Department of Computer Science & Information Technology

Institute for Advanced Studies in Basic Sciences
Gava Zang, Zanjan, Iran

Institute for Advanced Studies
in Basic Sciences
Gava Zang, Zanjan, Iran

Computer Science & Information Technology

Fields of Education:

- Artificial Intelligence & Robotics
- Data Mining
- Internet of Things (IoT)
- System Theory
- Bioinformatics (coming soon…)
- Cybersecurity (coming soon…)

Artificial Intelligence & Robotics

Postgraduate

Definition: Artificial Intelligence (AI) is a branch of computer science that focuses on creating systems capable of performing tasks that would typically require human intelligence. These tasks include understanding natural language, recognizing patterns, solving problems, and making decisions. AI systems are designed to simulate human cognitive processes, such as learning, reasoning, and self-correction, using algorithms, machine learning models, and data-driven techniques.

Importance: AI has rapidly become one of the most influential technologies of the 21st century, revolutionizing industries and reshaping the way we live and work. Its importance lies in its ability to process and analyze vast amounts of data at unprecedented speeds, providing insights and solutions that were previously unimaginable. AI enhances productivity, drives innovation, and creates new opportunities for growth across various sectors. As AI continues to advance, it is expected to play a crucial role in addressing some of the world's most pressing challenges, such as climate change, healthcare, and resource management.

Applications: AI has widespread applications across various industries, including healthcare, where it's used for diagnostics and personalized medicine; finance, for algorithmic trading and fraud detection; and transportation, where it powers autonomous vehicles and optimizes traffic management. It also enhances manufacturing through automation, improves retail with personalized recommendations, and revolutionizes education with adaptive learning systems. AI's versatility makes it a key driver of innovation and efficiency in nearly every sector.

Subfields: AI encompasses several subfields, each focusing on different aspects of intelligence and problem-solving:

- **Machine Learning (ML):** The study of algorithms that enable systems to learn from data and improve their performance over time without being explicitly programmed.
- **Natural Language Processing (NLP):** The field that focuses on enabling machines to understand, interpret, and generate human language.
- **Computer Vision:** The area of AI that enables machines to interpret and make decisions based on visual data from the world, such as images and videos.
- **Robotics:** The branch of AI that deals with the design, construction, and operation of robots capable of performing tasks autonomously or semi-autonomously.
- **Expert Systems:** AI systems that mimic the decision-making ability of a human expert in a specific domain, often used in medical diagnosis or complex problem-solving scenarios.

In conclusion, AI is a transformative technology that holds immense potential to shape the future of humanity. As it continues to evolve, its impact on society will be profound, offering solutions to complex challenges and creating new opportunities for growth and development.

Artificial Intelligence & Robotics

COURSES

Postgraduate

Postgraduate student courses			
Course Title	**Unit**	**Theoretical**	**Laboratory**
Artificial Neural Networks	3	●	
Machine Learning	3	●	
Stochastic Processes	3	●	
Advanced Artificial Intelligence	3	●	
Pattern Recognition	3	●	
Deep Learning	3	●	
Digital Image Processing	3	●	
Machine Vision	3	●	
Natural Language Processing	3	●	
Reinforcement Learning	3	●	
Optimization-Evolutionary Algorithms	3	●	
Advanced Data Mining	3	●	
Multi-Agent Systems	3	●	
Autonomous Robots	3	●	
Expert Systems	3	●	
Game Theory	3	●	
Minimum number of courses 10 equivalent to 30 units			

Data Mining

Postgraduate

Definition: Data mining is the process of discovering patterns, correlations, and meaningful insights from large datasets using statistical methods, machine learning algorithms, and database management techniques. It involves extracting hidden knowledge from raw data, transforming it into a comprehensible structure, and making it actionable for decision-making. Data mining helps organizations uncover trends, predict future outcomes, and make informed decisions by analyzing historical data.

Importance: In today's data-driven world, data mining is essential for organizations to gain a competitive edge, improve customer experiences, and optimize operations by uncovering hidden patterns in data. It enables proactive decision-making, risk reduction, and increased profitability, while also advancing research and development by revealing new insights.

