

Proceeding

of the

1th INTERNATIONAL CONFERENCE ON Artificial Intelligence (ICAI 2025)

Shahid Beheshti University, Tehran, Iran

25- 26 February 2025



<https://iai-conf.ir/en>



ICAI

First International Conference on
Artificial Intelligence





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MESSAGE FROM THE CHAIR

The ever-increasing advancement of artificial intelligence and the macro-level policies of the country towards the utilization and development of artificial intelligence infrastructures, as well as the social mission of academics in guiding emerging events, prompted us to plan the International Conference on Artificial Intelligence about a year in advance. The goal of this conference is to harmonize the three sides of artificial intelligence development triangle: university, governance, and industry. Governance as the policymaker, university as the research and development unit, and industry as the frontline for using research results play a very important role in the accurate development and appropriate use of achievements.

We hope that we have been able to play an effective role in achieving these goals.

Mohsen Ebrahimi Moghadam



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Student Committee

(The following names are listed in alphabetical order (A to Z).)

- Amirhossein Gaffarian
- Amirhossein Sadr
- Aras Valizadeh
- Armita Kamari
- Hoda Attari
- Sadeg Aref
- Seyed Alireza Nouri Nasab
- Seyed Sadra Mousavi

Thanks to all the other students who helped us organize this conference.



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conference pooster



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AI4All
Artificial Intelligence For All



Scan Me

Tracks

- Image Processing and Machine Vision
- Text and Natural Language Processing
- Voice and Speech Processing
- Knowledge Representation and Reasoning (Knowledge Engineering)
- Robotic
- Machine Learning Algorithms and Applications
- Data Mining
- Cognitive and Computational Neuroscience
- Artificial Intelligence in Games
- Artificial intelligence Hardware Platforms
- Bioinformatics
- Applications of AI in other fields of engineering
- Applications of AI in Health
- Applications of AI in Humanities and Social Sciences

Goals And Focuses

- Deep Learning
- Deep Reinforcement Learning
- Explainable Artificial Intelligence
- Responsible Artificial Intelligence
- Generative Artificial Intelligence
- Knowledge Distillation
- Large Language Models
- Imitation Learning and Demonstration Learning

Conference Chair

Prof. Seyed Mahmoud Reza Aghamiri
(President of Shahid Beheshti University)

Prof. Mohsen Ebrahimi Moghaddam
(Faculty of Computer Science and Engineering, SBU)

Scientific Committee Chair

Dr. Mehrnoush Shamsfard
(Faculty of Computer Science and Engineering, SBU)

Executive Committee Chair

Dr. Armin Salimi-Badr
(Faculty of Computer Science and Engineering, SBU)

Important Dates

Event Date: 25 February 2025 to 27 February 2025

Start of Paper Submission: 5 August 2024

19 November

End of Paper Submission: 30 November 2024

Announcement of Results: 19 January 2024



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International Conference Center

Selected articles of this conference will be published in
Journal of Innovations in Computer Science and Engineering

iai-conf.ir

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Schedule

1st International Conference on Artificial Intelligence

Reception		8:00 - 8:30					
Time							
8:30 - 10:00	<p>Opening Ceremony Recitation of the Quran and National Anthem Speech by the University President - Dr. Mahmoud Aghamiri Speech by the Conference Chair - Dr. Ebrahimi Moghaddam Speeches by Special Guests Location: Main Hall</p>						
10:00 - 10:30	Refreshments						
10:30 - 12:30	<p>First Keynote Speaker - Dr. Majid Nili Ahmatabadi (University of Tehran) Second Keynote Speaker - Dr. Gianluigi Folino (ICAR-CNR) Location: Main Hall</p>						
12:30 - 14:00	Break, Lunch, and Prayer						
14:00 - 15:30	<p>Panel: Artificial Intelligence in Higher Education Location: Main Hall</p>	<p>Panel: Artificial Intelligence in Traffic Control Location: Allameh Tabatabaee Hall</p>	<p>Session: Natural Language Processing Location: Sheikh Bahaei Hall</p>	<p>Session: Image Processing Location: Shahryar Hall</p>	<p>Poster Presentations Session 1 Location: Second Floor</p>	<p>Workshop: Applications of Artificial Intelligence in Financial Markets Location: Parvin Etesami Hall</p>	
15:30 - 16:00	Refreshments						
16:00 - 17:30	<p>Panel: Artificial Intelligence Infrastructure Location: Main Hall</p>	<p>Session: Language and Speech Processing Location: Khayyam Hall</p>	<p>Session: Artificial Intelligence in Health and Medicine Location: Khwarizmi Hall</p>				
17:30 - 18:30	<p>Third Keynote Speaker - Dr. Barbara Eugenia (University of Illinois) Location: Main Hall</p>						
8:30 - 10:00	<p>Panel: Intelligent Agent Design in Water Waste Management Location: Main Hall</p>	<p>Session: Health and Bioinformatics Location: Sheikh Bahaei Hall</p>	<p>Session: Games, Robotics, and Cognitive Sciences Location: Khwarizmi Hall</p>	<p>Panel: Artificial Intelligence in Infertility Location: Khayyam Hall</p>	<p>Workshop: Graph Mining and Big Data Location: Shahryar Hall</p>	<p>Workshop: Smart Oil Industry Location: Parvin Etesami Hall</p>	<p>Workshop: Prompt Engineering for Large Language Models Location: Allameh Tabatabaee Hall</p>
10:00 - 10:30	Refreshments						
10:30 - 12:00	<p>Panel: Applications of Artificial Intelligence in Business Development Location: Main Hall</p>	<p>Session: Applications of Artificial Intelligence in Engineering Location: Khayyam Hall</p>	<p>Session: Applications of Machine Learning (Information Security and E-commerce) Location: Khwarizmi Hall</p>				
12:00 - 13:00	Break, Lunch, and Prayer						
13:00 - 14:30	<p>Panel: Artificial Intelligence in Administrative Systems Challenges and Necessary Actions Location: Main Hall</p>	<p>Session: Artificial Intelligence in Humanities Location: Sheikh Bahaei Hall</p>	<p>Poster Presentations Session 2 Location: Second Floor</p>	<p>Workshop: Software Development with Artificial Intelligence on No-Code Platforms Location: Khayyam Hall</p>	<p>Workshop: Generative Networks in Image Processing Location: Parvin Etesami Hall</p>		
15:00 - 14:30	Refreshments						
15:00 - 16:30	<p>Panel: The Role of Artificial Intelligence in the Oil and Petrochemical Industry Location: Main Hall</p>	<p>Panel: Applications of Artificial Intelligence in Education Location: Allameh Tabatabaee Hall</p>					
16:30 - 17:30	<p>Final Keynote Speaker - Dr. Hossein Rahmani (Lancaster University) Location: Main Hall</p>						
18:30 - 17:30	<p>Closing Ceremony Special Guest Speech Acknowledgments and Award Presentation Location: Main Hall</p>						

Tuesday
February 25

Wednesday
February 26



Venue

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keynote speaker



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Prof. Majid Nili Ahmad Abadi

Time: Tuesday, February 25, 10:30-12:30

Title: Personalized AI Agents: A Social Learning Paradigm

Abstract: The future of AI democratization depends on truly personalized AI agents. However, current machine learning approaches are often too complex, slow, and costly for scalable personalization by everyday users. In contrast, biological intelligence seamlessly integrates social and individual learning to adapt efficiently. This talk explores how social learning can revolutionize AI personalization, making intelligent systems more accessible, adaptable, and user-driven.

Bio: Majid Nili Ahmadabadi (Member, IEEE) received the B.Sc. degree from the Sharif University of Technology, Tehran, Iran, in 1990, and the M.Sc. and Ph.D. degrees in information sciences from Tohoku University, Sendai, Japan, in 1994 and 1997, respectively. He was an Invited Visiting Professor with the Autonomous System Laboratory, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland, in 2005, and with ETH Zürich, Zürich, Switzerland, in 2008. He joined the Advanced Robotics Laboratory, Tohoku University. Later, he moved to the School of Electrical and Computer Engineering, College of Engineering, University of Tehran, Tehran, where he is currently a Professor and the Dean of the School of Electrical and Computer Engineering (ECE); the Head of the Robotics and artificial intelligence (AI) Laboratory; the Founder and the Director of the Cognitive Robotics Laboratory; and also a Senior Researcher with the School of Cognitive Sciences, Institute for Research in Fundamental Sciences. His current research interests include cognitive robotics and modeling cognitive systems, learning systems, distributed robotics, object manipulation, and mobile robots.

Time: Tuesday, February 25, 10:30-12:30

Dr. Gianluigi Folino

Title: Decentralized AI for Cybersecurity: The Power of Federated Learning

Abstract: Data sovereignty and regulations, along with growing concerns over privacy and security, underscore the limitations of centralized machine learning (ML) in sensitive domains like cybersecurity. Federated Learning (FL) has emerged as a promising paradigm, enabling the collaborative training of global models without sharing raw data, thereby aligning with privacy and sovereignty requirements while meeting the demand for advanced ML analytics.

This talk addresses these challenges and presents a framework based on sparse Mixture of Experts (MoE) architectures for FL in vertically federated settings, where parties hold complementary subsets of features. Sparse MoEs improve computational and energy efficiency by selectively activating experts and leveraging conditional computation.



The framework mitigates risks of information leakage and reduces communication costs, supporting efficient model training and deployment. Additionally, the talk explores key attack scenarios, defense strategies, and efficient methods for distributing the VFL paradigm with minimal communication overhead.

Bio: Gianluigi Folino received a Ph.D. in physics, mathematics, and computer science from Radboud University in Nijmegen (Holland), The Netherlands. Since 2001, he has been a senior researcher at the Institute of High Performance Computing and Networking, Italian National Research Council (ICAR-CNR), Rende, Italy. He is also a Lecturer at the University of Calabria. Within ICAR-CNR, he has been the coordinator of several national and international research/ industrial projects: “Cyber Security – Digital and Electronic Payment Services Protection” in 2013 and currently for the SPOKE 1 (Digital Sovereignty) of the PNRR Project SEcurity and RIghts in the CyberSpace (SERICS). He published more than 150 papers in international conferences and journals among which the IEEE Transactions on Evolutionary Computation, IEEE Transactions on Knowledge and Data Engineering, Information Sciences, Information Fusion and Bioinformatics. His research interests focus on applications of distributed computing and data mining in the areas of cybersecurity, big data, and bioinformatics. Dr. Folino is on the Editorial Board of Applied Soft Computing (Elsevier).



Prof. Barbara Di Eugenio

Time: Tuesday, February 25, 17:30-18:30

Title: Engaging Patients in Healthcare: Conversational Assistants in the era of LLMs

Abstract: Effective and compassionate communication with patients is becoming central to healthcare, and Natural Language Processing can play a central role in this endeavor. I will discuss the results of and lessons learned from two ongoing projects in this space, but also address the problem of bias in our computational models, especially LLMs.

The VIRTUAL-COACH project models health coaching interactions via text exchanges that encourage patients to adopt specific and realistic physical activity goals; the HFChat project envisions an always-on-call conversational assistant for heart failure patients, that they can ask for information about lifestyle issues such as food and exercise. In the HFChat project, we directly compared an in-house conversational interface with one based on ChatGPT. This will bring me to the third part of the talk, in which I will discuss our study of bias in LLMs applied to healthcare.

All our work is characterized by: large interdisciplinary groups of investigators who bring different perspectives to the research; grounding computational models in ecologically valid data, which is small by its own nature; and a focus on culturally appropriate interventions and on the ethical concerns of deploying such applications.

