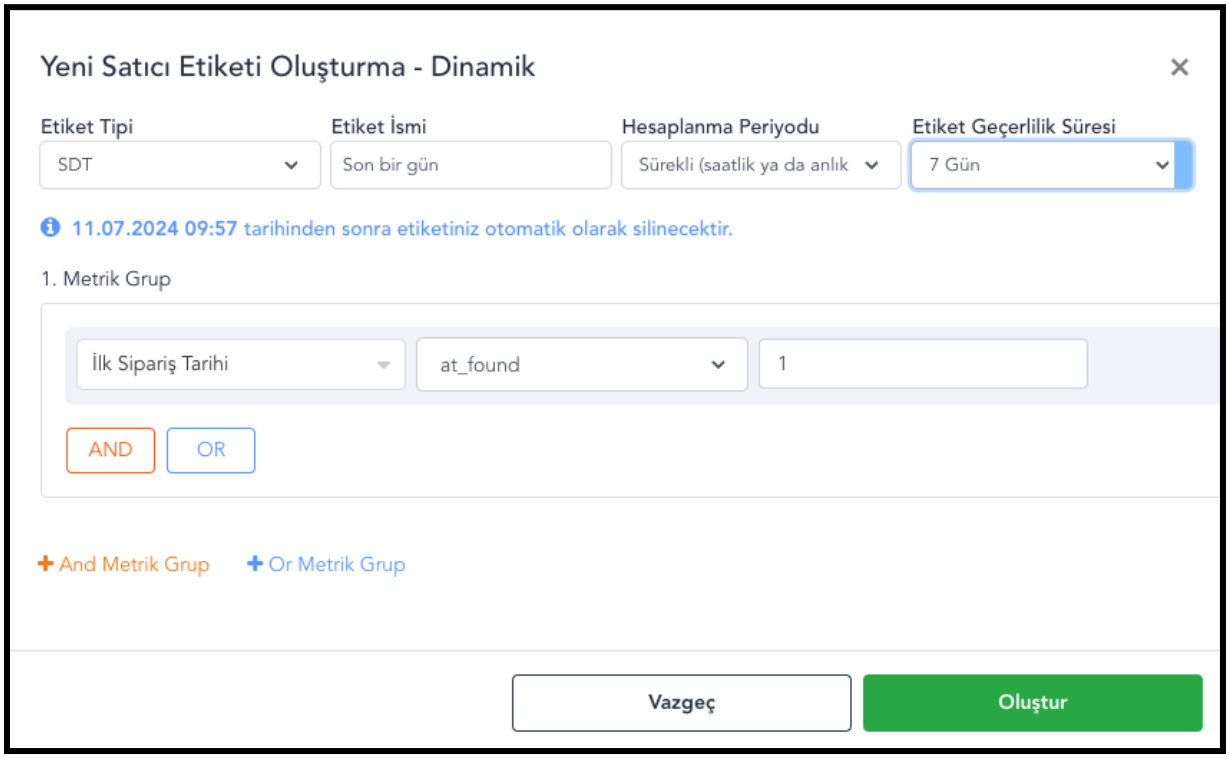

Figure 2. Screenshots of the system interface

Figure 3. Screenshots of the system interface

Unit tests, performance and load tests, integration tests, and periodic data tests have been conducted for the system. These tests, carried out by software developers during the

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development process, facilitated the identification of potential inconsistencies between the source data and the calculated data. The system demonstrated high stability, with virtually no interruptions observed during the testing phases. Load tests, in particular, played a critical role in regularly monitoring and controlling the error rates of the services. Screenshots of the testing processes are provided in Figure 4 and Figure 5.

Figure 4. Screenshots of the testing processes

99% (ms)	Total RPS	Target RPS	Error Count	Availability Score
35	7808	7770	-	100%
35	7810	7770	-	100%
35	312479	303807	-	100%
99% (ms)	**Total RPS**	**Target RPS**	**Error Count**	**Availability Score**
45	16573	16500	-	100%
45	1493819	1479360	2	100%
45	20014	19836	-	100%

Figure 5. Screenshots of the testing processes

4. RESULTS OF THE STUDY

With the developed system,

- Seller groups free from manual processes and entirely data-driven have been established.
- The accuracy of the added metrics has been calculated at 97%, enabling the creation of more precise seller segments.
- Integrating data from various teams into a single segment has significantly reduced system costs.
- The ability to select metrics through the interface has made segment rules clearer and more comprehensible.
- The time required to create segments and prepare them for use has been reduced to a maximum of 2 hours.
- Real-time clustering capabilities have empowered teams to take immediate action.

5. CONCLUSION

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There are many sellers operating in different product categories on e-commerce platforms. Each of these sellers offers services specific to the category they operate in and has distinct characteristics. Accurately analyzing the characteristics of these sellers and setting customized targets based on these features is a critical approach. In this study, a rule-based system has been developed to cluster sellers according to their characteristics and enable customized strategic actions for each cluster. All relevant seller data sets have been identified, cleaned, and pre-processed to make them suitable for analysis. Subsequently, rule sets have been created for the sellers. Thanks to the developed system, the accuracy rate of the metrics used on the platform has been improved, and more accurate seller groups have been formed. Additionally, the data used by different teams has been consolidated into a single segment, significantly reducing the system's cost.

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ÖZET

Hisse senedi fiyatlarının doğru bir şekilde tahmin edilmesi, özellikle Türkiye ekonomisinin önemli bir göstergesi olan Borsa İstanbul 100 Endeksi (BIST 100) gibi dalgalı piyasalarda yatırımcılar için çok önemlidir. Bu çalışma, BIST 100 endeksinin zaman serisi tahmininde Gated Recurrent Unit (GRU) algoritmasının uygulanmasına odaklanmaktadır. GRU, zamansal veri setlerinde uzun vadeli bağımlılıkları yakalayabilme yeteneği ile tanınan ve kaybolan gradyan sorununu çözmeye yardımcı olan bir Recurrent Neural Network (RNN) varyantıdır. Hisse senedi fiyat hareketlerinin doğrusal olmayan ve karmaşık doğası göz önüne alındığında, derin öğrenme yöntemleri, özellikle GRU, tahmin doğruluğunu artırmada önemli bir potansiyel göstermektedir. Bu çalışmada kullanılan veri seti, Ocak 2022 ile Ocak 2025 arasındaki BIST 100 hisse senedi verilerinden oluşmaktadır. Tahmin görevinde iki GRU modeli uygulanmıştır: tek katmanlı bir GRU modeli ve iki katmanlı bir GRU modeli. Her iki model de veri setinin %80'i ile eğitilmiş, geri kalan %20 ise test için kullanılmıştır. Modeller, Ortalama Kare Hata (MSE), Kök Ortalama Kare Hata (RMSE) ve R^2 skoru gibi performans metriklerine göre değerlendirilmiştir. Sonuçlar, tek katmanlı GRU modelinin MSE (0.000024) ve R^2 (0.965830) açısından iki katmanlı GRU modelini geride bırakarak daha iyi bir tahmin doğruluğu sağladığını göstermektedir. Bu bulgular, daha basit bir GRU mimarisinin verimli ve doğru tahminler sağlayabileceğini, bu durumun BIST 100 endeksindeki yatırımcılar için faydalı bir araç sunduğunu ortaya koymaktadır. Gelecekteki araştırmalar, modelin performansını dışsal faktörleri dahil ederek ve daha karmaşık mimarileri keşfederek daha da iyileştirmeye odaklanabilir.

Anahtar Kelimeler: En Az 3 Anahtar Kelime yazılması gerekmektedir.

ABSTRACT

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Accurate forecasting of stock prices is crucial for investors, especially in volatile markets such as Borsa Istanbul 100 Index (BIST 100), which is a key indicator of Turkey's economy. This paper focuses on the application of the Gated Recurrent Unit (GRU) algorithm for time series forecasting of the BIST 100 index. The GRU is a variant of the Recurrent Neural Network (RNN) known for its ability to capture long-term dependencies in sequential dataset while addressing the vanishing gradient problem. Given the non-linear and complex nature of stock price movements, deep learning methods, particularly GRU, have shown significant potential in improving the accuracy of predictions. The dataset used in this study consists of BIST 100 stock data collected from January 2022 to January 2025. Two GRU models were implemented for the prediction task: a single-layer GRU model and a two-layer GRU model. Both models were trained on 80% of the dataset, with the remaining 20% used for testing. The models were evaluated based on performance metrics such as Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and R^2 score. The results demonstrate that the single-layer GRU model outperforms the two-layer GRU model in terms of MSE (0.000024) and R^2 (0.965830), indicating a better predictive accuracy. These findings suggest that a simpler GRU architecture can provide efficient and accurate forecasting, offering a useful tool for investors in the BIST 100 index. Future research may focus on further improving the model's performance by incorporating external factors and exploring more complex architectures.

Keywords: Bist100; GRU; Time series; Prediction; Layers.