Applications: Data mining has a wide range of applications across different sectors:

- **Marketing and Customer Relationship Management (CRM)**: Data mining helps companies segment their customers, identify target markets, and personalize marketing campaigns. It can predict customer behavior, such as purchase patterns and churn rates, enabling businesses to tailor their strategies and improve customer retention.
- **Finance**: In the financial industry, data mining is used for credit scoring, fraud detection, and risk management. By analyzing transaction data, financial institutions can detect unusual patterns that may indicate fraudulent activity and assess the creditworthiness of clients.
- **Healthcare**: Data mining is employed to analyze patient records, identify trends in disease outbreaks, and improve treatment plans. It can also help in predicting patient outcomes and optimizing resource allocation within healthcare organizations.
- **Retail**: Retailers use data mining to optimize inventory management, forecast demand, and enhance supply chain efficiency. By analyzing sales data, they can identify popular products, seasonal trends, and customer preferences.
- **Telecommunications**: Data mining aids telecom companies in understanding customer usage patterns, predicting service demand, and reducing churn by offering targeted promotions.
- **Manufacturing**: In manufacturing, data mining is used to improve quality control, predict equipment failures, and optimize production processes. Analyzing production data enables manufacturers to reduce downtime and enhance efficiency.

Data mining's ability to uncover hidden insights from vast amounts of data makes it a powerful tool in today's digital age. Its applications across various industries not only drive efficiency and innovation but also enable organizations to make data-driven decisions that can significantly impact their success.

Data Mining

Postgraduate

COURSES

Postgraduate student courses			
Course Title	Unit	Theoretical	Laboratory
Computational Data Mining	3	●	
Advanced algorithms	3	●	
Data Mining	3	●	
Mathematics of Learning	3	●	
Convex Optimization	3	●	
Combinatorial Optimization	3	●	
Machine Learning	3	●	
Statistical Machine Learning	3	●	
Advanced Data Mining	3	●	
Text Mining and Web Mining	3	●	
Feature Selection and Feature Extraction	3	●	
Graph Mining	3	●	
Minimum number of courses 10 equivalent to 30 units			

Internet of Things (IoT)

Postgraduate

Definition: The Internet of Things (IoT) refers to a network of interconnected physical devices embedded with sensors, software, and other technologies that enable them to collect and exchange data over the internet. These devices, often referred to as "smart" devices, can range from everyday household items like refrigerators and thermostats to industrial machinery and wearable technology. IoT enables these devices to communicate with each other and with centralized systems, allowing for real-time monitoring, automation, and data-driven decision-making.

Importance: IoT is transforming our interaction with the world by connecting physical devices to the digital realm, enhancing efficiency, reducing costs, and improving quality of life. It enables remote monitoring and management in various sectors, such as optimizing business operations, providing real-time healthcare, and improving resource management in smart cities. Overall, IoT drives innovation and creates a more connected and efficient world.

Applications: IoT has a wide array of applications across different industries:

- **Smart Homes**: IoT devices like smart thermostats, lighting systems, and security cameras allow homeowners to control and monitor their homes remotely, enhancing convenience, energy efficiency, and security.
- **Healthcare**: IoT enables remote health monitoring through wearable devices that track vital signs, medication adherence, and overall health. It also supports telemedicine, allowing doctors to provide care remotely.
- **Industrial IoT (IIoT)**: In manufacturing, IoT is used for predictive maintenance, where sensors monitor equipment health and predict failures before they occur. It also enhances supply chain management and improves production efficiency through real-time data analysis.
- **Smart Cities**: IoT plays a key role in the development of smart cities, where connected devices manage traffic flow, optimize waste management, and monitor environmental conditions, leading to more sustainable and livable urban environments.
- **Agriculture**: IoT is transforming agriculture through precision farming, where sensors monitor soil conditions, weather patterns, and crop health, enabling farmers to optimize water usage, reduce waste, and increase crop yields.
- **Transportation**: IoT enhances transportation systems through connected vehicles, which can communicate with each other and with traffic management systems to reduce congestion and improve safety. Fleet management and logistics are also optimized using IoT devices for real-time tracking and route planning.

The Internet of Things is driving significant advancements across multiple industries by enabling a more connected, efficient, and data-driven world. Its wide-ranging applications have the potential to transform everyday life and business operations, making IoT a key technology in the modern era.