Bio: Barbara Di Eugenio is the Warren S. McCulloch Collegiate Professor and Director of Graduate Studies in the Computer Science department at the University of Illinois Chicago (USA). There she leads the NLP laboratory (<http://nlp.cs.uic.edu/>). She obtained her PhD in Computer Science from the University of Pennsylvania (1993). Her research has always focused on the pragmatics and computational modeling of discourse and dialogue, grounded in authentic data collection on the one hand, and in user studies on the other. The applications of her work run the gamut from educational technology to human-robot interaction, from data visualization to healthcare. Dr. Di Eugenio is an NSF CAREER awardee (2002); a UIC University Scholar (2018-2020); a Zenith Award recipient from AWIS, the Association for Women in Science (2022); and an Association of Computational Linguistics Fellow (2023). She has been the editor-in-chief for the Journal of Discourse and Dialogue since 2019. She is very proud to have graduated 16 PhD and 32 Master's students.



Prof. Hossein Rahmani

Time: Wednesday, February 26, 16-16:45

Title: Toward Privacy Preserved Large Multi-Modal Models

Abstract: Large Multimodal Models (LMMs), such as GPT-4V and LLaVA, have become essential across various industries, including healthcare, e-commerce, autonomous driving, and robotic manipulation. Given their widespread applicability and transformative potential, LMM-based products are expected to constitute a significant and rapidly growing market.

However, the immense potential of LMMs has also sparked growing concerns about privacy and copyright protection, voiced by diverse stakeholders throughout the LMMs' lifecycle. From the general public's perspective: 1) their personal data shared online is vulnerable to exploitation without their authorization or even awareness, by third parties like LMM services. 2) Additionally, using LMM services often requires individuals to proactively upload personal data to the cloud, further heightening concerns about potential privacy breaches. From the perspective of LMM providers: 1) Retaining knowledge that violates privacy or copyright within their models can be illegal. 2) Furthermore, their models, which they have invested significant effort in developing, are also at high risk of being stolen or misused.

The aim of this talk is to explain the problem from the perspective of LMM providers as well as the general public's perspective and introduce two methods that address privacy concerns from the public's standpoint.

Bio: Professor in Computer Vision and Machine Learning, Lancaster University. Associate Editor of IEEE Transactions on Neural Networks and Learning Systems, Pattern recognition, ACM Computing Surveys , and Area Chair of CVPR 2025, CVPR 2024, ICLR 2025, ECCV 2024, IJCAI 2023 and IJCAI 2024.



Honorary speakers



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Dr. Hossein Afshin

Dr. Hossein Afshin is a distinguished Iranian engineer and academic, specializing in electrical engineering and advanced technologies. With a Ph.D. in Electrical Engineering, he has contributed significantly to research in areas such as power systems, renewable energy, and smart grid technologies. His work aligns with the growing intersection of artificial intelligence and energy systems, particularly in optimizing energy efficiency and sustainability.

Dr. Afshin has held academic positions at leading universities in Iran, where he has mentored students and researchers in cutting-edge engineering disciplines. His research publications and projects reflect a commitment to innovation and the practical application of technology for societal benefit.

As an advocate for sustainable development, Dr. Afshin emphasizes the role of AI and smart technologies in addressing global energy challenges. His expertise and leadership continue to inspire advancements in Iran's engineering and technology sectors

Dr. Fatemeh Mohajerani

Dr. Fatemeh Mohajerani is a prominent Iranian politician and the current spokesperson for the Iranian government. She made history on July 28, 2024, by becoming the first woman to hold this prestigious position.

With an impressive academic background, Dr. Mohajerani holds a Master's degree in Mechanical Engineering and a Doctorate in Business Administration from Heriot-Watt University in Scotland.

Prior to her appointment as government spokesperson, Dr. Mohajerani served as the head of the Technical and Vocational Training University of Shariati. She also led the National Organization for Developing Brilliant Talents during the 12th government, demonstrating her commitment to education and talent development in Iran.





Oral papers



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Meeting Schedule

of the First International Conference on Artificial Intelligence

Article number	chairman	Subject	time
<ul style="list-style-type: none"> • iai-1125 • iai-1093 • iai-1080 • iai-1130 	Dr. Bokaei & Dr. Malek	Natural Language Processing	14:00-15:30
<ul style="list-style-type: none"> • iai-1082 • iai-1074 • iai-1089 	Dr. Soriani & Dr. Mahmoudi	Image Processing and Computer Vision	14:00-15:30
<ul style="list-style-type: none"> • iai-1129 • iai-1063 • iai-1084 • iai-1121 	Dr. Homayounpour & Dr. Tabibian	Speech and Language Processing	16:00-17:30
<ul style="list-style-type: none"> • iai-1144 • iai-1040 • iai-1118 	Dr. Moghaddasi & Dr. Talebpour	Artificial Intelligence in Health and Medicine	16:00-17:30
<ul style="list-style-type: none"> • iai-1122 • iai-1091 • iai-1018 • iai-1022 	Dr. Kharadpisheh & Dr. Abdous	Artificial Intelligence in Health and Bioinformatics	8:30-10:30
<ul style="list-style-type: none"> • iai-1090 • iai-1136 • iai-1120 • iai-1086 • iai-1035 	Dr. Mahdiani & Dr. Nejat	Game, Robotics, and Cognitive Sciences	8:30-10:30
<ul style="list-style-type: none"> • iai-1096 • iai-1110 • iai-1052 • iai-1111 	Dr. Noorzad & Dr. Abin	Applications of Artificial Intelligence in Engineering	11:00-12:30
<ul style="list-style-type: none"> • iai-1141 • iai-1138 • iai-1094 • iai-1079 	Dr. Jahanian & Dr. Soleimani	Applications of Machine Learning (Information Security and E-Commerce)	11:00-12:30
<ul style="list-style-type: none"> • iai-1124 • iai-1069 • iai-1045 	Dr. Mohammadi & Dr. Riahi	Artificial Intelligence in Humanities	13:30-15:00

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Venue:

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Tuesday - February 25

14-15:30

Article code:1125

DOR: 20.1001.2.0324048873.1403.1.1.62.3

Intermediate Fine-Tuning for Robust Persian Emotion Detection in Text

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Abstract— Emotion recognition in text is a growing area in Natural Language Processing (NLP), essential for improving human-computer interactions by allowing systems to interpret emotional expressions. While much progress has been made in English, Persian emotion recognition has seen limited development due to resource constraints and linguistic challenges. In this study, we address these gaps by leveraging two key Persian datasets, ArmanEmo and ShortEmo, to train an efficient emotion recognition model. Using FaBERT, a BERT-based model optimized for Persian, we employ intermediate fine-tuning on a large collection of informal and formal Persian texts to enhance the model's adaptability to colloquial language. This step significantly improves comprehension of Persian text

variations, as reflected in reduced perplexity scores. Our final evaluations, incorporating accuracy, precision, recall, and F1 score metrics, demonstrate that this fine-tuned FaBERT model achieves strong performance in emotion recognition, providing a promising approach for NLP in low-resource languages.

Keywords— Emotion Recognition, Persian Text Processing, Intermediate Fine-Tuning, BERT-based Models, NLP in Low-resource Languages.



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Tuesday - February 25 14-15:30

Article code:1093

DOR: 20.1001.2.0324048873.1403.1.1.33.4

Improvement in intent detection and slot filling by model enhancement and different data augmentation strategies

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Abstract—Intent detection and slot filling are crucial for understanding human language and are essential for creating intelligent virtual assistants, chatbots, and other interactive systems that interpret user queries accurately. Recent advancements, especially in transformer-based architectures and large language models (LLMs), have significantly improved the effectiveness of intent detection and slot filling. This paper, proposes a method for effectively utilizing low volume fine-tuning data samples to enhance the natural language comprehension of lightweight language models, yielding a nimble and efficient approach. Our approach involves augmenting new data while increasing model layers to enhance understanding of desired intents and slots. We explored various synonym replacement methods and prompt-generated data samples created by large language models. To prevent semantic meaning disturbance, we established a lexical retention list containing non- slots to preserve the sentence's core meaning. This strategy enhances the model's slot precision, recall, F1-score, and exact match metrics by 1.41%, 1.8%, 1.61%, and 3.81%, respectively, compared to not using it. The impact of increasing model layers was studied under different layer arrangement scenarios. Our results show that our proposed solution outperforms the baseline by 10.95% and 4.89% in exact match and slot F1-score evaluation metrics.

Keywords—intent detection, slot filling, joint model, BERT, language model, data augmentation



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Article code:1080

DOR: 20.1001.2.0324048873.1403.1.1.45.6

Split and rephrase: Simple Syntactic Sentences for NLP applications

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Alireza Talebpour

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Interdisciplinary Studies of Quran

Computer Science and Engineering

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Abstract—In today's world, simplifying compound and complex sentences into simple sentences is crucial for enhancing machine understanding in various natural language processing (NLP) tasks, such as inference, machine translation, and information extraction. This simplification process improves accuracy. Consequently, our research is inspired by a text simplification method called "split and rephrase." We introduce a new sequence-to-sequence text generation model that transforms complex sentences into simple ones based on the conjunction "and" in Persian. By utilizing linguistic models with millions or even billions of parameters, our approach facilitates a better understanding of text complexities and more accurate identification of breaking points. Our results show an output accuracy of 0.47 in the BLEU score for the generated simple sentences, which are both grammatically correct and fluent.

Keywords—Split and rephrase, Text simplification, Compound sentence, Complex sentence, Simple sentence, Text generation



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Article code:1130

DOR: 20.1001.2.0324048873.1403.1.1.67.8

Persian Intelligent Assistant in Healthcare Domain

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Abstract—Nowadays, advances in technology and medical science have led to significant changes in the field of healthcare. Consequently, an effort has been taken to develop an intelligent health assistant in the Persian language, focusing on the emergency department. To achieve this goal, a labeled dataset was prepared. Subsequently, an intelligent assistant architecture was developed, utilizing slot filling and speech act classification for natural language understanding. A dialogue manager was designed to address negation in patient statements, resulting in the classification of triage patients. Evaluation revealed that the assistant's performance matched that of emergency staff in 83% of cases.

Keywords— Intelligent Assistant, Natural language understanding, Speech act classification, Slot filling



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Tuesday - February 25 14-15:30

Article code:1082

DOR: 20.1001.2.0324048873.1403.1.1.27.8

Evaluating Parkinson's Disease Severity Through Attention-Based STGCN and S2AGCN Models Utilizing Kinect Skeleton Images

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Abstract— Parkinson's Disease (PD) is a prevalent neurological disorder marked by motor symptoms such as rigidity and tremors. Accurate and timely assessment of disease severity is essential for judging the efficacy of various treatment interventions. This study presents an innovative approach that employs computer vision technology—specifically Kinect cameras—paired with advanced deep learning techniques to enable precise evaluations of Parkinson's severity.

Leveraging the high accuracy of Kinect cameras in capturing essential movement patterns, our proposed system employs advanced convolutional neural networks, specifically incorporating mechanisms from the Spatial-Temporal Graph Convolutional Network (STGCN) and the Two-Stream Adaptive Graph Convolutional Network (2SAGCN). These architectures are adept at detecting movement anomalies and generating precise quantitative severity measures. To further enhance the performance of the 2SAGCN, we introduce distinct temporal and spatial attention modules, resulting in improved classification outcomes. The model achieves outstanding metrics, with accuracy, precision, recall, and F1 score recorded at 94.14 ± 0.26 , 98.1 ± 0.12 , 98.6 ± 0.05 , and 98.2 ± 0.02 , respectively, when incorporating spatial attention into the 2SAGCN model and utilizing 3D augmented data.