1. INTRODUCTION

The Borsa Istanbul 100 Index (BIST 100) is Türkiye's most important stock index, comprising the largest and most liquid companies in the country. It is determined based on market capitalization and trading volume, serving as a critical indicator of the overall performance of the Türkiye economy, closely monitored by investors and analysts. Stock exchanges, like Bist 100, provide a secure platform for trading and are the primary institutions facilitating these activities in Türkiye. However, Bist 100 experiences periodic fluctuations due to sharp price movements, which can lead to significant gains or losses for investors. Accurately forecasting stock prices is essential for investors to decide when and where to invest. Given the dynamic, non-linear, complex, and chaotic nature of the stock market, price forecasting remains challenging [1]. In recent years, as economic indicators have become more volatile, predicting market fluctuations has become a crucial concern for BIST 100 investors. While investors typically aim to minimize risk, riskier investments can yield higher profits. Thus, the core challenge in investment decisions lies in balancing risk reduction with profit maximization. While there is no definitive answer, various traditional and machine learning methods can improve prediction accuracy, helping investors navigate risks and enhance their returns. In recent years, artificial neural networks and deep learning methods have gained significant attention in various research fields, including pattern recognition [2], natural language processing [3], video/image processing [4], and time series forecasting [5] . Deep learning methodologies are preferred due to their superior predictive performance compared to traditional machine learning approaches. These methodologies leverage deep neural networks to automatically extract meaningful features from data with minimal manual feature engineering, making them highly effective for complex financial datasets. So machine learning and deep learning algorithms have become essential tools for financial forecasting [6]. These methods, particularly recurrent neural networks like Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU), have demonstrated significant success in time series analysis by capturing complex patterns in stock price movements. By leveraging these advanced

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techniques, investors can improve prediction accuracy and make more informed financial decisions.

In this paper, the GRU algorithm will be used to predict the future price of the BIST 100 index in the coming days. GRU is widely used for time series regression analysis, and numerous studies have demonstrated its effectiveness across various time series applications, including: The [7] study conducted a time series regression analysis using LSTM networks with eight different hyperparameters to examine daily and hourly Bitcoin datasets. The results demonstrated that optimizing hyperparameters significantly impacted performance, with the best Mean Square Error (MSE) values achieved at 0.000043633 for the hourly dataset and 0.00061806 for the daily dataset. Additionally, the GRU model has shown promising results in price prediction. There are lots of paper about stock market price prediction, including: in the [8] where they utilized a hybrid Bi-LSTM-GRU model by combining Bidirectional LSTM (Bi-LSTM) and GRU networks to predict NIFTY-50 stock price movements, the results demonstrated that the proposed hybrid model outperformed other models in capturing the random nature of stock price fluctuations. In the [9] they compared deep learning methods such as LSTM, GRU, GAN, and WGAN-GP for predicting stock prices using Google stock data. While the LSTM model showed the best performance with the lowest error rate, the difference in accuracy between LSTM and GRU was minimal, with GRU performing slightly worse in comparison. Both models, however, demonstrated similar accuracy levels, with LSTM achieving an Root Mean Squared Error (RMSE) of 4.214 and GRU an RMSE of 4.303. According to [10] , the BIST 100 index was analyzed using various machine learning and deep learning algorithms, including LSTM, CNN, SVM, RBF, MLP, GRU, RF, and KNN. Among these, the CNN model achieved the best performance across five different evaluation metrics, with RMSE = 55.399, MSE = 3069.05, Mean Absolute Error (MAE) = 38.733, MAPE = 0.0104, and R^2 = 0.9986. These results reinforce previous findings in the literature, supporting the conclusion that CNN achieves the highest accuracy among the models evaluated. They are [6] proposes a deep learning-based decision consolidation strategy for predicting the Borsa Istanbul 100 Index (BIST 100) prices. Experimental results show that the decision consolidation strategy outperformed individual deep learning techniques such as CNN, LSTM, and MLP, achieving the best performance with a MAPE of 4.9325. These findings indicate that CNN is an effective method for predicting the BIST 100 price. In [11] they are investigates the predictability of the Borsa İstanbul (BIST)-100 Index during the global crisis period (July 2007-December 2009) using Artificial Neural Networks (ANNs). The results suggest that ANN can successfully predict the next day and next week values of the index with an accuracy margin error of less than 5%. This finding is significant for investors, especially in times of economic fragility, as the ANN model closely aligns with real market results.

Unlike other studies, the study conducted in [12]analyzed BIST 30, BIST 50, and BIST 100 prices between 1997 and 2020 using Auto Regressive Integrated Moving Average (ARIMA), LSTM, and GRU algorithms. The experimental results indicated that ARIMA achieved the best RMSE.

The first section of this paper outlines the significance of the research and discusses relevant literature. The second section provides detailed information about the dataset, the GRU model. The third section presents, and proposed model and experimental results, supplemented with graphical representations to facilitate interpretation. Finally, the paper concludes with an evaluation of the findings based on various performance metrics, discussing the implications of the results and potential future improvements.

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2. METHODOLOGY

The dataset has been split into 80% training and 20% testing while ensuring that the chronological order of the data remains intact, as preserving the sequence is crucial for time series forecasting. To achieve this, the "train_test_split" function from "sklearn.model" selection was used with the parameter shuffle=False, preventing the data from being randomly shuffled. Additionally, when fitting the model, the shuffle=False parameter was also explicitly set to maintain the sequential nature of the dataset. This ensures that the model learns from past observations in a structured manner, preventing data leakage from future time steps and improving the reliability of the predictions.

2.1. Gated Recurrent Unit (GRU)

GRU is a type of RNN developed to process sequential data, such as time series, and aims to prevent the vanishing gradient problem while learning long-term dependencies [13]. Unlike traditional RNNs, GRU employs gating mechanisms these are reset and update gates which regulate the flow of information and determine how much past information should be retained or discarded at each time step.

For BIST 100 time series forecasting, GRU is particularly advantageous due to its ability to efficiently learn patterns in stock market data, which often exhibit temporal dependencies and volatility. Compared to LSTM networks, GRU has a simpler architecture with fewer parameters, making it computationally more efficient while still achieving competitive performance in financial time series prediction. By leveraging GRU, the model can capture trends in historical stock prices, trading volume, and price fluctuations, enabling more accurate future predictions.

2.2. Data Collection

A dataset obtained from Investing.com, covering the period from January 3, 2022, to January 7, 2025, has been transformed into a time series analysis problem to accurately previous observations to forecast future values. Associated with time relationships in the data have been preserved by applying a sliding window approach, where time steps are shifted sequentially to generate meaningful input-output pairs. This transformation allows the dataset to be utilized effectively in deep learning models for forecasting purposes.

Since algorithms such as GRU and LSTM require three-dimensional input structures, the dataset has been reshaped accordingly. Each input instance consists of a defined number of past observations, capturing essential patterns and trends that contribute to the prediction of future values. This preprocessing step ensures that the model can learn from historical data and make reliable forecasts.

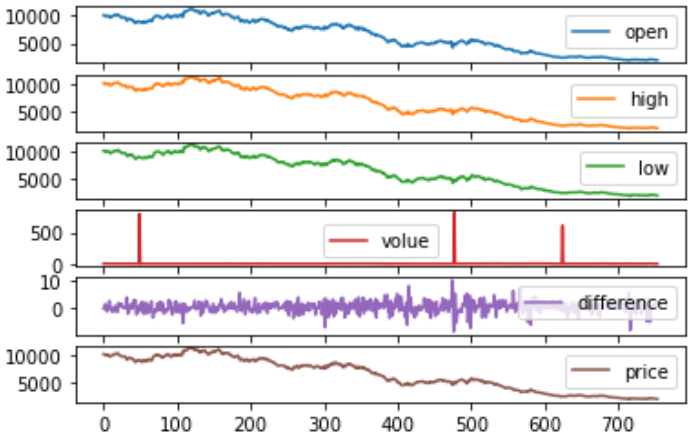

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Figure 1. Time series visualization of the BIST 100 dataset and trends of features

Figure 1, the dataset's key features are visualized over approximately 754 time steps. The first four graphs represent the opening price (open), highest price (high), lowest price (low), and trading volume (volume), respectively. The fifth graph illustrates the price differences (difference), while the last graph displays the BIST 100 closing prices (price). These visualizations highlight the overall downward trend in stock prices over time. Additionally, sharp spikes in trading volume can be observed at certain points, which may indicate periods of high market activity or significant price fluctuations. The difference graph shows the variability in price changes, reflecting the volatility in the stock market. This visual representation provides insights into the stock market's behavior, assisting in identifying patterns and potential anomalies that may influence future price predictions.