Internet of Things (IoT)

COURSES

Postgraduate

Postgraduate student courses			
Course Title	Unit	Theoretical	Laboratory
Security & Privacy in IoT	3	●	●
Intelligent Systems & Applications	3	●	●
IoT Protocols & Infrastructures	3	●	●
Advanced Distributed Systems in IoT	3	●	
Industrial IoT	3	●	●
Advanced Embedded and Real-Time Systems	3	●	●
Communication Technologies in IoT	3	●	
Developing Embedded Systems Using FPGA	3	●	●
Reliable & Error Sustainable Systems	3	●	
Hardware & Embedded Systems' Security	3	●	
Machine & Deep Learning in IoT	3	●	●
Big Data Management	3	●	●
Advanced Software Engineering in IoT	3	●	
Energy Efficient Processing Architectures in IoT	3	●	
Minimum number of courses 10 equivalent to 30 units			

Systems Theory

Postgraduate

Definition: Systems Theory is an interdisciplinary conceptual framework that studies complex systems in nature, society, and science. It focuses on the holistic analysis of systems, understanding how individual components interact within a whole to produce collective behaviors and properties. Originating from fields like biology, engineering, and sociology, Systems Theory emphasizes the interdependence, feedback loops, and dynamics within systems, whether they are biological organisms, social organizations, ecological networks, or mechanical structures.

Importance: The significance of Systems Theory lies in its ability to provide a comprehensive perspective on complex phenomena. By examining the relationships and interactions between components rather than isolating them, this theory enables a deeper understanding of how systems function, adapt, and evolve. It fosters interdisciplinary collaboration, allowing insights from one field to inform another. In an increasingly interconnected world, Systems Theory equips researchers, policymakers, and practitioners with tools to address multifaceted challenges, predict system behaviors, and design interventions that consider the broader implications on the entire system.

Applications: Systems Theory has a wide range of applications across various domains:

- **Engineering and Control Systems**: In engineering, Systems Theory underpins the design and analysis of control systems, ensuring stability and desired performance in mechanical, electrical, and aerospace systems through feedback mechanisms.
- **Ecology**: Ecologists employ Systems Theory to understand ecosystems' dynamics, studying how species interactions, energy flows, and environmental factors contribute to ecosystem stability and resilience.
- **Organizational Management:** In business and management, Systems Theory informs organizational structure and behavior, helping leaders understand how different departments and processes interact, leading to more effective decision-making and change management.
- **Healthcare**: Healthcare systems utilize this theory to analyze patient care processes, hospital operations, and public health strategies, aiming to improve efficiency, patient outcomes, and resource allocation.
- **Social Sciences**: Sociologists and anthropologists apply Systems Theory to examine social structures, cultural dynamics, and community interactions, providing insights into societal behaviors and transformations.
- **Information Technology**: In IT, Systems Theory guides the development of complex software systems, network architectures, and

By offering a lens to view and analyze the complexity inherent in various systems, Systems Theory remains a vital tool across disciplines. Its holistic approach enables the identification of leverage points for change, prediction of system behaviors, and the crafting of solutions that are sustainable and considerate of the system's entirety.

Systems Theory

Postgraduate

COURSES

Postgraduate student courses			
Course Title	Unit	Theoretical	Laboratory
Computational Data Mining	3	•	
Advanced Algorithms	3	•	
Advanced Software Engineering	3	•	
Advanced Operating System	3	•	
Advanced Database	3	•	
Real Time Systems	3	•	
Decision Support Systems	3	•	
Advanced Compiler	3	•	
Distributed Systems	3	•	
Advanced Computer Networks	3	•	
Advanced Network Optimization	3	•	
Minimum number of courses 10 equivalent to 30 unites			

Bioinformatics

Postgraduate

Cybersecurity

Postgraduate

“The Head of Department”

In 2003, the university obtained approval from the Ministry of Science, Research, and Technology of Iran to establish the Information Technology Engineering program at the bachelor's level, admitting 23 students in this field and 18 students jointly with **Heriot-Watt University in Scotland**. In 2008, after receiving approval from the Ministry of Science, the university launched the Computer Science program at the master's level, admitting 10 students. From 2014 to 2017, the university admitted master's students in two specializations: Intelligent Systems and Computation Theory. Since 2018, student admissions have been carried out in four specializations: Artificial Intelligence, Data Mining, Internet of Things (IoT), and Systems Theory.

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Faculty Members

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Mahdi Vasighi

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My current researches are focused on a range of problems in structural bioinformatics. In order to model the relationships between the sequences and corresponding structure or biological function, biological sequence coding is considered as one of the main steps to design powerful models (classifiers/predictors) using different machine learning algorithms. Extraction of the relevant features is also another important step in related researches.

Some of publications:

■ **Vasighi, Mahd**i, and Homa Amini. "A directed batch growing approach to enhance the topology preservation of self-organizing map." Applied Soft Computing 55 (**2017**): 424-435.