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The severity classification framework distinguishes between 11 specific classes of Parkinson's symptoms, which are derived from 9 distinct motion categories. Within this framework, class 0 represents healthy individuals, while classes 0 to 1 correspond to varying degrees of severity in Parkinson's symptoms, resulting in a comprehensive classification system encompassing 99 distinct outcomes.

To further enhance the model's accuracy, we have implemented strategies such as transfer learning and data 3D augmentation. This research marks a significant step forward in the realm of non-invasive, quantitative assessments of Parkinson's Disease, showcasing the potential of cutting-edge technology and state-of-the-art neural network architectures. (Abstract)

Keywords—3D Motion tracking, Computational neurology, Deep learning diagnostics, Motor function analysis, Parkinson's assessment.



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A β 42/40 ratio prediction using MRI images features for Alzheimer's Early Detection

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Abstract—Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive decline and the accumulation of amyloid-beta plaques. Early detection is crucial for timely intervention, and the A β 42/A β 40 ratio is a key biomarker for identifying amyloid deposition. In this study, we propose a method to predict the A β 42/A β 40 ratio using the extracted features from MRI images using 3D Convolutional Neural Network (3D CNN). Moreover, Random Forest Regression is employed to obtain the relationship between MRI features and the A β 42/A β 40 ratio. Our results demonstrate a strong correlation ($r = 0.72$) between the predicted and actual A β 42/A β 40 ratios, effectively predicting amyloid accumulation. This result also makes the proposed feature extraction model more reliable. By leveraging MRI and molecular biomarkers such as the A β 42/A β 40 ratio, the proposed method provides valuable insights into disease progression and early diagnosis.

Keywords—3DCNN, Alzheimer's Disease, A β 42/A β 40 ratio, MRI, Random Forest Regression



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Enhanced Early Diagnosis of Parkinson's Disease via Transformer-Based Deep Learning and GAN-Augmented Handwriting Analysis

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Abstract— Early diagnosis of Parkinson's disease (PD) is an important challenge in medicine. Hand tremors and writing disorders, which are early motor symptoms of Parkinson's, would appear before a formal diagnosis for decades. So, handwriting analysis has become an essential tool for diagnosing Parkinson's disease. While many machine learning algorithms have been applied in this field, they struggle to capture subtle variations in handwriting and must describe features from different perspectives. To address these problems, this study proposes a model for Parkinson's handwriting recognition. This long-term dependence of the features on the common coordinate attention schedule enables the model to more accurately localize important features of handwriting data and extract fuzzy edge features of handwriting images. These features of the CAS transformer will allow it to outperform current state-of-the-art deep learning methods in classification, with an accuracy of 92.68% in experiments conducted on two handwritten datasets.

Keywords: Data Augmentation, Deep Learning (DL), Handwriting Analysis, Parkinson's Disease (PD), Pattern Recognition, Transformer.



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Inferring organizational duties from Persian administrative and employment laws using Large Language Models (LLMs) and few- shot learning

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Abstract—Extracting organizational duties from legal documents is a critical yet challenging task, particularly in low-resource languages like Persian. This paper presents an innovative approach that integrates state-of-the-art Named Entity Recognition (NER) with advanced segmentation techniques and Large Language Models (LLMs) to accurately identify and extract duties assigned to organizations from Persian legal texts. Leveraging the power of the BERT-based model for NER, we enhance the recognition of relevant entities and ensure precise linkage to target organizations. Our method involves segmenting documents into sentences with an enhanced POS-based tokenizer, followed by the retrieval of contextually relevant segments based on the detected entities. We then explore the effectiveness of different LLM configurations, including a hierarchical approach that leverages both small and large models. Our experiments demonstrate that the hierarchical approach, combining 'Llama-3.1-8B' and 'gpt-4o', achieves an F1-score of 0.7901, significantly outperforming single-model approaches. This research underscores the potential of LLMs in legal text analysis, paving the way for more advanced tools in Natural Language Processing. Future work will include testing on a broader range of organizations, refining prompt engineering techniques, and enhancing model interpretability.

Keywords—NLP, Large Language Models, Few-shot Learning, Duty Extraction, Document Segmentation, Legal Informatics



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Development and Validation of the Comprehensive Persian Social Perception Dictionary using a Semi-automated Method

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Abstract — Social perception is among fundamental topics in social cognition, and is defined as attributing traits and characteristics to persons or social groups. Questionnaires constitute the traditional way to assess individuals' perception of persons or groups. However, the rising number of psychological studies based on computerized text analysis necessitates the development of a dictionary to be used in social perception studies. Such a dictionary has been developed by Nicolas et al. (2021) in English using a semi-automated method. The present research aimed to develop a Persian dictionary using a similar method. Nicolas et al. used WordNet to expand a set of seed dictionaries (each dictionary represents one dimension used in social perception). In the present study, seed dictionaries were mapped and expanded using FarsNet. Next, participants were asked to report their perception of a set of social groups and persons. Due to the insufficient coverage of the primary dictionaries (40 percent),



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additional dictionaries were developed by expanding uncovered responses, resulting in 32 dictionaries with 8279 words overall. The coverage of the final set of dictionaries amounted to 80 percent for intergroup, and 86 percent for interpersonal perception data. Next, the reliability of dictionaries was assessed using word-embedding techniques. As expected, words in each dictionary bore higher similarity with each other than words from other dictionaries. To validate the dictionaries, participants were asked to report their perception of a set of social groups and persons on dimensions related to the dictionaries. As expected, dictionary coding based on directional scores predicted participants' responses. Finally, as another method for validation, participants saw random sets of words from each of the dictionaries, and were instructed to rate how relevant each set of words were to each dictionary, based on their meaning. With a few exceptions, participants reported more similarity to the dictionary the words were originally taken from than to other dictionaries. To conclude, we found the coverage, reliability, and validity of the comprehensive Persian social perception dictionary to be adequate.

Keywords—Dictionary, Text Analysis, Social Perception



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Title Generation for the Qur'anic chapters by summarizing them

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Abstract— With the increase in textual data generated on the internet and the limited time individuals have for reading, the need for automatic text summarization is more essential than ever. One application of summarization is title generation. The goal of this study, which falls within the field of digital humanities and interdisciplinary studies, is to provide a framework for title generation through extractive and abstractive summarization methods, focusing specifically on chapters of the Qur'an. For extractive summarization, eleven different methods have been examined, some of which are novel and innovative. For the abstractive part and title generation, several models have been trained to select the most effective one. In this research, the Persian translation of the Qur'an is used as the primary source, and a dataset was created based on the first ten parts (juz) of the Qur'an, including extractive summaries, abstractive summaries, and titles for various sections of the chapters. The results of this study indicate that the titles generated through summarization are close to human-generated titles, based on BERTScore, R-1, R-2, and R-l values of 21.03, 6.85, 20.73, and 52.51, respectively. It is important to note in the evaluation that a single fixed title does not exist for a document; multiple titles may also be valid. In human evaluation, we observed that the average score produced by the proposed approach is 0.59, while for the best results from other approaches, this value is 0.44.

Keywords— extractive summarization, abstractive summarization, title generation for Qur'anic surahs, computational Qur'anic studies



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Efficient DL Models for Voice Pathology Detection in Healthcare Applications using Sustained Vowels

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Abstract— Voice Pathology Detection (VPD) aims to identify voice impairments through the analysis of speech signals, providing a foundation for developing diagnostic tools in advanced healthcare services to the public. This paper contributes to the development of efficient and accurate models based on deep learning (DL) for automatic VPD using sustained vowels of speech data. Therefore, this study explores the comparative efficacy of Mel-Frequency Cepstral Coefficients (MFCCs) and Linear Predictive Coding (LPC) as acoustic features extracted from vowels /i/, /a/, and /u/. Using the AVFAD database, we utilized and optimized a Convolutional Neural Network (CNN) as a DL model to classify healthy and pathological voices, prioritizing both accuracy and computational efficiency for real-time applications. Our findings reveal that 20 MFCC features extracted from vowel /i/ achieve the highest accuracy, with the optimal model reaching approximately 88% on test data.

Keywords— Voice Pathology Detection, Sustained Vowel, Feature extraction, MFCC, LPC, CNN.



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Advances in Deep Learning for Eye Disease Diagnosis: Applications, Challenges, and Future Directions

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Abstract— Deep learning has emerged as a transformative technology in ophthalmology, addressing critical challenges in the diagnosis and management of eye diseases such as diabetic retinopathy (DR), glaucoma, age-related macular degeneration (AMD), and central serous chorioretinopathy (CSCR). These conditions, among the leading causes of preventable blindness, require accurate and timely detection, which is often limited by traditional diagnostic methods due to inefficiency and the complexity of interpretation. The goal of this study is to examine the applications of deep learning in the diagnosis of ophthalmic diseases and to help researchers gain a better understanding of recent advances in model development, identify challenges associated with widespread implementation of these models in real-world applications, and outline future research directions in this area. Methodologically, recent studies using convolutional neural networks (CNNs), vision transformers, and hybrid models demonstrate high diagnostic accuracy and potential for early disease detection. Applications extend beyond disease diagnosis to lesion segmentation, disease progression monitoring, and personalized treatment planning. Deep learning systems have demonstrated comparable or



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superior diagnostic performance to human experts in detecting diseases such as DR and glaucoma. Despite these advances, challenges remain, including limited generalizability, data bias, and the need for explainable AI models to foster clinical trust and adoption. Addressing these challenges through improved model transparency, diverse datasets, and ethical frameworks will be critical to integrating deep learning into routine ophthalmic practice. This review highlights the significant advances in deep learning-driven ophthalmology and outlines a path for future research to optimize its clinical implementation.

Keywords—Deep Learning, Ophthalmology, Artificial Intelligence, Medical Imaging, Eye disease.



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Enhancing Automated Skin Cancer Detection Through Ensemble Learning and Multi-Head Attention Mechanisms

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Abstract— Skin cancer is one of the deadliest but most prevalent types of cancer; as such, early diagnosis is urgently required to improve patient outcomes. This work presents a collaborative deep learning model that classifies skin cancer with respect to three different networks: EfficientnetB1, EfficientnetB2, and EfficientnetV2s on dermoscopic images. The proposed collaborative model has a multi-head attention mechanism, ensuring that this model has a better attention capability for improving its accuracy in the task of classification. The HAM10k dataset provided the proposed model with a platform for fine tuning with transfer learning, along with some augmentation techniques to handle class imbalance challenges and feature variations of lesions. The results for the ensemble model combined with Multi-Head Attention were very high: an accuracy of 97.11%, and precision, recall, and F1-score are also very high. These findings prove that our approach can dramatically improve automation in skin cancer detection. Therefore, it will be helpful in clinical dermatology for early diagnosis in medicine.

Keywords— Skin lesion classification, Multi-head attention, Ensemble learning, Medical imaging



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Deep Learning Frailty Model for Heart Failure Survival Prediction

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Abstract—The study employed Deep Learning Frailty (DLF), a compelling neural modeling framework for predicting heart failure patient survival. The DLF embeds a notion of multiplicative frailty from classical survival analysis that deals with unobserved heterogeneity while exploiting the neural structure's strong capabilities in approximating any non-linear covariate relationship. The results showed that incorporating frailty leads to significant improvements, and the DLF model performs better on average.

Keywords—Deep Learning, prediction, survival analysis, heart failure



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A Novel Fixed-Parameter Activation Function for Neural Networks: Enhanced Accuracy and Convergence on MNIST

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Abstract— Activation functions are essential for extracting meaningful relationships from real-world data in deep learning models. The design of activation functions is critical, as they directly influence the performance of these models. Nonlinear activation functions are commonly preferred since linear functions can limit a model's learning capacity. Nonlinear activation functions can either have fixed parameters, which are predefined before training, or adjustable ones that modify during training. Fixed-parameter activation functions require the user to set the parameter values prior to model training. However, finding suitable parameters can be time-consuming and may slow down the convergence of the model. In this study, a novel fixed-parameter activation function is proposed and its performance is evaluated using benchmark MNIST datasets, demonstrating improvements in both accuracy and convergence speed.