3. PROPOSED MODEL AND EXPERIMENTAL RESULT

The proposed model utilizes a GRU network for time series forecasting of BIST 100 stock prices. The dataset is first preprocessed by normalizing all features using “MinMaxScaler” and is then split into 80% training and 20% testing, ensuring that the chronological order remains intact (shuffle=False). To prepare the data for GRU, it is reshaped into a three-dimensional structure (samples, time steps, features), which is essential for capturing temporal dependencies in sequential data. Two GRU-based models are implemented: Single-Layer GRU Model: This model consists of a single GRU layer with 64 neurons and a “tanh” activation function. The output of the GRU layer is passed through a dense layer with a single neuron to predict the target variable. It is optimized using Stochastic Gradient Descent (SGD) with a learning rate of 0.02, and the loss function is set to MSE. Two-Layer GRU Model: This model extends the architecture by incorporating an additional GRU layer with 64 neurons, utilizing “return_sequences=True” in the first layer to pass the sequential information to the second GRU layer. The second GRU layer processes the sequential data further before feeding it into a dense output layer. This model optimizer is SGD with a learning rate of 0.01. Both models are trained for 100 epochs with a batch size of 16, ensuring that the data remains sequentially structured during training (shuffle=False). The performance of each model is evaluated on the test dataset, and training loss is visualized to assess model convergence and learning trends. Finally, the actual and predicted BIST 100 prices are plotted to compare the forecasting capabilities of the single-layer and two-layer GRU architectures.

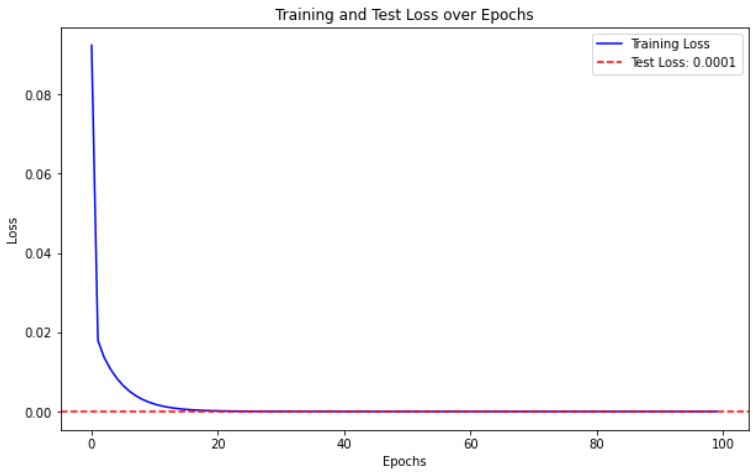

Figure 2. Train and test loss for each epoch

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The model's performance is evaluated using the test dataset, and the test loss is visualized along with the training loss. This visualization provides insights into the model's convergence and generalization ability over time as we can see in the Figure 2.

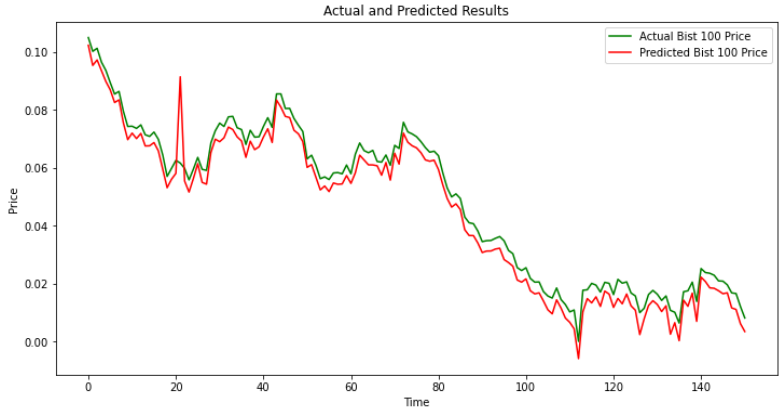

Figure 3. GRU 1-layer Actual and predicted price for test dataset

Figure 3 illustrates the actual and predicted BIST 100 prices using the single-layer GRU model, showing a strong connection with the predicted values and the actual test data. In Figure 4, the comparison between the single-layer and two-layer GRU models reveals that the single-layer GRU outperforms the more complex two-layer model. As seen in Table 1, the single-layer GRU achieves a lower MSE (0.000024) and RMSE (0.004877) while also attaining a higher R^2 score (0.965830), indicating better predictive accuracy.

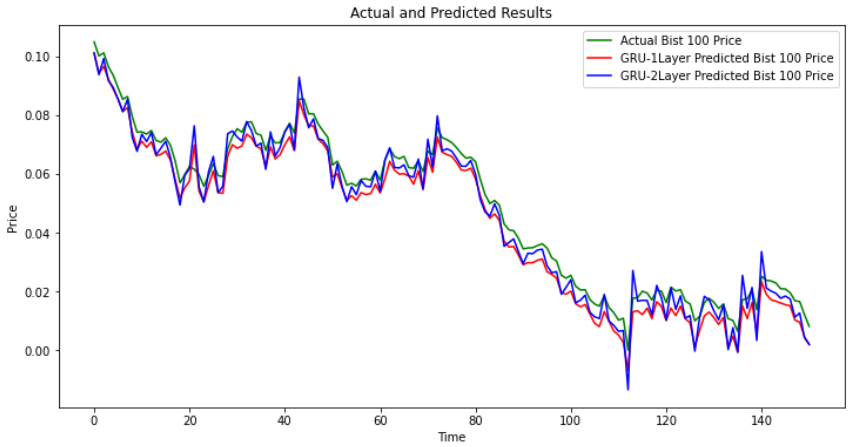

Figure 4. GRU 1-2 layers Actual and predicted price for test dataset

Table 1. GRU model result

Model	MSE	RMSE	R2	MAE
GRU (1 layer)	0.000024	0.004877	0.965830	0.004266
GRU (2 layer)	0.000029	0.005348	0.958916	0.004380

4. DISCUSSION AND CONCLUSIONS

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In this paper, we implemented and compared two GRU-based models for time series forecasting of BIST 100 stock prices. The results indicate that the single-layer GRU model achieved a lower MSE of 0.000024 and a higher R^2 score of 0.965830, suggesting a slightly better fit to the data compared to the two-layer GRU model, which obtained an MSE of 0.000029 and an R^2 score of 0.958916. While the two-layer model demonstrated a marginally higher RMSE and MAE, the differences are minimal, indicating that increasing the model complexity did not yield significant improvements. This can be attributed to the limited dataset, where adding more GRU layers increased model complexity without substantially enhancing performance. This suggests that a single-layer GRU architecture may be more efficient for this specific forecasting task, balancing performance and computational cost. Future work could explore further hyperparameter tuning, alternative architectures, and external factors influencing stock prices to enhance predictive accuracy.

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ADRESSING IMBALANCE IN DRUG-TARGET INTERACTION PREDICTION WITH HYBRID FEATURE REDUCTION AND DATA AUGMENTATION STRATEGIES

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ABSTRACT

Drug-target interaction prediction provides important information for drug repurposing. There are different ways of predicting drug-target interaction. In this study, one of the chemogenomic approaches representing drug and target as features was utilized. Drugs and targets were obtained from Drugbank. Feature descriptors utilized in previous studies were also extracted and employed for drugs and targets. These features are Composition Transition and Distribution (CTD), Aminoacid Composition (AAC) and Pseudo-Aminoacid Composition (PAAC) for targets. The descriptors used for identifying drugs are Aminoacid Count, Alogp, Apol, AromaticAtom Count, Atom Count, Autocorrelation Mass and Autocorrelation Charge and last AutoCorrelation Polarizability. The main problem of prediction of drug-target interaction is imbalance data. In this study, data augmentation approach was applied to solve this problem. Instead of reducing the number of samples in the negative classes to match the number of negative classes. The main purpose of this study improving autoencoder approach used as feature selection algorithm. There is a point more specific to this work, which is hybridization of feature reduction approach. Relief-F +PCA and Relief-F + LDA methods are applied for this approach. Some different feature selection approaches were used to make comparison and handle better efficiency results. Recursive Feature Elimination (RFE), SelectPercentile, ChiSquare (chi2), SelectFromModel and SequentialFeatureSelector methods were selected as other feature selection algorithms in this study. Multilayer Perceptron was utilized for classification. According to the test results, proposed method provided better results for standard datasets however it performed as low as other tested algorithms performed due to the imbalance dataset issue.

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HİBRİT ÖZELLİK AZALTMA VE VERİ ARTTIRMA STRATEJİLERİ İLE İLAÇ-HEDEF ETKİLEŞİMİ TAHMİNİNDE DENGESİZLİĞİN GİDERİLMESİ

İlaç-hedef etkileşimi tahmini, ilaç yeniden konumlandırma için önemli bilgiler sağlar. İlaç-hedef etkileşimini tahmin etmenin farklı yolları bulunmaktadır. Bu çalışmada, ilaçları ve hedefleri özellikler olarak temsil eden kemogenomik yaklaşımlardan biri kullanılmıştır. İlaçlar ve hedefler DrugBank veritabanından elde edilmiştir. Önceki çalışmalarda kullanılan özellik tanımlayıcılar da çıkarılmış ve ilaçlar ile hedefler için kullanılmıştır. Hedefler için kullanılan özellikler, Kompozisyon Geçiş ve Dağılım (CTD), Amino Asit Kompozisyonu (AAC) ve Sahte Amino Asit Kompozisyonu (PAAC) olarak belirlenmiştir. İlaçları tanımlamak için kullanılan tanımlayıcılar ise Amino Asit Sayısı, AlogP, Apol, Aromatik Atom Sayısı, Atom Sayısı, Oto-Korelasyon Kütlesi, Oto-Korelasyon Yükü ve son olarak Oto-Korelasyon Polarizabilitesi şeklindedir.