■ Ballabio, Davide, and **Mahdi Vasighi**. "A MATLAB toolbox for Self Organizing Maps and supervised neural network learning strategies." Chemometrics and intelligent laboratory systems 118 (**2012**): 24-32.

■ Kavianpour, Hamidreza, and **Mahdi Vasighi**. "Structural classification of proteins using texture descriptors extracted from the cellular automata image." Amino Acids 49, no. 2 (**2017**): 261-271.

■ Hooshyar, L., M. B. Hernández-Jiménez, A. Khastan, and **Mahdi Vasighi**. "An efficient and accurate approach to identify similarities between biological sequences using pair amino acid composition and physicochemical properties." Soft Computing (**2024**): 1-17.

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Peyman Pahlevani

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- 5G Communication
- IoT (Internet Of Things)
- Vehicular Communication
- Wireless Network
- Network Coding

Some of publications:

■ Gholamian, Vida, Hosein K. Nazari, **Peyman Pahlevani**, and Frank HP Fitzek. "Accelerating Partial Packet Recovery in RLNC." IEEE Communications Letters (**2023**).

■ Ghassabi, Kiana, and **Peyman Pahlevani**. "DEDUCT: A Secure Deduplication of Textual Data in Cloud Environments." IEEE Access (**2024**).

■ Khamfroush, Hana, Daniel E. Lucani, **Peyman Pahlevani**, and João Barros. "On optimal policies for network-coded cooperation: Theory and implementation." IEEE Journal on Selected Areas in Communications 33, no. 2 (**2014**): 199-212.

■ **Pahlevani, Peyman**, Martin Hundebøll, Morten V. Pedersen, Daniel Lucani, Hassan Charaf, Frank HP Fitzek, Hamidreza Bagheri, and Marcos Katz. "Novel concepts for device-to-device communication using network coding." IEEE Communications Magazine 52, no. 4 (**2014**): 32-39.

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Zahra Narimani

Position: Assistant prof.

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My current researches are focused on a range of problems in the following fields:

- Algorithmic bioinformatics,
- Machine learning (Probabilistic graphical models, deep learning),
- Analysis of network-based and time-series data

Some of publications:

■ Esmaeili, Fariba, **Zahra Narimani**, and Mahdi Vasighi. "Discovering SNP-disease relationships in genome-wide SNP data using an improved harmony search based on SNP locus and genetic inheritance patterns." Plos one 18, no. 10 (**2023**): e0292266.

■ Iman, Maryam, **Zahra Narimani**, Iman Hamraz, and Ebrahim Ansari. "Network based identification of different mechanisms underlying pathogenesis of human papilloma virus-active and human papilloma virus-negative oropharyngeal squamous cell carcinoma." Journal of the Chinese Chemical Society 65, no. 11 (**2018**): 1307-1316.

■ Adineh, Amir Hossein, **Zahra Narimani**, and Suresh Chandra Satapathy. "Importance of data preprocessing in time series prediction using SARIMA: A case study." International Journal of Knowledge-based and Intelligent Engineering Systems 24, no. 4 (**2020**): 331-342.

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Parvin Razzaghi

Position: Assistant prof.

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Her research interests include:

- Deep learning,
- Transfer learning,
- Computer vision,
- Scene understanding,
- Machine learning and
- Pattern recognition

Some of publications:

■ Rafiei, Fatemeh, Hojjat Zeraati, Karim Abbasi, **Parvin Razzaghi**, Jahan B. Ghasemi, Mahboubeh Parsaeian, and Ali Masoudi-Nejad. "CFSSynergy: combining feature-based and similarity-based methods for drug synergy prediction." Journal of Chemical Information and Modeling 64, no. 7 (**2024**): 2577-2585.

■ Dehghan, Alireza, Karim Abbasi, **Parvin Razzaghi**, Hossein Banadkuki, and Sajjad Gharaghani. "CCL-DTI: contributing the contrastive loss in drug–target interaction prediction." BMC bioinformatics 25, no. 1 (**2024**): 48.

■ Palhamkhani, Farnaz, Milad Alipour, Abbas Dehnad, Karim Abbasi, **Parvin Razzaghi**, and Jahan B. Ghasemi. "DeepCompoundNet: enhancing compound–protein interaction prediction with multimodal convolutional neural networks." Journal of Biomolecular Structure and Dynamics (**2023**): 1-10.