Keywords— Activation Function, Deep Learning, Fixed-Parameter, Neural Networks, MNIST Dataset, Nonlinear Function, Gradient Optimization, Vanishing Gradient Problem



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Brain Age Classification from fMRI Data Using Graph Neural Networks and Evolutionary Algorithm

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Abstract— The brain is a complex organ that undergoes changes with age, and predicting brain age is crucial for monitoring brain health. It provides valuable insights into brain function and helps in the prevention of neurological diseases. This research predicts brain age through age classification based on fMRI data from the HCP dataset, consisting of individuals aged 22 to 36 years. After training a graph convolutional neural network, the model achieved an accuracy of 0.73 on the test data, demonstrating an improvement over previous studies on the same dataset. An evolutionary approach was then applied to optimize the selection of brain regions using a Genetic Algorithm to identify important and informative regions. This selection and optimization process maintained good predictive accuracy while reducing the number of brain regions. The results indicate that, despite using only half the original number of brain regions (8 regions), the model's accuracy remained at 0.65, showing only a slight decline. This highlights the significance of these regions in brain age classification. Identifying these key regions can contribute to the early diagnosis of brain and neurological diseases, enabling experts to better understand and manage the brain aging process.

Keywords— brain-age, GNN, EA, fMRI



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Attention-Based Noise Reduction for Surface- Electromyography: A Novel Method for Enhanced Signal Quality in Clinical Diagnostics

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Abstract— Surface electromyography (sEMG) signals are an important tool for monitoring and measuring muscle activity, rehabilitation, Human-Computer Interaction (HCI) systems, and diagnosis of neurological disorders. However, these signals are often affected by various sources of noise and disturbance during recording, which reduces the integrity, quality of the signal and increases the error of diagnostic applications. Traditional denoising techniques, such as filters and decomposition methods, often fail to handle the non-stationary nature of sEMG, resulting in a loss of essential information. This study introduces a novel denoising technique, Generalized Successive Variable Mode Decomposition (GSVMD), which integrates Successive Variational Mode Decomposition (SVMD), Soft Interval Thresholding (SIT), and attention mechanisms to enhance signal clarity. The proposed method was evaluated using data from twelve healthy subjects and twenty-four stroke patients, demonstrating a higher Signal-to-Noise Ratio (SNR) and lower R-squared (R^2) values compared to conventional denoising techniques. Moreover, statistical tests, including paired t-tests and Analysis of Variance (ANOVA), confirmed the significant enhancements achieved by the method, with p-values less than 0.001 and $p < 0.05$, thereby validating its effectiveness and robustness. GSVMD utilizes data mining to dynamically adjust signal components, ensuring robust denoising without losing critical information. Its reduced



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dependency on hyperparameters and high computational efficiency make it suitable for real-time clinical applications, providing enhanced accuracy and reliability for neuromuscular assessments.

Keywords— Attention Mechanism, Clinical Diagnostics, Data Mining, Surface Electromyography, Successive Variational Mode Decomposition.



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Genetic Algorithm-Based Hyperparameter Optimization of Convolutional Neural Network Models For White Blood Cells Classification

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Abstract— Detecting white blood cells (WBC) in microscopic images is essential in medical diagnosis. Manual analysis of these images is time-consuming and has a high error rate. Using object detection for WBCs detection with deep convolutional neural networks (CNN) can be considered a practical and effective solution. In this study, a CNN model is proposed to classify these images. In order to achieve optimal training performance, CNNs have many hyperparameters, such as dropout rate, number of hidden units in each hidden layer, activation function, loss function and optimizer, which need to be optimized. Therefore, a hyperparameter optimization approach based on a genetic algorithm is suggested, which can then be used to select the best combination parameters to improve accuracy and efficiency in detecting white blood cells in microscopic images. This new approach is significant and flexible for medical technicians to use in clinical practice for examining blood cell microscopy. In this research, the images were classified into five classes and the mean accuracy of the model for the five classes was 87%, which is considered a good accuracy for classification into five classes.

Keywords— Image Processing, Deep Learning, Metaheuristic Algorithm, Convolutional Neural Network, Histopathology image processing



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A Master-Slave Approach for Simultaneously Controlling Two Drones when Carrying an Object

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Abstract- This paper proposes a master-slave approach to simultaneously control two drones with the aim of carrying an object toward a goal. The proposed method utilizes the Double Deep Q-Learning (DDQN) technique to train a master agent to be able to carry an object toward a goal with the help of a slave agent. This procedure is implemented such that the master agent gathers the observations and specifies the actions to be made by itself and the slave agent. Indeed, the slave agent just applies a predefined action and does not process any input for producing the output. This manner of learning, leads to a unified convergence to an optimal solution compared to the situation in which each agent is trained separately. To verify the functionality of the proposed method, the algorithm is examined in the webots simulation environment. The simulations show that the introduced method has a good performance when controlling the drones to reach to the goal. The introduced method, other than algorithmic benefits which leads to a faster convergence of the model, suggests some reduction in the processing demand. The reason is that the learning procedure is guided by one of the agents and consequently only one of the agents is responsible for doing the calculations that lead to choosing the action. In this scenario, the slave agent does not require any processing resources for choosing the action and just simply applies a predefined action dictated by the master agent.

Keywords— Reinforcement Learning, Double Deep Q-Learning, master-slave approach.



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Creating a Foundation for Dynamic Difficulty Adjustment within PCG of games using Imitation Learning

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Abstract— This research proposes a novel approach to create a foundation for dynamic difficulty adjustment (DDA) within computer games that use procedural content generation (PCG), utilizing imitation learning to optimize gameplay. When PCG is used in creating the levels and enemies within a game, the difficulty adjustment must be ensured so that the game is not too hard or too easy for each player. However, PCG is random by nature, and thus, the developers may have a challenging task of adjusting the difficulty for each player in such games. The study aims to address these limitations by developing a foundation for DDA models based on imitation learning. The proposed model incorporates an imitation learning component, referred to as the 'Clone,' which replicates the player's behavior, alongside an enemy creator agent that leverages procedural content generation (PCG) to design enemies. By analyzing the Clone's performance against these procedurally generated enemies, the system ensures the creation of fair and engaging levels. To this end, a 2D platformer Unity game using PCG was developed, and imitation learning was utilized through Unity's ML-agents module. These models were used to mimic the players' play-style to predict the player's performance in PCG-generated levels. Three separate models were created to mimic five players. It was observed that two of these models could mimic players' performance, showing that this method can be used to implement DDA.

Keywords— Dynamic difficulty adjustment, Procedural content generation, Imitation learning, Computer Games



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MQL-NPC: A Modified Q-Learning-based Approach to Design Intelligent Non-Player Character in a Survival Game

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Abstract—This paper presents an intelligent non-player character(NPC) for a survivalgame with a modified Q-learning-based scheme. Due to the dynamics of the computergame environment, reinforcement learning is employed to make this agent smart. This leads the agent to react appropriately based on the game’s scenario by choosing an action that provides a higher reward inthe current situation. This is like a brain for the target NPC that processes different situations and reacts appropriately. Our intelligent agent is applied to a sample survival game with different complexity levels. In this game, multiple characters and objects alongside win-and-lose scenarios are considered. Our designed intelligent NPC is equipped with modified Q-learning to interact and try different actions on objects and learn about them. This learning process leads to an experience saved in the designed agent to reactbest to the environment. The efficiency of our proposed approach is evaluated through multiple scenarios and the appropriate reaction of the NPC is verified.

keywords: Non-Player Character(NPC), Intelligent Agent, Survival Game, Reinforcement Learning, Dynamic Environment.



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Unlocking individual motor signatures using feature-based clustering of a graphomotor task

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Abstract—Understanding individual motor signatures (IMS) is essential for personalized treatment and performance optimization. This study investigates the effectiveness of Fuzzy C-Means (FCM) clustering for identifying individual motor signatures from graphomotor tasks. We analyze various kinematic and geometric features, such as movement duration, velocity, and trajectory length, to reveal which aspects of motor behavior are most effective in distinguishing individuals. The results show that features like length of movement are particularly discriminative, while others, such as beta and velocity, offer weaker clustering outcomes.

Keywords—Motor behavior, Fuzzy C-Means clustering, hand-drawing tasks, motor signatures, feature selection.



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From Nodes to Themes: A Social Network Analysis and Thematic Progress in the field of Biomedical Ontologies

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Abstract—The paper aimed to analyze the thematic evolution and various networks of intellectual structures in the field of biomedical ontologies during 2014-2023. This applied research used an analytical and descriptive method, co-word techniques, and social network analysis. A web-based interface of bibliometrix, Microsoft Excel, and VOSviewer software were used for descriptive bibliometric study, data analysis, and network structure visualization. The period from mid-2020 to mid-2021 presented an increased dissemination of significant and prominent keywords within the overlay network in the field. Five major topic clusters were identified based on a co-occurrence network. These clusters labeled 'gene ontology', 'biomedical informatics focusing on AI techniques', 'bioinformatics applications in biomarker discovery', 'protein interaction networks in Alzheimer's proteomics', and 'network-based molecular mechanism'. Basic clusters were 'gene ontology', 'bioinformatics', and 'gene expression'. Moreover, five clusters experienced significant developments between 2023 and 2024, namely 'bioinformatics', 'deep learning', 'machine learning', 'transcriptome', and 'network pharmacology'. These topics are the latest and hottest concepts in this field. Clusters, namely 'deep learning', machine learning, and 'ontology' were recognized as niche and the most well-developed themes. The most mature and mainstream thematic clusters were namely 'transcriptome', 'prognosis', and 'rna-seq'. The most undeveloped and chaotic themes were 'network pharmacology' and 'molecular docking'.

Keywords— Social Network Analysis; Thematic Evolution; Biomedical Ontologies; Biblioshiny; Bioinformatics; Gene ontology.



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Automated Recognition of Marine Thermal Patterns Using Deep Learning

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Abstract— Sea Surface Temperature (SST) data reveal the temporal and spatial distribution of warm anticyclonic eddies and cold cyclonic eddies, impacting ocean behavior. The SST combined products attained adequate decisions to permit the recognition of mesoscale eddies with the introduction of altimeter operations and the availability of two or more altimeters at the same time. Climate change impacts ocean circulation and atmospheric anomalies linked to SST variations. Ocean eddies, vital for material and energy transport, require precise identification to advance oceanography. This study uses SST data from CMEMS in the Atlantic to introduce EddyNet, a deep-learning model for automatic eddy detection and classification. EddyNet's encoder-decoder architecture includes a pixel-wise classification layer, labeling each pixel as "0" (non-eddy), "1" (anticyclonic), or "2" (cyclonic). The high-resolution feature representation outperforms existing models, marking a significant leap in eddy detection accuracy and reliability. This study introduces EddyNet, a deep-learning model based on the U-Net architecture for automatic eddy detection and classification using Sea Surface Temperature (SST) data. The model was trained and evaluated on satellite imagery from the Copernicus Marine Environment Monitoring Service (CMEMS), achieving a training accuracy of 78.55%, a Dice score of 31.99%, and a precision of 0.9259. The recall values for different classes indicate that the model correctly identifies 99.51% of non-eddy pixels, 51.57% of anticyclonic eddy pixels, and 57.19% of cyclonic eddy pixels. These results demonstrate the effectiveness of deep learning in mesoscale eddy detection and highlight the potential for further optimization in classifying eddy structures with higher precision.