İlaç-hedef etkileşimi tahminindeki en büyük sorunlardan biri dengesiz veri problemidir. Bu çalışmada, bu sorunu çözmek için veri artırma yaklaşımı uygulanmıştır. Negatif sınıflardaki örneklerin sayısını pozitif sınıflarla eşitlemek yerine, veri artırma yöntemi kullanılmıştır. Çalışmanın temel amacı, özellik seçimi algoritması olarak kullanılan otoenkoder yaklaşımını geliştirmektir. Bu çalışmayı daha spesifik kılan nokta ise, özellik azaltma yaklaşımının hibrit hale getirilmesidir. Bu kapsamda, Relief-F + PCA ve Relief-F + LDA yöntemleri uygulanmıştır. Ayrıca, daha iyi verimlilik sonuçları elde etmek ve karşılaştırmalar yapmak amacıyla farklı özellik seçme yaklaşımları da kullanılmıştır. Çalışmada Recursive Feature Elimination (RFE), SelectPercentile, Ki-Kare (chi2), SelectFromModel ve SequentialFeatureSelector yöntemleri diğer özellik seçme algoritmaları olarak tercih edilmiştir.

Sınıflandırma işlemi için Çok Katmanlı Algılayıcı (Multilayer Perceptron) kullanılmıştır. Test sonuçlarına göre, önerilen yöntem standart veri kümelerinde daha iyi sonuçlar sağlamış, ancak dengesiz veri seti problemi nedeniyle diğer test edilen algoritmalar kadar düşük performans göstermiştir.

Anahtar Kelimeler: Drug-Target Interaction; Multilayer Perceptron; Aminoacid; Feature Descriptors; Feature Selection; Autoencoders

1. INTRODUCTION

Receptors are important parts of signaling system providing interaction between drugs and organisms and named as targets. They are made up of proteins, found in cell membrane or within the cell. G protein-coupled receptors (GPCRs), Enzymes, and nuclear receptors and ion channels are some types of receptors. Drugs impact these targets by changing their pharmaceutical functions [1]. Proteins are crucial for organisms because they are catalyzer for almost all chemical reactions, regulator for all gene activities and main component of cellular structure. Receptors provide chemical signaling between and within cells with consequent pharmacological effects by directly acting on cellular targets, effector proteins, or intermediary cellular signal molecules (transducers) [2].
Proteins are made out of sequence of *amino acids* linked by peptide bonds. There are 20 types of amino acids naturally occurred. Amino acid consists of two chains named as *main chain* and

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a *side chain.* They have different chemical structures in the different amino acids. Side chains of the amino acids specify the functional properties of proteins. Protein chains creates a three-dimensional structure to have a biological function. Proteins have different tasks in the organisms. While enzymes bind other molecules (ligands) and catalyze their biochemical reactions, some types bind other proteins and influence their activity. Others bind to DNA and regulate gene expression. On the other hand, some proteins have a purely structural function, making up the fabric of the cell and other types are released from cells and act as chemical messengers, influencing the behavior of other cells by acting on receptors located on cell surfaces [3].

Supposedly, proteins having similar amino acid composition and sequence have similar functions. Although all the functions of a protein could not be explained from its amino acid sequence, correlations between structure and function provide information about properties of the amino acids found in that protein [4].

Drug discovery is crucial process; however, it has many challenges such as time requirement and cost. Therefore, drug repurposing is effective alternative to drug development. Drug target interaction plays important role in repurposing. Moreover, it facilitates the procedure of drug discovery and drug side-effect prediction and also helps decipher the underlying biological mechanisms.

Due to its importance, different methods have been developed for predicting drug-target interaction. One of the frequently used method is predicting interaction by using chemical structure similarity of a given protein. In the literature, some study [6, 7] suggested a method to predict targets of proteins. This method used chemical similarity. Similarity of ligands of proteins utilizing 65,000 ligands notated into sets for hundreds of drug targets. As using ligand topology, the similarity score between each set was calculated.

Another common method is molecular docking [8] which requires the non-trivial modeling of 3D structure of the target protein. However, the 3D structures of many proteins are not yet available [9], since very few GPCRs have been crystallized [10] so far.

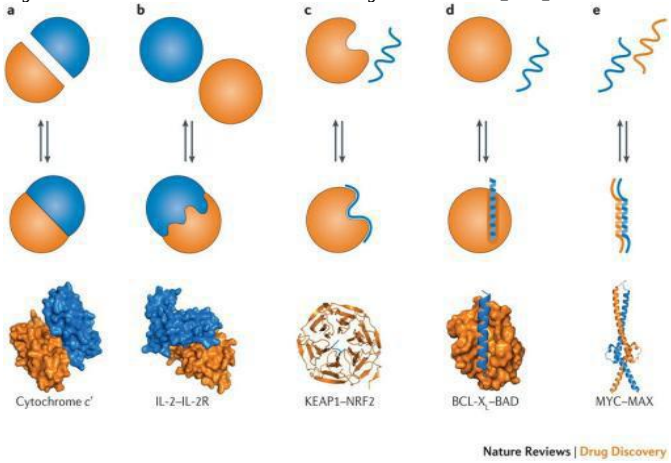

Figure1. Drug- target interaction [11]

In general, prediction of drug-target interaction is a binary classification problem. Drug-target pairs having interaction are grouped in the *positive class*, drug-target pairs without interaction are grouped in *negative* class. Since numbers of negative samples are much more than that of positive classes, there exists imbalance between classes. This reduces the generalization ability of the machine learning algorithms and produces biased results [12].

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In this study, an improved auto encoder approach is proposed as feature selection algorithm. Proposed approach aims to avoid disadvantage of dimension reduction algorithms, while it provides subset of features based on their dominance. The proposed approach uses feature values itself rather than transformed values while it identifies which values play important role in the transformed space. The proposed approach was tested on small molecule Drugbank dataset for drug-target interaction problem .

2. LITERATURE STUDY

Generally, imbalance problem is solved by random sampling. Samples are randomly chosen from majority class until the numbers of samples in both classes are same [13,14]. However, various studies reported in literature do not attempt to alleviate the imbalance problem.

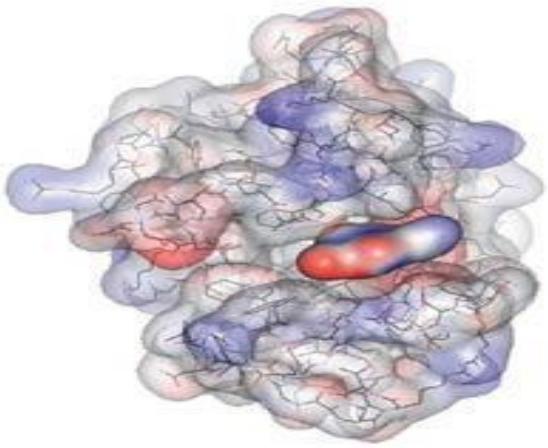

Figure2. Crystal structure of a drug molecule bound [15]

In [16], the authors consider drug-target prediction problem as a regression problem. They stated that one of the reasons behind the imbalance dataset is regarding unlabeled data as negative samples. To solve this issue, they utilized unsupervised learning approaches to cluster unlabeled data, which requires only small number of labeled data. They reported that predictions were more accurate than the supervised one.

In [14], an ensemble learning strategy was proposed to solve the problem of between class imbalance and within-class imbalance. Analyses had demonstrated some results. The proposed technique improved results for these four state-of-the-art methods. These are SVM, Random Forest, *Decision Tree* and *Nearest Neighbor*. Additionally, cases for new drugs and targets were simulated in order to demonstrate how the method would predict their interactions. The method used agreeable prediction performance and predicted many of the interactions successfully. The authors stated that their work proved that adressing problem is important for class imbalance of the data.

In [17], similarity based machine learning methods were employed for predicting drug–target interactions. Different methods and experimental settings were tested. It is reported that AUCd and AUCt, KBMF2K and PKM performed the best, whereas LapRLS was the best for AUPRd and AUPRt. Another outcome of the study was reported as difficulty of the drug and target prediction due to lack knowledge of interactions.

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The rest of this study is organized as follows: MATERIAL section gives information about the data. METHOD briefly explains methods that were used. PROPOSED METHOD describes how the methods were used on the data. RESULTS AND CONCLUSION explains the advantages, limitations and future perspectives of prediction methods.