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Mansoor Davoodi-Monfared

- Optimization Algorithms and Operations Research
- Modeling real-world problems, Uncertainty handling
- Soft Computing: Theories and Applications
- Mathematics of Machin Learning and Statistical Optimization, Data Analysis
- Theoretical Computer Science

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Some of publications:

■ Batista, Ana, Abhishek Senapati, **Mansoor Davoodi**, and Justin M. Calabrese. "Personnel staffing and scheduling during disease outbreaks: A contact network-based analysis." Computers & Industrial Engineering (**2024**): 110112.

■ Sadeghi Bigham, Bahram, **Mansoor Davoodi Monfared**, Samaneh Mazaheri, and Jalal Kheyrabadi. "Tiling Rectangles and the Plane Using Squares of Integral Sides." Mathematics 12, no. 7 (**2024**): 1027.

■ **Davoodi, Mansoor**, and Justin M. Calabrese. "Test Center Location Problem: A Bi-Objective Model and Algorithms." Algorithms 17, no. 4 (**2024**): 135.

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- Natural Language Processing
- Machine Learning
- Computer Security
- High Performance Computing

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Some of publications:

■ **Ansari, Ebrahim**, Ondřej Bojar, Barry Haddow, and Mohammad Mahmoudi. "SLTev: Comprehensive evaluation of spoken language translation." In Proceedings of the 16th Conference of the European Chapter of the Association for Computational Linguistics: System Demonstrations, pp. 71-79. **2021**. Selected as Outstanding Paper

■ **Ansari, Ebrahim**, Amittai Axelrod, Nguyen Bach, Ondřej Bojar, Roldano Cattoni, Fahim Dalvi, Nadir Durrani et al. "Findings of the IWSLT 2020 evaluation campaign." In Proceedings of the 17th International Conference on Spoken Language Translation, pp. 1-34. **2020**.

■ Fahandezi Sadi, Majid**, Ebrahim Ansari**, and Mohsen Afsharchi. "Supervised word sense disambiguation using new features based on word embeddings." Journal of Intelligent & Fuzzy Systems 37, no. 1 (**2019**): 1467-1476.

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Mahmoud Shirazi

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- IoT and Cyber-Physical Systems
- Real-Time and Embedded Systems
- Energy Aware/Efficient Computing

Some of publications:

■ **Shirazi, Mahmoud**, Lothar Thiele, and Mehdi Kargahi. "Energy-resilient real-time scheduling." IEEE Transactions on Computers 72, no. 1 (**2022**): 69-81.

■ Razzaghi, Parvin, Karim Abbasi, **Mahmoud Shirazi**, and Shima Rashidi. "Multimodal brain tumor detection using multimodal deep transfer learning." Applied Soft Computing 129 (**2022**): 109631.

■ **Shirazi, Mahmoud**, Mehdi Kargahi, and Lothar Thiele. "Performance maximization of energy-variable self-powered (m, k)-firm real-time systems." Real-Time Systems 56, no. 1 (**2020**): 64-111.

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Mohsen Hooshmand

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- Theory of Computation
- Artificial Intelligence
- Bioinformatics
- Natural Language Processing
- Stochastics Processes

Some of publications:

■ Hashemi, Morteza, Arash Zabihian, Masih Hajsaeedi, and **Mohsen Hooshmand**. "Antivirals for Monkeypox Virus: Proposing an Effective Machine/Deep Learning Framework." bioRxiv (**2024**): 2024-02.

■ Zabihian, Arash, Javad Asghari, **Mohsen Hooshmand**, and Sajjad Gharaghani. "A comparative analysis of computational drug repurposing approaches: proposing a novel tensor-matrix-tensor factorization method." Molecular Diversity (**2024**): 1-20.

■ Zabihian, Arash, Faeze Zakaryapour Sayyad, Seyyed Morteza Hashemi, **Mohsen Hooshmand**, and Sajjad Gharaghani. "DEDTI vs IEDTI: Efficient and Predictive Models of Drug-Target Interactions." (**2022**).

Alireza Masoum

- Internet of Things (IoT)
- Wireless Networks
- Data Mining

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Some of publications:

- **Masoum, Alireza**, Nirvana Meratnia, and Paul JM Havinga. "Coalition formation based compressive sensing in wireless sensor networks." Sensors 18, no. 7 (**2018**): 2331.

- **Masoum, Alireza**, Nirvana Meratnia, and Paul JM Havinga. "Compressive sensing based data collection in wireless sensor networks." In 2017 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI), pp. 442-447. IEEE, **2017**.