Keywords— Mesoscale Eddy identification, U-Net, Remote Sensing, Deep Learning, pixel-wise classification



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Exploring AI Techniques in the Identification and Control of Marine Vehicles

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Abstract—The rapid advancement of artificial intelligence (AI) offers new avenues for enhancing the identification, control, and autonomous operation of marine vehicles. This study investigates the application of AI techniques in maritime environments, focusing on object detection, navigation, and autonomous control to support safe and efficient operations in various marine conditions. Key objectives include evaluating machine learning models for identifying and tracking marine vehicles and the development of intelligent control algorithms that can adapt to dynamic oceanic settings. Methods involved training convolutional neural networks (CNNs) on datasets of marine images for object identification and using reinforcement learning (RL) algorithms to optimize the control systems of autonomous marine vehicles. Results demonstrate that CNN-based models achieve high accuracy in vehicle identification, even under challenging visual conditions such as low lighting or occlusion. At the same time, RL-driven control systems adapt effectively to complex, fluctuating marine environments. Simulated and real-world testing indicated that these AI techniques improve vessel maneuverability and response times, leading to more efficient and safer operations. In conclusion, this study highlights the potential of AI to revolutionize marine vehicle identification and control, with implications for enhanced security, efficiency, and sustainability in maritime operations. It is advisable to conduct additional research to improve these models, enabling their application across a wider range of marine environments.

Keywords—Artificial Intelligence, Machine Learning, Autonomous Navigation, Marine Vehicles, AI Techniques



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Application of machine learning algorithms in the prediction of the reliability of post-tensioned concrete members

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Abstract—Structural reliability analysis (SRA) is associated with complex calculations and large number of simulations. In this paper, machine learning (ML) methods are integrated with SRA to reduce the overall intricacy and computational cost of direct SRA methods, such as the Monte Carlo simulation (MCS) method. An SRA is conducted in this paper on post-tensioned concrete members under the influence of prestress loss, and their reliability indices are obtained through the MCS method. The results of the SRA are used to create a database for data fitting of the ML algorithms. The algorithms are compared to find the most accurate ML model to be applied on the problem at hand. For the SRA, different stochastic parameters with specified probabilistic distributions are considered for the numerical models, and nonlinear dynamic analyses are conducted on them. Using the labeled data resulted from the SRA, five ML algorithms are compared; (i) linear regression, (ii) random forest, (iii) artificial neural network, (iv) k-nearest neighbors, (v) extreme gradient boosting. R-squared and root mean squared error are considered as the metrics used for the comparison of the ML models. Bayesian search is used for hyperparameter optimization of algorithms. The performance of the linear regression algorithm ($R^2 = 0.67$ and $RMSE = 0.26$) indicates that the SRA problems are highly nonlinear and linear algorithms cannot precisely map the relationships in data. However, the results show that extreme gradient boosting has the finest accuracy with $R^2 = 0.9$ and $RMSE = 0.04$. Additionally, its predicted values mostly have relative errors of less than $\pm 30\%$. The closeness of performances of testing and training sets indicates that overfitting is avoided for all 5 predictive models.

Keywords—artificial intelligence, machine learning, supervised learning, structural reliability analysis



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Predicting Damage States of RC Columns Using Machine Learning Algorithms

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Abstract— Performance-based design of bridges requires prediction of different damage states of components. (RC) piers are key components in bridge system, which may experience severe damages during earthquakes. Therefore, seismic damage assessment of RC bridges depends strongly on predicting failure modes RC piers. Using machine learning for damage evaluation of structures is becoming increasingly popular in earthquake engineering. This study implements three different machine learning techniques to capture different damage limit states of RC bridge piers under seismic loading. For this purpose, three machine learning techniques including K-Nearest Neighbors (KNN), Artificial Neural Networks (ANNs) and decision tree regressions were utilized for predicting four damage states of a RC bridge piers tested experimentally under seismic excitations based on drift limits. The efficiency of the three algorithms in damage prediction of RC piers were compared.

Keywords— Machine learning algorithm, RC Bridge pier, Damage states, Seismic performance.



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A Deep Reinforcement Learning Approach to Automated Stock Trading, using xLSTM Networks

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Abstract—Traditional Long Short-Term Memory (LSTM) networks are effective for handling sequential data but have limitations such as gradient vanishing and difficulty in capturing long-term dependencies, which can impact their performance in dynamic and risky environments like stock trading. To address these limitations, this study explores the usage of the newly introduced Extended Long Short-Term Memory (xLSTM) network in combination with a deep reinforcement learning (DRL) approach for automated stock trading. Our proposed method utilizes xLSTM networks in both actor and critic components, enabling effective handling of time series data and dynamic market environments. Proximal Policy Optimization (PPO), with its ability to balance exploration and exploitation, is employed to optimize the trading strategy. Experiments were conducted using financial data from major tech companies over a comprehensive timeline, demonstrating that the xLSTM-based model outperforms LSTM-based methods in key trading evaluation metrics, including cumulative return, average profitability per trade, maximum earning rate, maximum pullback, and Sharpe ratio. These findings mark the potential of xLSTM for enhancing DRL-based stock trading systems.

Keywords—Extended Long Short-Term Memory (xLSTM), Proximal Policy Optimization (PPO), Automated Stock Trading, Actor-Critic Reinforcement Learning



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A Hybrid Approach for Intrusion Detection in Computer Systems Using Optimized Deep Neural Networks

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Abstract—The issue of intrusion in security presents a fundamental challenge that can lead to serious damage in IT systems. Intrusion Detection Systems (IDS) serve as effective tools for identifying intrusion activities and generating alerts. However, traditional IDS methods often face issues such as low accuracy and long training times. Therefore, enhancing the performance and efficiency of these systems is crucial. The proposed approach in this study leverages evolutionary optimization algorithms combined with machine learning approaches to improve accuracy and training speed in IDS and better manage large volumes of data. This combination leads to the development of an Evolutionary Neural Network (ENN) that enhances and optimizes IDS performance. In this approach, BUZOA and Ant Colony Optimization (ACO) algorithms are used for feature selection, and decision tree, k-nearest neighbor, support vector machine, and deep neural network algorithms are used for classification and intrusion detection. The dataset used in this research is from the CICDDOS2019 database, containing 54,000 samples and 22 initial features. The experimental results indicate that among the metaheuristic algorithms BUZOA and ACO, and their combinations with decision tree, k-nearest neighbor, and support vector machine, the BUZOA-CNN hybrid algorithm with an average RMSE of 0.0117 and an accuracy of 96.32% performs better than other algorithms.

Keywords—Intrusion Detection, Cyber Attacks, BUZOA Optimization Algorithm, Ant Colony Optimization, Deep Learning.



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LDA-ML: A Hybrid DDoS Detection Attacks in SDN Environment using Machine Learning

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Abstract—In today's world, DDoS attacks are becoming more common and complex; thus, they constitute a great challenge for network security under the auspices of SDN. The research effort described here proposes an integrated hybrid model called "LDA-ML," which leverages some state-of-the-art machine learning methods: LDA, naive bayes, random forest, and logistic regression. We optimize the data analysis process by leveraging LDA for feature selection and dimensionality reduction, followed by a sequential application of the classifiers to exploit their strengths. Evaluated on the CICDDoS-2019 dataset, the proposed model has achieved an outstanding accuracy of 98.98%, indicating the efficacy of the model in correctly classifying benign versus attack traffic. All of the above underlines the robustness of the proposed LDA-ML model, pointing to great potential for its application to continuously improve cybersecurity strategies against DDoS threats in SDN architectures. This holistic approach offers improvements in detection, while it also enriches diagnostic insights-an important contribution to finding effective security solutions in increasingly dynamic network environments.

Keywords— DDoS attack, SDN, Cybersecurity, Machine learning



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Enhancing Telecom Recommendation Systems through Customer Profiling and Graph Neural Networks (GNN) on Graph Data

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Abstract—Telecommunications companies rely on recommendation systems to deliver personalized services and enhance customer satisfaction. Traditional methods, such as Collaborative Filtering (CF) and Content-Based Filtering (CBF), often fall short in capturing the complex relationships and social influences inherent in large telecom networks. In this paper, we propose a novel Graph Neural Network (GNN)-based recommendation system that integrates customer profiles with graph data representing customer interactions (e.g., calls, messages). The system uses the GraphSAGE architecture to aggregate information from each customer's network, enabling it to learn from both direct and indirect relationships. By combining customer demographic and usage data with interaction networks, our model provides more accurate and personalized service recommendations.

We evaluate the system on a real-world telecom dataset, comparing it with traditional models, including CF, CBF, and Matrix Factorization (MF). The GNN-based system achieves a significant performance boost, with a precision of 0.81 and an F1-score of 0.80, outperforming all baselines. These results highlight the ability of GNNs to capture social and communication patterns, making them highly effective for telecom recommendations. Future work will explore the scalability of the system and its application to real-time data, further enhancing its potential for customer retention and revenue growth.

Keywords—Customer Profiling, Graph Neural Networks (GNN), Recommendation Systems, Telecom Industry, Graph Data, Personalized Services, Collaborative Filtering (CF), Content-Based Filtering (CBF), Matrix Factorization (MF), Customer Interaction Data.



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Comparative Study of Criminal Responsibility of AI in the Legal Framework of Iran and Saudi Arabia

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Abstract— This paper examines the legal frameworks governing the criminal liability of artificial intelligence (AI) in Iran and Saudi Arabia, focusing on how both countries address the evolving role of AI in criminal acts. With the rapid advancement of AI technologies—from narrow (weak) AI, which performs specific tasks, to general (strong) AI, capable of autonomous decision-making—complex legal and ethical questions have emerged. Specifically, this paper examines the applicability of three theoretical models of AI criminal liability: Perpetration-By-Another Liability, Natural-Probable-Consequence Liability, and Direct Liability.

The comparative analysis highlights that despite differences in legal traditions and societal contexts, both Iran and Saudi Arabia recognize that AI itself cannot bear criminal responsibility, and instead, liability is attributed to human actors, such as developers, users, and operators. The findings suggest that integrating technological progress with ethical and legal safeguards, grounded in Islamic jurisprudence, is essential for addressing the challenges posed by AI-related crimes in both jurisdictions.

Keywords—artificial intelligence, criminal liability, AI ethics principles, Saudi Arabia, Iran



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Empowering Businesses through AI: A Strategic Approach to Implementation

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Abstract - As artificial intelligence (AI) increasingly becomes central to digital transformation, businesses across industries are recognizing its transformative potential for enhancing efficiency, accuracy, and innovation. This article examines a structured framework for AI integration that empowers businesses to manage the challenges associated with AI implementation, emphasizing both technical and "soft" competencies crucial for successful implementation. Through a phased approach, including Discovery, Roadmap Design, Implementation, and Evaluation, this review provides actionable insights to align AI solutions with business objectives, optimize resources, and overcome organizational barriers. The framework highlights how AI-driven tools, such as predictive analytics, data mining, and automated decision-making systems, enhance strategic capabilities, streamline operations, and improve customer engagement. To ensure long-term success, this study underscores the significance of cultivating an environment that promotes innovation and teamwork. AI adoption requires not only robust data infrastructure and technical expertise but also strategic foresight, cross-functional collaboration, and a commitment to iterative learning. By integrating technical and soft knowledge, organizations can overcome challenges in AI adoption, such as resistance to change and uncertain ROI, by fostering a supportive environment that enables AI-driven growth. This article provides decision-makers with a thorough guide, equipping them with the insight needed to maximize AI's potential for long-term competitive success in an evolving digital world.