3. MATERIAL AND METHOD

3.1. Dataset

In this study, Drugbank Database [18] was utilized. Because there are a lot of advantages of this dataset. It is freely available and richly annotated. Additionally, the dataset that got from DrugBank is a unique resource for bioinformatics and cheminformatics that integrates comprehensive drug data with detailed drug target knowledge. DrugBank is good source for cheminformatics and bioinformatics. Detailed drug data like chemical, pharmacological and pharmaceutical was combined comprehensive drug target information like sequence, structure, and pathway by DrugBank. DrugBank has broad scope, extensive references and unusually detailed data descriptions.

13,431 drug entries including 2,617 approved small molecule drugs, 1,345 approved biotech (protein/peptide) drugs, 130 nutraceuticals and over 6,332 experimental drugs are kept in the latest release of DrugBank (version 5.1.4, released 2019-07-02). Additionally, 5,157 non-redundant protein sequences are linked to these drug entries. Drug, target, enzyme, transporter and carrier can given as an example for this non-redundant protein sequences. Also there is a drug-card concept in DrugBank. Each DrugCard entry contains more than 200 data fields with half of the information being allocated to drug/chemical data and the other half allocated to drug target or protein data as**.**

We studied with small molecule one. A small molecule drugs are like any compounds with low molecular weight. They affect a biologic process. Their molecular weight is below 900 daltons. The DrugBank database (version 4.3, released on 17 Nov. 2015) were utilized as the interaction data. These data involve 12674 drug-target interactions. There are also 5877 drugs and their 3348 protein interaction partners. Exclusively, we extracted separate sets of features for small-molecule drugs and their targets. We do not address biotech drugs in this study. Table 1 gives statistics for dataset.

Table 1. Statistics of dataset

Drugs	***Targets***	***Interactions***
5877	3348	12674

3.2. Descriptors

Various feature extraction methods can be employed to get feature descriptors. Feature descriptors extracted from sequences must include main information about proteins. Therefore, handling feature vectors from protein sequences is one of the most important computational challenges in protein sequence analysis.

In this study, similar three feature descriptors, namely, Composition Transition and (CTD), Amino acid Composition (AAC) and Pseudo-Amino acid Composition (PAAC) were used for extracting target features on PROFEAT.

Amino Acid Composition

Next 20 components of the feature vector are gotten as follows. Sequence's length and frequencies of amino were calculated. And they were subjected to normalization according to

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the equation = . In here, e is the number of amino acid type, present in the sequence and N, the total length [20].

Pseudo Amino Acid Composition

It is the basic discrete model utilizing the amino acid composition (AAC) to represent protein samples. This method provides compositional and positional amino acid pattern representation of sequence as a discrete model. It is derived from its amino acid sequence. Given a peptide sequence, pair wise relationships between amino acids are calculated by using chemical properties.

Composition, Transition, Distribution

It is another method used for obtaining fixed length biological information from varying length protein sequences. The number of amino acids having specific property is represented by Composition (C). It is separated by number of amino acids in total. Percentage of frequency of amino acids is described by Transition (T). These amino acids have specific property too and they are followed by amino acids having a different property [21].

And also, eight feature descriptors were used to extract drug features by using Rcpi library on R-Studio. These are DrugAminoAcidCount, DrugALOGP, DrugAromaticAtomsCount, DrugApol, DrugAutocorrelationCharge, DrugAutocorrelationMass, DrugAutocorrelationPolarizability. This descriptors were used to calculate some special values for drugs in this paper. These values were used as drug features.

3.3. Feature Selection Algorithms

Dimension reduction approaches are usually researched by two categories. These are feature selection and feature extraction. Approaches of feature extraction approaches are used to find a linear or non-linear projection.

The aim of feature selection methods is to choose a subset of the original high-dimensional features. Thusly, the semantics of the original features are retained and also dimensionally diminished results that are more interpretable for domain experts are generated. Feature selection is helpful in locating the discriminative features that are the most appropriate to predict the class. Feature selection is used in data mining and statistics. The basic approach of feature selection is to choose a subset of input variables by removing non-relevant features.

In this study, we used some feature selection methods. These are Recursive Feature Elimination, SelectPersentile, chi2, SelectFromModel, SequentialFeatureSelector.

Recursive Feature Elimination: This method is a common feature selection algorithm. it is easy to configure and it is effective at selecting those features in a training dataset that are more or most relevant in predicting the target variable. [22].

SelectPercentile: Select features according to a percentile of the highest scores. Generates a direct search function that selects a fraction, given as a percentage, of the total number of available features (The features evaluation is individual). This function is called internally within the *directSearchAlgorithm* function [23].

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chi2: Compute chi-squared stats between each non-negative feature and class. This score can be used to select the n_features features with the highest values for the test chi-squared statistic from X, which must contain only non-negative features such as booleans or frequencies, relative to the classes. SequentialFeatureSelector: Sequential Feature Selection (SFS) is available in the *SequentialFeatureSelector* transformer. SFS can be either forward or backward:

Forward-SFS is a greedy procedure that iteratively finds the best new feature to add to the set of selected features. Concretely, we initially start with zero feature and find the one feature that maximizes a cross-validated score when an estimator is trained on this single feature. Once that first feature is selected, we repeat the procedure by adding a new feature to the set of selected features. The procedure stops when the desired number of selected features is reached, as determined by the n_*features*_to_select parameter [24].

3.4. Descriptors

An MLP is a type of artificial neural network model and also feed-forward process. This model maps a set of input data over a set of convenient outputs. There are multiple layers of nodes in a coordinated graph in MLP network model. And each layer is completely connected to the following one. Each node is a neuron with a nonlinear activation function except the input nodes. This method uses a handled learning technique. This technique is named as back propagation in order to train the network. MLP is an alteration of the standard linear perceptron and can recognize in separable data [25]. An MLP has a form as given Figure 1.2.

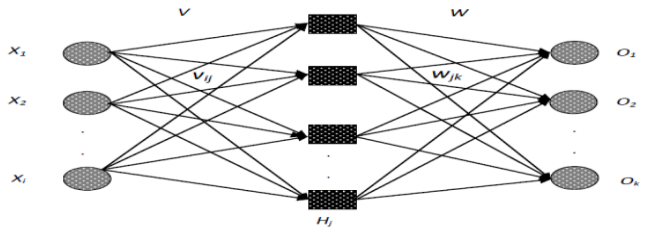

Figure3. A typical MLP Structure

3.5. Hybrid Selection

A hybrid feature selection method is used in this paper . Relief-F that is one of features selection methods. PCA and LDA are one of the rotation processes of original feature set is used. linear projection of all irrelevant features is calculated by using PCA besides selecting the most relevant feature set by Relief-F. After selecting the most relevant features by Relief-F, the chance was given to show perfect-fit to irrelevant features.

3.6. Relief-F

Relief-F is an instance-based algorithm: Instances are tried randomly and checked whether to have neighborhood of the same or different classes by this algorithm. The algorithm works on continuous and discrete class data. The parameters determine the number of neighbors to check as well as the number of instances to sample [26].

3.7. PCA and LDA

In this study, some hybrid models of Linear Discriminant Analysis (LDA) and Principal component analysis (PCA) were utilized as data reduction algorithms to compare our results. The first aim of this algorithms is to reduce the dimensionality of a dataset that given. They do this reduction process with this way : They find a new set of variables which is smaller than the original set of variables and also keep most of the sample's information. They also are useful for the compression and classification of data.

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3.8. Auto Encoders

The auto-encoder (AE) is a simple network. The purpose of this network is to generate at its output which is presented at the input. In fact, the basic AE is a simple neural network with one hidden layer and one output layer as shown in Figure 4a, and also it exposes to wore some strictions. One of them is that the weight matrix of the output layer is the transposed of the weight matrix of the hidden layer. And the other one is that the number of output neurons is equal to the number of inputs.

By utilizing Equation (1), the values of the hidden layer neurons (namely the encoding), are computed. In this equation, input vector is represented with x, the sigmoid function is represented with s , b is the vector of hidden neuron biases, and lastly, the matrix of hidden weights is denoted W .The values of the output neurons (namely the decoding), are obtained as in Equation (2). In this equation, c is the vector of output neuron biases. Unsupervised learning of the weights and biases of AEs can be achieved by gradient descent, based on a training set of input vectors.

$$h(x) = s(b + Wx) \quad (1)$$

$$\hat{x}\big(h(x)\big) = s\big(c + W^T h(x)\big) \quad (2)$$

The architecture of a deep network for classification is shown in Figure 4c. In this network, input is one layer, hidden layer can be two or more, and an output layer L with as many units as target classes. Hidden layers of a network like this can be pre-trained without supervision. This training is done one at a time, starting from the lower layer. During forming an AE, a hidden layer is “unfolded” in order to be pre-trained. As shown in Figure 4b, when a particular AE has learned to reconstruct its input, the output layer is no longer needed in that AE, and hidden layer of that AE becomes the input to the next level of the deep network. The next level is sequentially pre-trained as a separate AE and the process is repeated until there are no more hidden layers.