- **Masoum, Alireza**, Nirvana Meratnia, and Paul JM Havinga. "An energy-efficient adaptive sampling scheme for wireless sensor networks." In 2013 IEEE Eighth International Conference on Intelligent Sensors, Sensor Networks and Information Processing, pp. 231-236. IEEE, **2013**.

Zahra Taghi-Khaki

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Some of publications:

- **Taghikhaki, Zahra,** Nirvana Meratnia, and Paul JM Havinga. "On QoS guarantees of error control schemes for data dissemination in a chain-based wireless sensor networks." Sensors & transducers 18 (**2013**): 188-202.
- **Taghikhaki, Zahra**, Nirvana Meratnia, and Paul JM Havinga. "A trust-based probabilistic coverage algorithm for wireless sensor networks." Procedia computer science 21 (**2013**): 455-464.
- **Taghikhaki, Zahra**, Nirvana Meratnia, and Paul JM Havinga. "A reliable and energy-efficient chain-cluster based routing protocol for Wireless Sensor Networks." In 2013 IEEE eighth international conference on intelligent sensors, sensor networks and information processing, pp. 248-253. IEEE, **2013**.
- **Taghikhaki, Zahra**, Nirvana Meratnia, and Paul JM Havinga. "An error control scheme for delay constrained data communication in a chain-based wireless sensor network." In 2012 Seventh International Conference on Broadband, Wireless Computing, Communication and Applications, pp. 385-390. IEEE, **2012**.

Majid Ramezani

- Natural Language Processing
- Automatic Personality Assessment
- Machine/Deep Learning
- Knowledge Representation
- Explainable AI (XAI)
- Data Mining

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Some of publications:

■ **Ramezani, Majid**, Mohammad-Reza Feizi-Derakhshi, and Mohammad-Ali Balafar. "Text-based automatic personality prediction using KGrAt-Net: a knowledge graph attention network classifier." Scientific Reports, no. 1 (**2022**): 21453.

■ **Ramezani, Majid**, Mohammad-Reza Feizi-Derakhshi, and Mohammad-Ali Balafar. "Knowledge Graph-Enabled Text-Based Automatic Personality Prediction." Computational Intelligence and Neuroscience 2022, no. 1 (**2022**): 3732351.

■ **Ramezani, Majid**, Mohammad-Reza Feizi-Derakhshi, Mohammad-Ali Balafar, Meysam Asgari-Chenaghlu, Ali-Reza Feizi-Derakhshi, Narjes Nikzad-Khasmakhi, Mehrdad Ranjbar-Khadivi, Zoleikha Jahanbakhsh-Nagadeh, Elnaz Zafarani-Moattar, and Taymaz Akan. "Automatic personality prediction: an enhanced method using ensemble modeling." Neural Computing and Applications 34, no. 21 (**2022**): 18369-18389.

Sorour Sheidani

- Cryptography
- Privacy-Preserving Computations
- Security Protocols
- Digital Forensics
- Provable Security

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Some of publications:

■ Kabirirad, Saeideh, **Sorour Sheidani**, and Ziba Eslami. "An Efficient Ramp Secret Sharing Scheme Based on Zigzag-Decodable Codes." Computer and Knowledge Engineering 6, no. 2 (**2023**): 15-24.

■ **Sheidani, Sorour**, Ahmad Mahmoudi-Aznaveh, and Ziba Eslami. "CPA-secure privacy-preserving reversible data hiding for JPEG images." IEEE Transactions on Information Forensics and Security 16 (**2021**): 3647-3661.

■ **Sheidani, Sorour**, and Ziba Eslami. "Blind multipurpose watermarking with insertion of a single watermark: a generic construction based on verifiable threshold secret sharing." IET Image Processing 14, no. 17 (**2020**): 4766-4773.

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Mojtaba Shahidi

- Project Management
- Executive Management
- Network Administration
- Business Planning

Position: Head of the Computational Lab.