Keywords - Artificial Intelligence, Digital Transformation, Business Strategy, Operational Efficiency



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Improving the Quality of Life: The Experience of Women with MS from AI Chatbot Program

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Abstract— | This study examines the impact of using artificial intelligence chatbots on improving the quality of life for women with multiple sclerosis (MS) in Iran. Using a qualitative method and semi-structured interviews, the experiences of women participating in relation to the functionality of AI chatbots were analyzed. The findings indicate that chatbots can play a significant role as supportive and informational tools in managing the disease, reducing anxiety, and improving communication for these women. Additionally, these tools assist in organizing daily tasks and reducing feelings of loneliness. Although some participants pointed to an excessive reliance on chatbots, overall, the results show more positive effects compared to the disadvantages of this technology. Ultimately, the research suggests that future studies should explore the psychological and ethical impacts of using chatbots more deeply.

Keywords— Multiple Sclerosis (MS), Quality of Life, AI Chatbots, Artificial Intelligence, Qualitative Method



poster papers



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<ul style="list-style-type: none">• iai-1127• iai-1142• iai-1051• iai-1081• iai-1028• iai-1029• iai-1061• iai-1027• iai-1032• iai-1066• iai-1109	second part	Wednesday February 26 13:00 - 14:30



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Evaluation of the Computational Complexity of Fundamental Algorithms for Sentiment Analysis in Natural Language Processing

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Abstract— The central objective of this study is to explore the computational complexity of sentiment analysis algorithms within the context of Natural Language Processing. As a critical task in the realm of text classification, sentiment analysis seeks to determine whether user opinions on a specific subject are positive, negative, or neutral. With a wide array of classification techniques available, various algorithms have been developed, each with distinct computational demands and resource requirements. This research aims to conduct a thorough comparison of the computational complexities of these algorithms, offering insights into potential optimization strategies to improve their efficiency under diverse conditions. The outcomes of this study will provide valuable guidance in selecting more efficient algorithms and refining the performance of sentiment analysis systems.

Keywords— Sentiment Analysis, Computational Complexity, Machine Learning, Time Complexity.



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An Efficient Training-Free Resume Matching System with NLP-Based Extraction and Custom Scoring for Enhanced Candidate Selection

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Abstract— As the volume of job applications continues to grow, efficient resume-matching systems have become essential for organizations to streamline candidate selection. This paper presents a resume-matching system that utilizes natural language processing (NLP) and rule-based algorithms for efficient candidate screening without requiring a training phase. The system extracts critical attributes, including skills, age, and educational qualifications, from resumes using customized pattern files and regular expressions. By eliminating the need for training, the system reduces data dependency and enhances processing speed, making it suitable for real-time applications. Skills are matched using a semantic similarity function, while age compatibility is assessed through a non-linear scoring approach, and degrees are compared based on predefined educational levels. Experimental evaluations with 200 manually reviewed resumes show high accuracy in attribute extraction and matching, demonstrating the system's advantages in speed and efficiency over training-dependent models.

Keywords— resume matching, natural language processing, training-free system, candidate screening, semantic similarity



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Reconstruction of ECoG signals in response to visual stimuli to decipher the function of brain regions involved in visual processing using a model based on convolutional and regression networks.

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Abstract— The visual system is one of the most sophisticated complex systems in our body, and it plays a crucial role in enabling us to perceive the world around us. When we see images, we send visual information from the eyes to different parts of the brain and various routes transmit visual information and processing. The purpose of this study is to ascertain whether it is possible to reconstruct brain signals directly from visual stimuli using deep neural networks. In order to simulate the visual routes in the brain, we implemented deep neural networks (DNNs) with the objective of predicting the electrocortical data of the whole brain of the Subjects. In this study, we employed an advanced methodology that utilized convolutional neural networks to decode the electrical activity of the brain during the processing of visual data. A convolutional neural network is employed to extract relevant features from the image, which are then fed to a deep regressor for the prediction of the electrocortical data of the subject in that trial. The results demonstrated that brain signals could be reconstructed directly from visual stimuli presented in the trial with acceptable efficiency. Furthermore, neural routes in the brain could be simulated via DNNs. This model could facilitate a deeper understanding of human vision and enhance our comprehension of data processing within the brain.

Keywords— Convolutional Neural Networks (CNN), electrocorticography (ECoG), Regressor, Vision



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Data Mining's Role in Crafting Intelligent Recommender Systems: A Systematic Review

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Abstract—This paper presents a systematic review of the role of data mining in the design and utilization of recommender systems. The review focuses on the impact of data mining techniques in understanding user preferences across diverse domains, including restaurants, libraries, organizations, and customer interactions. The review, based on 18 articles, found that collaborative filtering and clustering are the most frequently applied data mining techniques in recommender system design. The study highlights the essential role of data mining in strengthening the conceptual foundation of recommender systems. Data mining helps reveal hidden patterns and insights from big data, which are then used to generate recommendations. The review also emphasizes the increasing need for sophisticated data mining techniques to address the growing complexity of systems and the need for humanizing technology. The paper concludes by proposing a model for designing recommender systems where data mining serves as the primary background throughout the design and development process. The model emphasizes the importance of data analysis based on organizational and user identities to create accurate and effective recommendations. The paper also stresses that the effectiveness of recommender systems is contingent on both data mining and user feedback and that these two components should be considered inseparable in the recommendation and decision-making process.

Keywords—data mining, recommender systems, recommendation systems, user preferences, collaborative filtering



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Predictive Modeling of Escherichia coli Growth: The Role of Key Cellular Features

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Abstract—This study investigates the influence of four key features on the added length of Escherichia coli cells using a fully connected neural network (FCNN), based on data collected from 1,220 samples. The data comprises observations of individual cells and 10-minute sliding window averages from simulated data. Results show that removing the feature fluorescence intensity (YFP) led to the highest increase in Loss (0.3711) and root mean square error (RMSE) (0.6092). Removing cycle duration (Tcyc) also significantly reduced model accuracy, increasing Loss (0.2811) and RMSE (0.5302). In contrast, eliminating size at birth (Lb) and growth rate (Mu) had less impact. These findings highlight the importance of effective feature selection in predicting cell growth.

Keywords—Escherichia coli, Cell Growth Prediction, Metabolism Regulation, Microbial Cell Dynamics, Deep Learning in Biology.



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Implication of AI programs AlphaFold-2 and 3 in Predicting Complex Protein Assemblies: A Case Study on Barnacle *Chthamalus malayensis* Cement Adhesive Proteins

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Abstract—High-accuracy protein structure prediction is a prerequisite for understanding biological functions, especially for such complex systems. Herein, we focus on a five-protein adhesive complex from *Chthamalus malayensis*, a barnacle species that exhibits remarkable adhesion capability. We have predicted the complex's structure and interactions using the AI programs AlphaFold-2 and AlphaFold-3. AlphaFold-3 successfully predicted the complete assembly of the barnacle cement protein complex, accurately integrating all five proteins, including CP20. This provided valuable insights into the molecular interactions within the adhesive complex. In contrast, AlphaFold-2 successfully predicted the structures of CP10, CP43, CP52, and CP100 in multimeric structure, but it failed to incorporate CP20 into the multimeric structure, leaving it outside the assembly. This limitation highlights the challenge AlphaFold-2 faces in fully assembling complex protein interactions compared to AlphaFold-3. Our findings point out the potential of deep-learning-based tools like AlphaFold for researching marine organisms and allow us to understand how computational models can be further improved to produce more accurate predictions of structural biology.

Keywords—AlphaFold, Protein Structure, Multimer, Adhesion, *Chthamalus malayensis*, Barnacle Cement



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A Systematic Review of Deep Learning Applications in Parkinson's Disease Research

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Abstract—Parkinson's disease (PD) is a degenerative neurological disorder that impacts millions of individuals globally. In recent years, deep learning (DL) techniques have emerged as powerful tools to enhance the accuracy and efficiency of diagnosing and managing PD. This systematic review provides a comprehensive analysis of the various deep learning approaches applied to PD research, particularly in diagnostic and prognostic contexts. The review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, incorporating studies published up to the current year. The analysis focuses on key elements such as dataset quality, data preprocessing methods, feature extraction techniques, and model evaluation metrics. The survey identifies the most common deep learning models, including Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), which have demonstrated promising results in PD diagnosis. Additionally, this review explores the limitations and challenges of current models and suggests potential pathways for future research, such as integrating multi-modal data and developing more generalized models for clinical use. The findings aim to establish a foundational understanding for further advancement of DL techniques in the early detection and comprehensive management of Parkinson's disease.

Keywords—Parkinson's Disease, Deep Learning, Convolutional Neural Networks, Recurrent Neural Networks, Clinical Decision Support



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Deep Learning in Healthcare: Focusing on Interpretability and Data Quality Challenges for Enhanced Disease Detection

Review on Deep Learning in Healthcare Industry

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Abstract— This research paper reviewed the applications of deep learning algorithms in the healthcare domain, highlighting their transformative impact on disease diagnosis and treatment. It provided an in-depth analysis of various deep learning architectures, including Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), and demonstrated their effectiveness in diagnosing diseases such as breast cancer, lung cancer, and Parkinson's disease. Furthermore, the paper discussed the challenges and opportunities associated with the implementation of deep learning in healthcare, focusing on key issues such as data quality, computational requirements, and model interpretability. The study concluded by emphasizing the significant potential of deep learning to enhance diagnostic accuracy and improve treatment efficiency, paving the way for more advanced and personalized healthcare solutions.

Keywords— healthcare; deep learning; machine learning algorithms; supervised learning.



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White blood cell image analysis using CNN model

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Abstract—White blood cells, play a vital role in the immune system. For medical experts, the precise and effective classification of these cells is essential for diagnosing diseases This classification facilitates the precise detection of medical problems. In this study, the categories of white blood cells are with the help of a transform learning model Convolutional Neural Network (CNN). Our approach achieves an impressive accuracy rate of 98.5%, surpassing the performance of current techniques.

Keywords—Blood cell image, classification Deep learning, Convolutional neural network



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Empowering Decision-Making in Venture Investments: A Systematic Review of Machine Learning Applications for Predicting Startup Success

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Abstract—Startup success is inherently unpredictable, with most ventures failing within their early years. This systematic review, following PRISMA guidelines, synthesizes findings from 23 peer-reviewed studies on machine learning (ML) applications in predicting startup success. Key ML techniques, including Random Forest, Gradient Boosting, and hybrid models, demonstrated high accuracy (up to 94.3%) across diverse datasets like Crunchbase and Kaggle.

Critical success factors identified include funding patterns, team composition, market adaptability, and social media engagement. Relational approaches, such as graph embeddings, underscored the importance of proximity to investors and industry networks. However, reliance on incomplete public datasets and limited integration of qualitative factors remain challenges. This review provides actionable insights for investors, entrepreneurs, and policymakers, highlighting ML's transformative potential in fostering data-driven decision-making. Future research should focus on diversifying datasets, improving explainability, and integrating qualitative factors to address existing gaps.

Keywords: Startup Success Prediction, Machine Learning in Venture Capital, Data-Driven Decision-Making, Investment Risk Assessment, Machine Learning



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A Comprehensive Approach to Predicting Customer Churn with XGBoost

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Abstract--Customer churn is a significant challenge for businesses, leading to substantial financial losses when dissatisfied customers switch to competitors. Machine learning (ML) and deep learning (DL) methods have been increasingly employed to address this issue; however, achieving high accuracy and minimizing false predictions remain critical challenges.

This study leverages the XGBoost model, a robust algorithm, for predicting customer churn. The model is optimized through parameter tuning and the SMOTE technique to address data imbalance. Experimental results demonstrate that the proposed approach achieves an overall accuracy of 85.89%, outperforming several existing methods.

Additionally, this research compares the proposed model with a baseline study utilizing a BiLSTM-CNN hybrid approach. The findings highlight that a well-optimized XGBoost model offers superior predictive performance and serves as a valuable tool for businesses in managing and mitigating customer churn effectively.