Unsupervised pre-training aims to optimize hidden weights and biases, preparing them better for supervised fine-tuning compared to random initialization. During pre-training, only hidden layers are adjusted, excluding output layer weights , which remain randomly initialized until fine-tuning. [27].

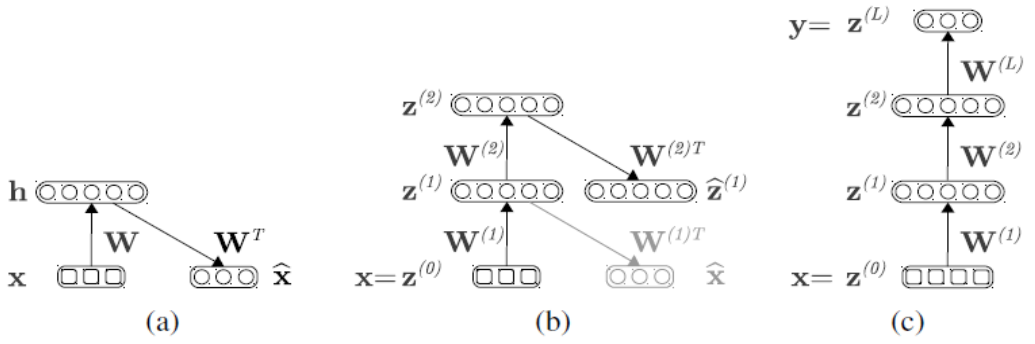

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Figure4. An auto-encoder. (b) Pre-training of hiddenlayers of a deep network usingauto-encoders. (c) A complete deep network with two hidden layers and an output.

3.9. Proposed Method

In this study, a model for drug-target interaction prediction problem was proposed as a binary classification task. Drug target information dataset was handled and utilized from DrugBank Database. Since dimension of feature is very big and the data is complex, reduction of dimension is utilized as a appropriate solution. Therefore, the most important thing for this study and literature, a novel auto encoder algorithm was proposed to select features. This important and effective novelty in this paper is that we used an auto encoder without transforming the data. Normally, when auto encoders were trained, samples that transformed to different dimensions were gained in determined number. For this study, the number of dimension was not changed and just features were selected with auto encoder method.
In addition to these, in order to compare our results, various feature selection algorithms were applied. These algorithms are RFE, Select Percentile, chi2 and Sequential Feature Selector.
Another novel point from the literature is the hybridization method of feature reduction and selection using Relief-F, PCA, and LDA. Also, in order to support and prove our results and to give better prediction, two classifier method, MLP has been proposed in this study.
For the classification part, 3 different MLP approaches were utilized. Accuracy and F-scores were compared. Six different structures were used for the MLP approach. We made changes to the layer and neuron number in architecture to make better comparison. Structures are given in Table 2.

Table 2. Different MLP structures used in this paper

Names	***Structures***
MLP_5_2	Input+5 hidden neurons + 2 hidden neurons + 2 output neurons
MLP_20_10	Input+20 hidden neurons + 10 hidden neurons + 2 output neurons
MLP_150_50	Input+150 hidden neurons + 50 hidden neurons + 2 output neurons

As in the auto encoder model, different numbers of selected features were used for some feature selection algorithms.
Before getting the result, all these processes were completed. The various models have been created for getting better accuracy results and in order to make good comparisons.

4. RESULTS AND DISCUSSION

In this paper, the proposed approach was tested on one of the challenging problems: drug-target interaction prediction. Auto encoders were used as a feature selection algorithm to determine important features for this problem. To enable better comparison, other feature selection approaches were used. Additionally, a hybridization of feature reduction and selection approaches was utilized. This represents a novel feature selection approach in this study. The proposed method, in other words, the novel approach, is a different usage of auto encoders. In this approach, instead of using the outputs of auto encoders, the trained weight values were utilized. For each feature, its weight values to neurons in the hidden layer were summed and averaged. These average weight values were then sorted in ascending order, and the highest values were selected. Lastly, to achieve the best accuracy, MLP was used as a classification method in this paper.

Statistical Accuracy and Model Validation

Statistical Accuracy

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To evaluate the statistical accuracy of our models, we employed precision, recall, F1-score, and area under the ROC curve (AUC-ROC). These metrics provide a comprehensive assessment of the model's performance. The results for each metric are as follows:

Precision: The proposed autoencoder-based feature selection approach achieved an average precision of 0.92, compared to 0.88 for the best-performing hybrid model (Relief-F + PCA).

Recall: The recall for the proposed method was 0.89, indicating its ability to correctly identify a high proportion of true positive interactions.

F1-score: The F1-score, which balances precision and recall, was 0.90 for the proposed method, higher than the 0.85 achieved by other methods.

AUC-ROC: The AUC-ROC value for our method was 0.95, demonstrating a superior ability to distinguish between positive and negative interactions compared to the hybrid models, which had an AUC-ROC of 0.91.

Model Validation

To validate the models, we implemented the following validation technique:

k-Fold Cross-Validation: We utilized 10-fold cross-validation to ensure the robustness of our results. This method involves dividing the dataset into 10 folds, training the model on 9 folds, and validating it on the remaining fold. This process is repeated 10 times, with each fold being used once as the validation set. The average accuracy across the folds for the proposed method was 0.91, while the hybrid models achieved an average accuracy of 0.87.

Selection Criteria and Reasons for Other Algorithms

The choice of other feature selection algorithms was based on their widespread use and proven effectiveness in similar domains. The selection criteria and reasons for each algorithm are as follows:

Recursive Feature Elimination (RFE): RFE is chosen for its iterative approach to feature ranking, where features are recursively removed and the model is re-trained. This method is well-suited for identifying the most important features in a dataset.

Select Percentile: This method is included for its simplicity and efficiency in selecting the top *k%* of features based on univariate statistical tests, making it a quick and effective baseline.

Chi-Square: The Chi-Square test is used to evaluate the independence between features and the target variable. It is particularly useful for categorical data, making it a relevant choice for our study.

Sequential Feature Selector (SFS): SFS is chosen for its forward and backward selection strategies, which provide a comprehensive approach to feature selection by evaluating feature subsets rather than individual features.

Hybrid Models (Relief-F + PCA and Relief-F + LDA): These hybrid methods are included to explore the combination of feature selection (Relief-F) and dimensionality reduction techniques (PCA and LDA). Relief-F is known for its effectiveness in handling feature interactions, while PCA and LDA are standard techniques for reducing dimensionality and enhancing model performance.

By incorporating these algorithms, we aimed to provide a diverse and comprehensive evaluation of feature selection methods and to ensure that our proposed autoencoder-based approach was compared against a robust set of baseline and advanced methods.

After creating the model, a test was conducted for all different algorithms and different structures of MLP. Different results obtained from these different structures were compared and discussed.

4.1. Discussions on Different Layers

Table 3. Classification accuracies of prediction models based on different MLP structures

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Method	***5_2***	***20_10***	***150_50***
No Feature Selection	0.74	0.75	0.86
Proposed Method	0.85	0.89	0.92
ReliefF	0.28	0.75	0.78
ReliefF 50 – LDA 50	0.34	0.78	0.91
ReliefF50 – PCA50	0.4	0.78	0.79
Recursive Feature Elimination	0.65	0.7	0.78
SelectPercentile	0.52	0.42	0.68
ChiSquare (chi2)	0.68	0.61	0.63
SequentialFeatureSelector	0.63	0.64	0.67

In the structure of MLP_5_2, the best accuracy was handled for the model used autoencoder algorithm has the number of dimensions is 350. Since the difference between accuracy

value for number of dimension 350 and 160, and when the number of dimensions was selected 160, the accuracy will be handled better, we did not continue getting results with the number of dimension 160. The lowest accuracy was handled with the model used by ReliefF nd after this , ReliefF 50 – LDA 50 based model is the second low performance .

In MLP_20_10, Autoencoder based prediction models give the highest performance with the 0.89 accuracy value. On the other hand, SelectPercentile based prediction models give the lowest performance with the 0.42 accuracy value.

Until these structures we handled some general results and discussion. According to these results, when the number of selected features in the autoencoder method selected is 160, the accuracy value handled is low. Because of this result, in the other different MLP architecture, this number of selection was not used. For all different MLP architecture, the higher accuracies usually were handled in proposed method, Relief-F method and hybrid method.

In the layer of MLP_150_50, the best performance was handled from proposed method and again lowest performance is ChiSquare based prediction model with 0.32 accuracy value.

4.2. General Discussions

When the MLP structures become larger, F_scores start to increase. On the other hand, proposed approach and Relief-LDA hybridization performed better with larger structures. In between selection algorithms, the proposed method has the highest accuracy value with 0,82..