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Zahra Barari

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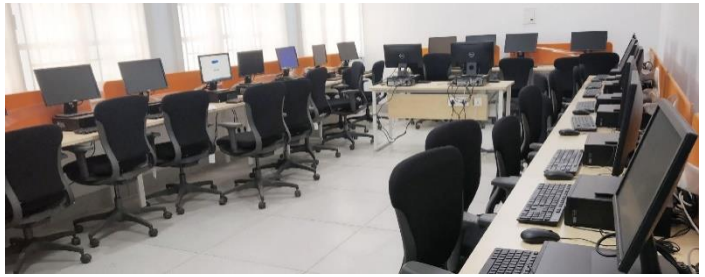
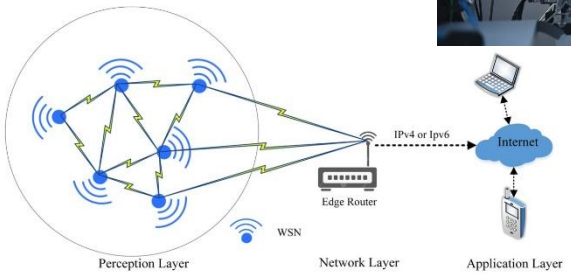
“Laboratories”

Computational Medicine



Human Computer Interaction



Data Science & Bioinformatics Laboratory

Laboratory

Bioinformatics and data mining

Mahdi Vasighi, Ph.D.

- Algorithmic Bioinformatics
- Machine & Deep Learning Solutions
- Computational Complexity Theory

Bioinformatics and data mining

Zahra Narimani, Ph.D.

- Algorithmic bioinformatics,
- Machine learning (probabilistic graphical models, deep learning),
- Analysis of network-based and time-series data

We focus on applying machine learning and statistical methods to solve problems in various domains: bioinformatics, financial markets, and recommender systems. The graph structure underlying the entities in these contexts is of particular importance in our solutions. For instance, the links between items and users in a recommender system, as well as the interactions between proteins and drugs, can all be modeled as graphs. Additionally, we are interested in using time-series signals present in bioinformatics (such as gene expression data) or financial markets to extract patterns and better understand the underlying systems. Our approach involves analyzing complex networks using both classic methods (such as centrality measures) and state-of-the-art techniques (such as deep learning), as well as leveraging probabilistic methods.

Some of our focus areas include: prediction of drug-target or protein-protein interactions, identifying disease-related genes, inference of biological networks, recommending drugs for diseases, recommending items to users in online shops, analysis of financial markets

Wireless Communication & IoT Laboratory

Laboratory

Computer Network & Security

Peyman Pahlevani, Ph.D.

- Wireless Networks
- IoT
- Cyber Security

Our lab is dedicated to pioneering research in computer networks, wireless communication, cybersecurity, and the Internet of Things (IoT). Our work is focused on developing robust and secure networking solutions that address the evolving challenges of modern digital environments. By exploring advanced techniques in network security, wireless systems, and IoT technologies, we aim to create innovative solutions that enhance connectivity, safeguard data, and ensure the resilience of next-generation networks against emerging threats.

Some of our focus areas include: Network Codding; IoT in Real-World Applications; IoT Protocols; IoT & OT Security

Internet-of-Things (IoT)

Mahmoud Shirazi, Ph.D.

- Resilience in IoT
- Energy-efficient scheduling of IoT devices
- Energy-resilient scheduling of cyber-physical systems
- Minimizing age-of-information in IoT
- Deadline-aware communication/computing in IoT

The Internet-of-Things Laboratory (IoTLab) at IASBS is dedicated to advancing the field of IoT and Cyber-Physical Systems (CPS) through cutting-edge research and innovation. Our team focuses on key challenges such as resilience and energy efficiency in connected systems. We are committed to developing solutions that enhance the reliability, efficiency, and responsiveness of IoT and CPS, with particular emphasis on timing constraints. By addressing these critical issues, our lab aims to contribute to the creation of robust, sustainable, and intelligent systems that can effectively meet the demands of modern technology.

Some of our focus areas include: Real-Time Embedded Systems; Energy Aware/Efficient Computing; Intelligent Real-Time Systems.

Artificial Intelligence Laboratory

Laboratory

Artificial Intelligence (AI)

Ebrahim Ansari, Ph.D.

- Machine Learning
- Computer Vision
- Natural Language Processing
- Computer Security and Malware Detection

Artificial Intelligence (AI) is a branch of Computer Science concerned with making computers behave like humans. The term was coined in 1956 by John McCarthy at the Massachusetts Institute of Technology. Artificial Intelligence aims to understand the nature of intelligence and to engineer systems that exhibit such intelligence by building vision, language, and knowledge. The resultant knowledge has diverse applications, particularly for designing and developing humanoid robots.