Keywords— customer churn, XGBoost, machine learning, predictive modeling



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Enhancing IoT Data Prediction Accuracy Using Deep Learning and Metaheuristic Algorithms

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Abstract— Given the increasing volume of data generated by the Internet of Things and the challenges associated with processing and storing this data in cloud environments, it is essential to employ deep learning methods and metaheuristic algorithms to improve the accuracy of stream data prediction. In this study, four different approaches were evaluated for classifying continuous IoT data: Particle Swarm Optimization, Support Vector Machine, the PSO-SVM combination, and a feedforward neural network integrated with PSO. Considering the characteristics of stream data and the need to avoid local optima, the PSO algorithm was utilized to optimize the weights and parameters of the feedforward neural network. Additionally, PSO was combined with SVM to optimize its parameters, achieving an accuracy of 0.71. The combination of FFN with PSO improved the prediction accuracy to 0.73, demonstrating the superior performance of this method compared to others. These results highlight the high potential of combining deep learning and metaheuristic methods in enhancing the classification accuracy of IoT data.

Keywords— data classification, internet of things, particle swarm optimization, support vector machine, feedforward neural network



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Efficient and Accurate Fairness Verification for Quantum Variational Circuits

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Abstract—We propose a formal framework for fairness verification in Quantum Machine Learning models, specifically focusing on Quantum Variational Circuits. Our approach improves upon existing methods by simplifying the fairness verification process by formulating the problem as convex programming. We present a theorem establishing that the fairness of a QVC can be verified by calculating the Lipschitz constant of the decision model. Our results provide a more efficient algorithm for fairness verification, applicable to larger quantum systems.

Keywords—Fairness Verification, Quantum Variational Circuits, Quantum Machine Learning



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Enhancing IoT Data Prediction Accuracy Using a Hybrid Neural Network and Genetic Algorithm Approach

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Abstract—Due to the rapid growth and increase in the volume of data caused by the Internet of Things, the need for effective methods for accurate prediction and classification of this data seems essential. In this research, the performance of four different methods of Internet of Things data classification, including genetic algorithm, multilayer neural network, hybrid random forest and genetic algorithm, and hybrid model of neural network and genetic algorithm have been evaluated. The results show that the combination of genetic algorithm with multilayer neural network has significantly improved the classification efficiency. This hybrid approach has managed to achieve a significant improvement in precision, recall and F1 score measures compared to other investigated methods. The findings of this research show that the use of hybrid methods such as GA-MLP can effectively play a significant role in the optimization and improvement of the massive data classification models of the Internet of Things

Keywords— classification, neural network, Genetic Algorithm, Prediction, IoT Data



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Hybrid ANN and Ant Colony Algorithm for IoT Data Classification

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Abstract—In this study, a hybrid approach based on the Ant Colony Optimization (ACO) algorithm and a Multilayer Perceptron (MLP) neural network is proposed for classifying Internet of Things (IoT) data. Managing and analyzing the large volume of data in IoT networks with multiple sensors presents a significant challenge. This research employs the ACO algorithm to identify and select the most relevant sensors and features from the collected data. By performing a parallel search through the feature space, ACO selects the best feature combinations from the vast amount of data, resulting in more accurate classification. These optimized features are then used to train the MLP neural network. The combination of ACO and MLP improves both classification accuracy and the learning speed of the model. ACO enhances model performance by efficiently optimizing the features and avoiding local optima. Meanwhile, the MLP's multilayer structure strengthens its ability to learn complex patterns and recognize non-linear relationships in IoT data. Experimental results show that ACO alone achieves an accuracy of 0.8 and an F1-Score of 0.839, while the combination with MLP increases the accuracy to 0.81 and the F1-Score to 0.849. This improvement indicates that integrating ACO with MLP enhances classification precision and strengthens the model's ability to learn complex patterns. The hybrid approach also reduces processing time and adapts better to dynamic, large-scale IoT data, demonstrating that combining swarm intelligence methods like ACO with neural networks provides an effective solution for IoT data processing and classification.

Keywords—ant colony optimization algorithm, artificial neural network, data classification, internet of things



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Potential of machine learning algorithms for predicting the properties of medium-density fiberboard (MDF): preliminary results

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Abstract—Traditional quality control methods in the wood-based panel industry, especially for medium-density fiberboard, are insufficient to compete in the current market. In addition, due to the rapid growth of wood-based panel production and the need to provide competitive products in the market, there is an unprecedented need to explore new methods of quality control throughout the production process. Therefore, it seems necessary to use new quality control methods based on artificial intelligence and machine learning algorithms, because they have high predictive and optimization capabilities. The aim of this research is to develop suitable model to identify the most important and effective variables in the production process of industrial fiberboards and finally to predict the properties of the final product such as the bending strength (MOR) based on industrial data.



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For this purpose, the R software environment was used to implement the random forest algorithm to identify important variables. The performance of the model was evaluated using the coefficient of determination (R^2) and the root mean square error (RMSE). The results showed moderate accuracy with an R^2 value of 0.49, which means that the model explained 49% of the variance of the dependent variable. The RMSE was 1.565, indicating a low prediction error. These metrics demonstrate the robustness and reliability of the random forest algorithm in managing complex data sets and producing accurate predictions.

Keywords—machine learning, wood-based panel, quality control, random forest, feature selection



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Strategies and Future Horizons of Innovative Entrepreneurship in AI-Based Programming

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Abstract—This paper examines the opportunities, challenges, and innovative approaches in the domain of AI-powered entrepreneurship. AI, as a catalyst for digital transformation, plays a pivotal role in boosting productivity and fostering innovation in businesses. This technology enables entrepreneurs and software developers to create innovative services and products that effectively address global market needs. This paper, while analyzing the existing challenges and proposing practical solutions, outlines a trajectory for entrepreneurs and explores the future landscape of this field.

Keywords— Artificial Intelligence, Digital Entrepreneurship, Innovative Programming



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An Overview of the Application of Artificial Intelligence in Schools

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Abstract— Considering that the integration of artificial intelligence in the education sector has the potential to create a revolution in teaching and learning methods, increase personal learning, and improve overall efficiency, the present research was conducted to identify the applications of artificial intelligence in schools. This research is a review method by searching for keywords; Application, school, education, and artificial intelligence and their equivalents in English in articles published from 1993 to 2023 available in Google Scholar, Springer, Magiran, SID, Scopus, Science Direct, Civilica and Iran Doc databases have been done. After analyzing the information obtained from the aforementioned databases, from a total of 123 sources, 61 sources were selected for the final review after removing irrelevant sources.

Based on the findings of the research, it can be concluded that for the effective use of artificial intelligence in schools, attention should be paid to all educational and educational fields, especially three levels: students, teachers, and educational management. In other words, an approach in which all the six levels and areas of the document of fundamental transformation of education are taken into consideration can lead to a favorable and comprehensive design of the use of artificial intelligence in schools.

Artificial intelligence can transform conventional teaching and learning methods in terms of technology. It does this by seamlessly integrating with e-learning technology and online learning management systems to introduce technology into classrooms and provide teaching and learning experiences for students as well as teachers.

Keywords: Artificial Intelligence, Application, Education, School.



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Examining the Role of Artificial Intelligence in Enhancing Educational Equity: A Systematic Review

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Abstract—Artificial intelligence (AI) has become increasingly prevalent in various aspects of human life. Given its rapid development, AI has also captured the attention of the education sector. This systematic review aims to investigate the role of AI in enhancing educational equity. A comprehensive search was conducted using the keywords "Artificial Intelligence," "Educational Equity," and "Instruction" in the Scopus, Web of Science, Wiley, JSTOR, and ERIC databases. After a systematic search based on these keywords, 42 English articles were identified. 1 duplicate article was removed, and 33 articles were eliminated after reviewing their titles and abstracts. Of the remaining articles, 2 were excluded due to unavailability. Consequently, 7 articles were selected based on predefined research criteria. The findings indicate that artificial intelligence offers many useful tools within the educational domain, presenting both opportunities and challenges. The findings point to AI as a powerful tool for promoting educational equality.

Keywords— Artificial Intelligence, Educational Equity, Instruction



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The Role of Ethics in Autonomous Decision Making: Advancements in Artificial Moral Agents

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Abstract— The expansion of artificial intelligence (AI) technologies necessitates a critical exploration of their ethical implications, especially in developing Artificial Moral Agents (AMAs) with autonomous decisions that lack alignment with human ethical standards. This paper reviews the current landscape of ethical challenges in AI and explores philosophical foundations, and methodologies for equipping AMAs with ethical principles. It discusses ethical theories, consequentialism, deontology, and virtue, highlighting the need for integrating ethical principles into AI frameworks. Moreover, it emphasizes a hybrid approach to ethical reasoning, blending top-down and bottom-up methodologies to enhance moral decision-making. The review identifies key ethical principles—beneficence, non-maleficence, autonomy, justice, and loyalty—and examines their technical application across AI models, highlights gaps in practical implementation, suggests pathways for future research, including using cognitive architecture, interdisciplinary collaboration, and context-sensitive ethical guidelines to improve trustworthy AI systems. These insights aim to enhance the ethical integrity and social acceptability of AI technologies.

Keywords— Moral, Ethics, Artificial Intelligence, Artificial Moral Agents (AMA), Moral Decision Making, Ethics Agents



panels



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Applications of Artificial Intelligence in Human Resources



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Head of the Informatics Center at the Ministry of Science

Deputy Director of the Informatics Center

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Leading Artificial Intelligence and Smart Government Development initiatives at Iran's Administrative and Recruitment Organization

Served as an advisor and board member for prominent financial institutions, including Mellat Bank, Melli Bank, Karafarin Bank, and Bank Maskan

Held key IT leadership roles at the Ministry of Economic Affairs and Finance and the Ministry of Communications and Information Technology

Active participant in the Supreme Council of Cyberspace and specialized committees focused on digital economy, banking, and insurance

Lecturer at prestigious institutions such as the University of Tehran and Sharif University of Technology

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Intelligent agent design in water waste management



Dr. Ali Noorzad

Deputy Director of Technical and Research and Board Member of the Specialized Parent Company of Iran Water Resources Management - Ministry of Energy

Deputy Director of Planning and Board Member of the Specialized Parent Company of Iran Water Resources Management - Ministry of Energy

Managing Director of Khak Azma Company - Ministry of Energy

Deputy Head of the Water and Soil Engineering Unit and Head of the Technical and Soil Mechanics Laboratory - Committee

of Water Affairs - Former Ministry of Jihad-e-Sazandegi

Former Associate Professor at Concordia University of Montreal - Canada

Dean of the Faculty of Civil Engineering, Water and Environment, Shahid Beheshti University

Dr. Hamid Mohammadnejad

Faculty member and assistant professor of the Department of Geotechnical and Transportation Engineering at

Faculty of Civil, Water and Environmental Engineering, Shahid Beheshti University

Researcher in the field of seismic geotechnics and earthquake engineering





Dr. Mojtaba Shourian

Assistant Professor, Faculty of Civil, Water and Environmental Engineering,
Shahid Beheshti University

Researcher in the field of water resources management

Dr. Issa Bozorgzadeh

Director General of the Office of Water Resources Planning and Budget
Integration, Iran Water Resources Management Company



Application of artificial intelligence in business development



Dr. Ehsan Chitsaz

Deputy Minister of Communications and Information Technology

Associate Professor, Faculty of Entrepreneurship, University of Tehran

Dr. Mohammadreza Abolghasemi

Faculty member and assistant professor, Faculty of Electrical and Computer Engineering, University of Tehran