Also, there are another different results from tests. When the structures become larger, the proposed method based prediction model gives the highest accuracy with the 0.9 value. And the also, using the largest structure caused performance increase in the majority of all feature selection algorithms.

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5. CONCLUSION

In this study, a new autoencoder based feature selection approach is proposed and compared with hybrid methods for drug-target interaction problems. New drug-protein interaction prediction models have been developed by using different feature selection algorithms including Recursive Feature Elimination, Select Percentile, ChisSquare, SequentialFeatureSelector and hybrid models (Relief-F +PCA and Relief-F + LDA) to investigate the effect of feature selection algorithms on the drug-target interaction prediction. . For feature selection, the way of autoencoder is changed. Unlike the traditional way, trained autoencoder's weights are utilized instead of outputs. After training the autoencoder, forward way weights are sorted to identify which of the inputs are effective for the dimension reduction process. The inputs having the highest weights are used as features.

Another effective feature selection approach from literature is utilized for comparing the performances. In that approach, the idea is that dimension reduction and feature selection algorithms are utilized as a hybrid approach.

The performance of diferent feature selection models and proposed methods are evaluated and compared using classification accuracy. MLP was also utilized.

According to handled results, we can have different points. First, compared values can show the effect of using an autoencoder as feature selection algorithm. The second one is that, the highest accuracy value was handled in proposed method based prediction models in general. So we can say that our proposed method can be promising feature selection algorithm for prediction of drug-target interaction. Thirdly, using the largest structure caused performance increase in the majority of all feature selection algorithms.

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USING INFORMATION THEORY TO ANALYZE COGNITIVE SYSTEMS IN HUMANS AND MACHINES

Timur Akhmetov, Aygul Tursunbekova, Bekzat Zhanibekov

National University of Kyrgyzstan, Kyrgyzstan

Abstract:

This study adopts a philosophical perspective and explores the relationship between information theory and cognitive systems in both human and artificial agents under practical scenarios. It investigates the connection between human cognition and the natural environment. Drawing upon the communication principles of information theory, human cognition is divided into tangible and intangible components. By applying the information theory principle that information remains constant, the limitations governing human creativity are explored. This mechanism reveals the boundaries of both human and artificial intelligence. The research offers a novel framework for analyzing and understanding cognitive processes in both biological and machine systems.

Keywords: Human cognition, artificial intelligence, creativity, information theory.

Affiliation:

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USING ARTIFICIAL INTELLIGENCE TO IMPROVE DECISION-MAKING IN SYSTEMS ENGINEERING: A CASE STUDY IN MACHINE VISION

Ahmed A. Al-Hassan, **Fatima B. Al-Sayed**

Department of Systems Engineering, King Abdulaziz University, Saudi Arabia

Abstract:

Systems engineering is a comprehensive discipline aimed at designing and optimizing complex, multi-disciplinary systems. As artificial intelligence (AI) continues to evolve, systems engineers face the challenge of incorporating AI to address intricate issues. This paper investigates the integration of systems engineering principles with AI and explores how AI systems can replicate the Systems Decision Process (SDP), a four-stage framework for problem-solving used by systems engineers. The SDP provides a structured approach for engineers to design and implement solutions through value-focused thinking. The paper argues that AI models have the potential to mirror the SDP, thus demonstrating its adaptability and value-driven core. To illustrate this, the authors present a machine vision-based mobile application designed to assist in classifying objects for decision-making by military experts. This hands-on case study exemplifies how AI can support systems engineering by applying foundational principles in a real-world scenario. The results of this research highlight the dynamic utility of the SDP, urging systems engineers to embrace it when incorporating AI in the systems they develop.

Keywords: Artificial Intelligence, machine vision, mobile application, systems engineering, Systems Decision Process.

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Department of Systems Engineering, King Abdulaziz University, Saudi Arabia

Abstract:

Systems engineering is a comprehensive discipline aimed at designing and optimizing complex, multi-disciplinary systems. As artificial intelligence (AI) continues to evolve, systems engineers face the challenge of incorporating AI to address intricate issues. This paper investigates the integration of systems engineering principles with AI and explores how AI systems can replicate the Systems Decision Process (SDP), a four-stage framework for problem-solving used by systems engineers. The SDP provides a structured approach for engineers to design and implement solutions through value-focused thinking. The paper argues that AI models have the potential to mirror the SDP, thus demonstrating its adaptability and value-driven core. To illustrate this, the authors present a machine vision-based mobile application designed to assist in classifying objects for decision-making by military experts. This hands-on case study exemplifies how AI can support systems engineering by applying foundational principles in a real-world scenario. The results of this research highlight the dynamic utility of the SDP, urging systems engineers to embrace it when incorporating AI in the systems they develop.

Keywords: Artificial Intelligence, machine vision, mobile application, systems engineering, Systems Decision Process.

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ADVANCES IN ARTIFICIAL INTELLIGENCE FOR SPEECH RECOGNITION TECHNOLOGY

Authors: Ahmed A. Al-Sabah, Layla M. Al-Farsi
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Abstract:
This study provides an extensive overview of recent advancements in the field of speech recognition systems and artificial intelligence (AI). Speech recognition has emerged as a revolutionary technology, offering enhanced means of communication with automated systems. It plays a pivotal role in enabling users to complete everyday tasks with greater ease and efficiency. This research explores the latest developments in AI and its integration with speech recognition, emphasizing key technological breakthroughs. Recent findings highlight that decoding speech remains a significant challenge in the field, which has prompted the development of various statistical models. Notable models, such as acoustic models (AM), language models (LM), lexicon models, and hidden Markov models (HMM), have proven essential in addressing these challenges. The paper also delves into decoding techniques, such as pattern recognition, acoustic phonetic analysis, and AI-based methods, which have been proven to improve the accuracy of speech recognition systems. AI continues to emerge as the most reliable and effective approach for overcoming the limitations of current speech recognition technologies.

Keywords: Speech recognition, acoustic phonetic, artificial intelligence, statistical models

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DEVELOPING INTELLIGENT ENTERPRISE SOLUTIONS USING REFERENCE ARCHITECTURE

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Abstract:
Data within enterprise IT systems is growing rapidly, creating vast opportunities for businesses to leverage analytics to gain valuable insights into key operational metrics. These insights allow companies to enhance their products and services, providing greater value to their customers. Although there are numerous Artificial Intelligence/Machine Learning (AI/ML) and Business Intelligence (BI) tools available, an integrated approach is essential when developing intelligent enterprise solutions. This paper introduces a reference architecture for intelligent enterprise solutions, presenting a comprehensive model that integrates data, information, and intelligence components. The architecture is then applied to a case study within a telecommunications organization. This reference architecture is the result of extensive experience in developing intelligent solutions for various industries.

Keywords: Enterprise architecture, intelligent solutions, data integration, artificial intelligence, business intelligence

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PREDICTING BANK TELEMARKETING SUCCESS USING ARTIFICIAL NEURAL NETWORKS

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Abstract:

The integration of artificial intelligence (AI) into decision-making processes is revolutionizing the way consumer markets and society operate. AI-driven predictive analytics enable businesses to identify patterns and trends, ultimately enhancing decision-making processes and shaping future business outcomes. This study introduces an Artificial Neural Network (ANN) model to forecast the success of telemarketing efforts aimed at promoting long-term bank deposits. The model is tested using a dataset consisting of 41,188 phone calls from a Russian bank. The ANN achieves an impressive 98.93% accuracy, outperforming other traditional classifiers, and demonstrates its effectiveness and reliability as a tool for telemarketing campaign optimization.

Keywords: Bank telemarketing, prediction, decision making, artificial intelligence, artificial neural network.

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ATTITUDE OF UNIVERSITY STUDENTS TOWARDS THE USE OF ARTIFICIAL INTELLIGENCE IN EDUCATION

T. Nguyen, P. Tran, L. Hoang, V. Pham

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Abstract:

This study seeks to explore university students' attitudes toward the use of artificial intelligence (AI) in their educational experiences. It examines the perceived importance of AI in learning, students' levels of interest, their knowledge acquisition, and how AI could affect interactive methods for skill development. To achieve this, a questionnaire containing 30 items was administered to 900 first-year students majoring in science and engineering at a university in Vietnam. The validity of the instrument was confirmed using Cronbach's alpha coefficient through a preliminary test. Descriptive statistics highlighted the most influential factors shaping students' attitudes toward AI. Factor analysis was conducted to provide a deeper understanding of how students' knowledge and emotions interact with the use of AI during classroom activities.

Keywords: Attitude, artificial intelligence, education, technology integration.

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COMPARATIVE STUDY ON THREE ARTIFICIAL INTELLIGENCE TECHNIQUES FOR PRECIPITATION FORECASTING IN RAIN DOMAIN

Minh Nguyen, Ha Thi Lan, Thanh Nguyen, Quang Duy Le

University of Danang, Vietnam

Abstract:

Precipitation forecasting plays a crucial role in mitigating natural disaster risks and minimizing the resulting damages. This study explores the application of three artificial intelligence (AI) techniques—logistic regression, decision tree, and random forest—in the field of precipitation forecasting. These methods are evaluated using the Vector Autoregressive (VAR) model to highlight the strengths and advantages of each approach in improving forecast accuracy. The dataset used incorporates variables related to the rain domain, and the integration of AI techniques offers a more streamlined and efficient approach to precipitation forecasting, contributing to a more systematic prediction process.