Some related projects that have their own webpage:

https://iasbs.ac.ir/~ansari/faraz/index.html
https://iasbs.ac.ir/~ansari/nlp/pepc.html
https://iasbs.ac.ir/~ansari/malware/aphmm.html
https://iasbs.ac.ir/~ansari/nlp/wsdw2vec.html

Language Technology

Parvin Razzaghi, Ph.D.

- Machine/Deep Learning
- Image Processing/Machine Vision
- Pattern Recognition
- Drug Discovery

Our lab is at the forefront of research in machine and deep learning, image processing, machine vision, pattern recognition, and drug discovery. Our interdisciplinary approach leverages advanced computational techniques to solve complex problems in image analysis and pattern recognition, while also driving innovation in drug discovery. By integrating cutting-edge machine learning algorithms with biological data, we aim to accelerate the discovery of new therapeutics and develop intelligent systems that transform both healthcare and technology.

Some of our focus areas include: drug prediction; tumor detection;

IoTCPP (IoT Connected Product & Platform)

Laboratory

IoTCPP

AIoT Connected Product & Platforms

Alireza Masoum, Ph.D.

- Digital factory, AIoT Connected Platform
- Edge AI, Virtual Twin
- Metaverse

The research focuses on the transformative potential of digital technologies in the industrial sector, particularly in revolutionizing manufacturing through digital transformation strategies. The emphasis is on the digital factory as a connected, intelligent platform that integrates technologies like IoT, cloud computing, data analytics, AI, the metaverse, modern software engineering, DevOps, and advanced wireless communication. The goal is to transform traditional manufacturing into a dynamic, adaptive, and fully digitalized environment.

Some of our focus areas include: In essence, the focus is on driving digital transformation by building the future of connected, intelligent, and fully integrated digital factories.

Internet of Things (IoT)

Zahra Taghi-Khaki, Ph.D.

- Smart Manufacturing
- Modern Software Platform Engineering
- IIoT, AR/VR, LLM

The research focuses on advancing smart manufacturing by integrating key technologies such as AI, Industrial IoT (IIoT), the metaverse, and blockchain. These technologies collectively transform traditional manufacturing into dynamic, intelligent, and adaptive systems. The goal is to develop fully integrated smart factories that are connected, automated, intelligent, and capable of self-optimization.

Some of our focus areas include: the focus is on leveraging AI, IIoT, the metaverse, and blockchain to create the next generation of smart manufacturing systems.

Data Science

Majid Ramezani, Ph.D.

- Data mining
- Deep Learning
- Data Visualization

Data Science is an interdisciplinary field focused on extracting insights and knowledge from data. It combines elements of statistics, computer science, and domain expertise to analyze, interpret, and visualize complex datasets. Data scientists use machine learning, data mining, and predictive modeling to make data-driven decisions. The goal is to turn raw data into actionable insights for various applications, from business to healthcare.

Some of our focus areas include: Business Intelligence (BI); predictive maintenance, medical data mining, etc.

Computational Medicine & Language Technology Laboratory

Laboratory

Computational Medicine

Mohsen Hooshmand, Ph.D.

- Algorithmic Bioinformatics
- Machine & Deep Learning Solutions
- Computational Complexity Theory

We specialize in developing advanced algorithmic bioinformatics, machine learning, and deep learning solutions to tackle complex medical challenges. Our research integrates computational complexity theory with cutting-edge technology to innovate and optimize healthcare solutions. By harnessing the power of data and algorithms, we aim to transform medical research and practice, paving the way for more precise diagnostics, personalized treatments, and better patient outcomes.

Some of our focus areas include: prediction of drug-target interactions; computational viral disease treatment; dataset collection & generation; sequence alignment, etc.

Language Technology

Majid Ramezani, Ph.D.

- Natural Language Processing, Understanding and Generation.
- Knowledge Representation
- Psycholinguistic Language Processing
- Explainable AI (NLP)

Here, a cutting-edge research facility dedicated to advancing the field of Natural Language Processing (NLP). Our work encompasses the full spectrum of language technology, from understanding human language to generating natural, coherent responses. By leveraging the latest in machine learning, deep learning, and computational linguistics, we aim to bridge the gap between human communication and artificial intelligence. Our lab is committed to pushing the boundaries of how machines comprehend, interpret, and generate human language, driving innovation in AI-driven language applications and contributing to the future of intelligent communication systems.

Some of our focus areas include: automatic personality assessment; knowledge representation; bias detection and mitigation; human and AI generated text discrimination; language and mental disorders, text summarization, recommender systems, etc.