Dr. Masoud Asadpour

PhD in Robotics from Polytechnic University of Lausanne, Switzerland; MSc in Machine Intelligence and Robotics from University of Tehran, B.A., Sharif Industrial Institute, Computer Software Engineering

Faculty Member, Faculty of Electrical and Computer Engineering, University of Tehran

Founder and CEO of Daneshbonyan Management Consultants, Hemaplus; Director of Social Networks Laboratory, University of Tehran



CEO of Pindo

Engineer Nima Ashrafzadeh

Engineer Seyed Saleh Arabi

CEO of Hub (First Companion Beheshti)



Application of artificial intelligence in traffic control



Dr. Hamid Mirzahassein

Faculty member and associate professor at Imam Khomeini International University

Researcher in the fields of accessibility, Tehran metropolis, travel demand and autonomous vehicles

Dr. Mohammadreza Abolghasemi

Manager of Traffic Monitoring and Analysis Department, Tehran Traffic Control Company



Dr. Amir Masoud Memarnejad

PhD in Transportation Engineering and Traffic Analyst

Urban Transportation Data Mining



Engineer Hamid Baradaran

CEO of Tehran Traffic Control Company



Application of artificial intelligence in higher education



Dr. Fataneh Taghi Yareh

Faculty member and Associate Professor, Faculty of Electrical and Computer Engineering, University of Tehran

PhD in Computer Engineering - Algorithms from Tokyo Institute of Technology

Dr. Mehdi Alipour Hafezi

Associate Professor of Information Science and Epistemology, Psychology and Educational Sciences, Allameh Tabatabaei University



Dr. Abolfazl Vahedi

Deputy Minister of Science for Education

Faculty member and full professor, Faculty of Electrical Engineering, Iran University of Science and Technology



Dr. Mohsen Ebrahimi Moghadam

Dean of the Faculty of Engineering and Computer Science

Former Director of Educational Planning and Evaluation, Shahid Beheshti University

Former Director of the University's Electronic Learning Center

Faculty Member and Full Professor, Faculty of Computer Engineering, Shahid Beheshti University





Dr. Abbas Saeedi

Vice President of Education, Shahid Beheshti University

Vice President of Research, Faculty of Biosciences and Technology, Shahid Beheshti University

Former Dean, Faculty of Biosciences and Technology, Shahid Beheshti University

Faculty member and full professor, Faculty of Biosciences and Technology



Workshops



ICAI

First International Conference on
Artificial Intelligence



Scheduling of side workshops for the First International Artificial Intelligence Conference

Time	Providers	Workshop title
13-16	Dr. Armin Salimi Badr Engineer Amir Mohammad Abbasi Engineer Mohammad Ali Ardhal	Applications of artificial intelligence in financial markets
12-8	Engineer Hossein Abbasi Engineer Hamid Moamelegary	Graph mining and big data
12-9	Dr. Hamed Malek	Prompt engineering for large language models
12-9	Dr. Aqeel Ahmadi	Smart oil industry
16-13	Engineer Seyyed Mohammad Mehdi Ghotbi	Software development with artificial intelligence on the platform of NoCode Platforms
16:30 - 13:30	Dr. Abbas Kochari	Generative networks in image processing

Tuesday
February 27

Wednesday
February 28

Applications of artificial intelligence in financial markets:

Financial markets, as one of the most complex and dynamic economic systems, are increasingly in need of modern tools for analysis and decision-making. In this workshop, with a comprehensive look at the role and position of artificial intelligence in financial markets, we will explore concepts such as the structure and types of financial markets and the AI techniques that have the highest efficiency in this field.

Presenters:

- Dr. Armin Salimi Badr
- Engineer Amir Mohammad Abbasi
- Engineer Mohammad Ali Ardhal

Graph mining and big data:

In this course, graph mining topics are discussed in two areas: graph storage and graph processing. Additionally, the course covers various types of graph databases, the basics of graph mining, the classification of algorithms (especially the applications of graphs in today's world), and viewing problems from a graph perspective. Finally, various graph processing tools in Python are introduced, and different types of graph databases currently under research and development in Europe are also presented.

Presenters:

- Engineer Hossein Abbasi
- Engineer Hamid Moamelegary

Prompt engineering for large language models:

In this workshop, after a brief introduction to the architecture of large language models (LLMs) and how they operate, we will cover the basics of prompt engineering. Next, we will review various standard prompt engineering techniques and then introduce the LangChain tool and its advantages. Subsequently, we will explore RAG models (Retrieval-Augmented Generation) and how to use them, followed by a discussion on agents and multi-agent systems and their interesting applications. Finally, we will review important methods for evaluating LLM-based models and applications.

Presenter:

- Dr. Hamed Malek

Smart oil industry:

Using artificial intelligence to increase efficiency, reduce costs and optimize processes: This workshop explores the role of Artificial Intelligence (AI) in the oil industry. Applications of AI include project management, optimization of refinery processes, risk prediction, resource allocation, and increasing accuracy and efficiency. AI can manage fuel consumption, optimize distribution, identify weaknesses in the supply chain, and prevent resource wastage. This technology drives the oil industry toward sustainability, flexibility, and greater productivity.

Presenter:

- Dr. Aqeel Ahmadi

Software development with artificial intelligence on the platform of NoCode Platforms:

This workshop explores how to use artificial intelligence to improve software development processes on no-code platforms. With the growing popularity of no-code platforms, artificial intelligence plays a key role in making these platforms easier to use and enhancing user productivity.

Presenter:

- Engineer Seyyed Mohammad Mehdi Ghotbi

Generative Networks in Image Processing:

Generative artificial intelligence, with models such as GANs and particularly StyleGAN, has revolutionized facial processing, enabling the generation, modification, and reconstruction of images. Despite challenges such as the need for extensive datasets and the complexity of training, recent advancements have contributed to the improvement of this technology and the expansion of its applications in machine vision.

Presenter:

- Dr. Abbas Kochari



Special Events and
programs



ICAI

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Artificial Intelligence



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Hackathon

The hackathon on “Artificial Intelligence in User-Centric Content Analysis” was held as an official pre-events of the First International Artificial Intelligence conference. This event also focused on identifying and supporting innovative ideas in the field of artificial intelligence, particularly in user-centric content creation. The primary goal of the three-day hackathon was to identify talented and skilled individuals in the technology and to nurture specialized and young professionals in collaboration with the industry.

During this program, this hackathon was organized by Beheshti Hub and Pindo in collaboration in partnership with the conference. This event received support and partnership from Pindo and Hooshmand Aval Beheshti. The selected teams from the hackathon will be honored during the conference.

Event Details:

Topic: Hackathon on Artificial Intelligence in User-Centric Content Analysis

Scientific Secretary: Dr. Mehrnoush Shams Fard, Faculty Member of Shahid Beheshti University

Dates: December 7, 8, and 9

Venue: Third and Seventh Floors of the Innovation Tower, Shahid Beheshti University

Innovative and intelligent industry award

One of the prominent parts of the first international artificial intelligence conference is to create an opportunity to support the best and innovative ideas in the field of artificial intelligence. The purpose of this part of the conference is to strengthen the connection between the university and the industry by encouraging innovative industrial ideas and plans presented by technological units, startups and technological companies in the field of artificial intelligence.

The program features participation from various technology units, startups, and companies, all of whom have submitted their innovative and intelligent ideas and projects to the conference, showcasing concepts that bridge the gap between academia and industry. Awards will be given for the best design and the most innovative idea.

Coordinator: Mr. Behrang Aghillinasab



Innovative and intelligent industry award



ICAI
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Artificial Intelligence

Exhibition of AI-Based Achievements

Alongside the First International Artificial Intelligence Conference, an exhibition showcasing AI-based achievements will be held in International Conferences Center of Shahid Beheshti University. This exhibition provides a unique opportunity for researchers, companies, startups, and activists in the field of artificial intelligence to present their innovations, products, and services in a specialized and international environment.

The objectives of the exhibition include introducing innovative projects and products in the field of artificial intelligence, establishing a space for interaction and networking among professionals, researchers, and industry stakeholders, and exhibiting practical applications of artificial intelligence in solving real-world issues across various sectors.

The benefits of participating in the exhibition include the opportunity to introduce outcomes to both national and international experts, interact directly with target audiences to receive expert feedback, and benefit from media opportunities and news coverage.

The exhibition coordinator:

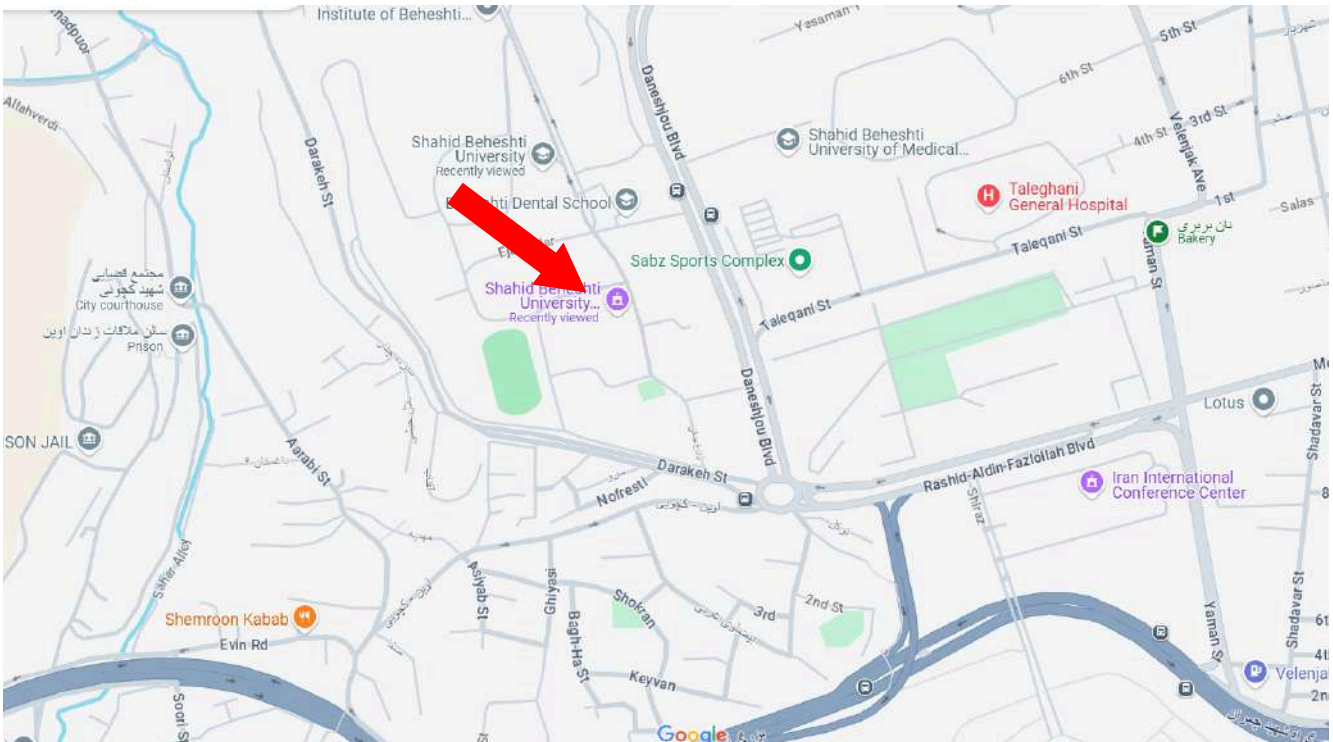
Mr. Borhani

Exhibit hours :

Tuesday, February 25, 8:30 - 18:30

Wednesday, February 26, 8:30 - 17:30

See You All in The First ICAI!



Venue: Chamran Highway - Daneshjoo Boulevard -
Shahid Beheshti University - International
Conference Center