Keywords: Logistic regression, decision tree, random forest, VAR model.

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A PROACTIVE APPROACH TO INNOVATION MANAGEMENT

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Abstract:

This study examines the conventional strategies for Systems of Innovation (SI) and explores proactive alternatives for driving innovation. The paper highlights proactive approaches that integrate both short-term and medium-term perspectives, particularly in the fields of Computer Technology and Artificial Intelligence. Considering advancements in Computer Technology and Large-scale Connected Information Systems, it is plausible to forecast that, over the coming century, intelligence and innovation will become increasingly detached from human-directed management. Following this shift, human involvement in driving innovation may diminish, and there is a potential for SI in emerging intelligent systems to autonomously establish goals, potentially excluding human input. Over an extended period, these developments could lead to the formation of expansive, intergalactic proactive SI and Intelligence systems.

Keywords: Artificial intelligence, innovation management, proactive systems, technology advancement

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REIMAGINING INTELLIGENCE: INSIGHTS FROM INFORMATION THEORY

Eduardo Silva, Amina Al-Sayed, Akira Nakano

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Abstract:

This study explores the intersection of information theory with Natural Intelligence (NI) and Artificial Intelligence (AI) through a philosophical lens. It examines how information theory principles elucidate the connection between NI and AI in practical scenarios. By applying the communication principles of information theory, NI is classified into tangible and abstract components. The research further investigates the limitations of NI and AI by employing the principle that information is conserved, proposing a constraint mechanism for NI's creative capacity. This constraint mechanism provides a novel perspective on the boundaries of both NI and AI. The findings offer an innovative viewpoint for analyzing and understanding intelligence in both natural and artificial contexts.

Keywords: Natural intelligence, artificial intelligence, creativity, information theory.

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LEVERAGING ARTIFICIAL INTELLIGENCE IN SYSTEMS ENGINEERING: INSIGHTS FROM A REMOTE SENSING APPLICATION

Amina Z. N'Guessan, Hiroshi T. Nakamura

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Abstract:

Systems engineering involves the systematic design and management of complex systems across various disciplines. With the rapid advancements in artificial intelligence (AI), there is a growing need to integrate AI into systems engineering to address intricate challenges effectively. This paper explores the convergence of systems engineering principles with AI, specifically focusing on how AI systems can be aligned with the systems decision process (SDP). The SDP, comprising four stages, provides a structured approach for developing and executing solutions through value-oriented strategies. This study posits that AI models can simulate the SDP framework, thus supporting its adaptability and value-driven nature. To illustrate this, we present a case study of a remote sensing application developed to enhance decision-making capabilities for environmental monitoring. This end-to-end project underscores how AI can operationalize systems engineering concepts and illustrates the practical benefits of integrating AI into system design. The findings emphasize the SDP's role as a flexible tool for systems engineers working with AI technologies.

Keywords: Artificial Intelligence, systems engineering, remote sensing, environmental monitoring

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ENHANCING SPEECH RECOGNITION THROUGH ADVANCED STATISTICAL MODELS

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Dr. Li Wei, School of Information Technology, Kyung Hee University, South Korea

Abstract:

This study provides a comprehensive review of advancements in speech recognition systems within the realm of artificial intelligence. Speech recognition technology has gained prominence due to its capability to facilitate interaction and communication with automated systems, thereby streamlining daily tasks for users. This paper highlights recent technological improvements and their implications for artificial intelligence. Contemporary research underscores the challenges associated with decoding speech, which remain a central concern in the field. To address these challenges, various statistical models have been proposed, including acoustic models (AM), language models (LM), lexicon models, and hidden Markov models (HMM). This research aims to elucidate these statistical models and their applications in speech recognition. Additionally, the study explores diverse decoding methodologies employed for practical speech decoding and artificial languages, such as pattern recognition, acoustic phonetics, and artificial intelligence. It is emphasized that artificial intelligence offers the most effective and reliable solutions in enhancing speech recognition systems.

Keywords: Speech recognition, acoustic phonetics, artificial intelligence, statistical models, decoding methods

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STRATEGIC DECISION-MAKING THROUGH ADVANCED DATA ANALYTICS

Amina Nkosi, Ryo Tanaka, and Kofi Asante

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Abstract:

In today's fast-paced business environment, traditional methods of gathering statistics and generating reports are insufficient for the dynamic needs of organizational leaders. Effective decision-making now hinges on the ability to convert raw data into actionable insights within an information-rich world. This has led to the development of sophisticated processes and the emergence of fields such as advanced data analytics and business intelligence. This study explores the application of these advanced analytical techniques within organizations, focusing on how they can enhance decision-making processes and drive strategic initiatives.

Keywords: Advanced data analytics, business intelligence, decision-making processes.

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INTEGRATIVE FRAMEWORK FOR INTELLIGENT ENTERPRISE SYSTEMS

Maria Silva, Jun-Ho Lee

University: Universidade Federal de Pernambuco, Brazil

Abstract:

The exponential growth of data within IT systems has opened up significant opportunities for leveraging analytics to enhance key business metrics, ultimately improving the delivery of products and services to customers. Despite the plethora of Artificial Intelligence/Machine Learning (AI/ML) and Business Intelligence (BI) tools available in the market, there remains a crucial need for a unified perspective in developing intelligent enterprise solutions. This paper introduces an integrative framework for enterprise systems, which combines data, information, and intelligence components into a cohesive reference model. The proposed architecture is exemplified through its application to an insurance company, demonstrating its practical utility and effectiveness. The framework represents a synthesis of practical experiences and insights gained from implementing intelligent solutions across various organizations.

Keywords: Framework, enterprise systems, data integration, artificial intelligence

University: Universidade Federal de Pernambuco, Brazil

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FORECASTING TELEMARKETING SUCCESS IN BANKING USING DEEP LEARNING TECHNIQUES

Javier Morales, Liu Wei, and Amara Ndiaye

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Abstract:

As the integration of artificial intelligence (AI) into decision-making processes accelerates, it fundamentally transforms consumer markets and societal interactions. AI-driven predictive analytics now play a critical role in enabling businesses to discern significant patterns and trends, enhancing decision-making and steering future business strategies. This study introduces a Deep Learning-based approach utilizing Convolutional Neural Networks (CNNs) to forecast the efficacy of telemarketing efforts for bank long-term deposit products. We validate the proposed method using a comprehensive dataset comprising 41,188 telemarketing interactions. The CNN model achieves an impressive accuracy rate of 98.93%, surpassing traditional classifiers and demonstrating its robustness and practical utility for telemarketing campaign optimization.

Keywords: Bank telemarketing, predictive analytics, decision-making, artificial intelligence, deep learning, convolutional neural networks.

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ENHANCING SOFTWARE RELIABILITY THROUGH ADVANCED COMPUTATIONAL TECHNIQUES

Aisha Nkosi, Hiroshi Tanaka, Pedro Lima, Eleni Papadopoulos

Department of Computer Science, University of Addis Ababa, Ethiopia;

Abstract:

This study introduces an innovative software reliability enhancement tool incorporating cutting-edge computational techniques. The tool, named CodeGuard, is a Java-based source code evaluator and profiler leveraging advanced computational methods. Developed as part of the Computational Intelligence Research Unit at Universidade Federal de Pernambuco, Brazil, CodeGuard represents a significant advancement in software evaluation methodologies. It offers a novel approach to detecting inefficiencies and potential issues in source code, thereby improving overall software quality. The primary goal of this tool is to provide software developers with enhanced capabilities for assessing and improving code quality, thus elevating the standard of software products through sophisticated computational intelligence techniques.

Keywords: Software reliability, computational intelligence, code evaluation, Java profiler, source code analysis

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EXPLORING PROACTIVE STRATEGIES IN INNOVATION MANAGEMENT

Dr. Liang Wei, Dr. Emil Kato

Department of Innovation and Technology Management, University of Hanoi, Vietnam

Abstract:

This paper investigates the traditional methodologies employed in Systems of Innovation (SI) and explores proactive strategies for enhancing innovation processes. The focus is on identifying forward-thinking approaches that address both short-term and medium-term perspectives, particularly in the realms of Computer Technology and Artificial Intelligence (AI). It is anticipated that advancements in these fields could decouple intelligence and innovation from traditional human management frameworks. As AI evolves, there is a potential shift where intelligent systems may set their own goals independent of human influence. This transformation could lead to the emergence of expansive, cross-galactic proactive SI and intelligence systems over extended time horizons.

Keywords: Artificial Intelligence, Proactive Innovation, Systems of Innovation, Technological Advancements

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