

ABOLFAZL MOHAMMADI ZOGHALCHALI

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Research Summary

My research focuses on applying deep learning and multimodal AI models to healthcare applications, particularly in medical image processing and signal analysis for cardiovascular diagnosis. I am interested in developing intelligent systems that combine computer vision, natural language processing, and machine learning to solve real-world problems in clinical settings.

Education

Babol Noshirvani University of Technology (Ranked 501-600 via Times Higher Education) **2021 – 2025**
Bachelor of Science in Computer Engineering (GPA: 3.82/4 over last two years) *Babol, Mazandaran*

Experiences

Research Experience

- Research Assistant, Artificial Intelligence Research Lab, Babol Noshirvani University of Tech-2025–present**
- nology**
Engaged in research projects focusing on software systems and applications of artificial intelligence.

Research Interests

- Deep Learning
- Machine Learning
- AI in Healthcare
- Neural Networks
- Image Processing
- Prompt Engineering

On-going Research

The Role of Machine Learning in Diagnosis of Acute Occlusion Myocardial Infarction in Presence of Left Bundle Branch Block (LBBB) | *A Mohammadi, A Ariaei*

- Conducted under supervision of **Dr. Hesam Omranpour**.
- Uses deep learning and signal processing to segment ECG images and extract ECG signals.
- Data consists of annotated ECG images and corresponding patient records.
- Expected outcome: an interpretable model to detect myocardial infarction in ECGs with LBBB cases, improving diagnosis accuracy.

Academic Projects

Deep learning-based ECG image segmentation

On-going

- Developed an ECG image segmentation application using **nnUNet** architecture trained on doctor-segmented RGB datasets (83 images).
- Data converted into Compressed NIfTI format (.nii.gz) for nnUNet compatibility.
- Achieved **90% segmentation accuracy** on one validation dataset.
- Technologies: **Python, PyTorch, nnUNet, OpenCV, NumPy**.
- Purpose: automate ECG image segmentation for efficient signal extraction for diagnostic AI systems.

Computational Intelligence Algorithms: Design, Implementation and Evaluation

2025

- Implemented various computational intelligence algorithms, including Genetic Algorithms, LVQ, and reinforcement learning (from scratch).
- Also implemented MLP, K-Means, KNN, and SOM using Python libraries.
- Used multiple datasets for performance comparison and visualization.
- Technologies: **Python, scikit-learn, NumPy, matplotlib**.
- Outcome: comparative analysis report showing convergence rates and classification accuracy.

Design and Implementation of Teslang Compiler: A Lexical, Syntax, and Semantic Analyzer for a Custom Programming Language

2024

- Built a multi-layer compiler (**Teslang**) with modular architecture.
- Implemented lexical, syntax, and semantic analysis with robust error recovery.
- Technologies: **Python, PLY**, custom grammar definitions.
- Purpose: to analyze and compile domain-specific code efficiently.

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| A CNN image classifier for CIFAR-10 dataset | 2024 |
| <ul style="list-style-type: none"> Developed a PyTorch-based CNN model for image classification on CIFAR-10 (60,000 images). Applied k-fold cross-validation for improved generalization. Purpose: test CNN architectures for small-scale natural image datasets. Outcome: achieved 85% accuracy on test set. | |
| Smart University chatbot implementation: Telegram-Based QA with LLM Integration and prompt engineering | 2024 |
| <ul style="list-style-type: none"> Developed a domain-specific chatbot to assist NIT students in querying academic regulations. Supervised by Dr. Mehdi Emadi. Utilized ChatGPT API, LangChain, Elasticsearch, Python, Telegram API. Purpose: natural language querying of university guidelines and manuals. Outcome: interactive chatbot capable of retrieving relevant text passages from academic PDFs. | |
| Design and Execution of a Fault-Tolerant File Encryption Service Using Sockets and Python | 2024 |
| <ul style="list-style-type: none"> Created a client-server encryption framework using Python sockets, multiprocessing, and MD5 hashing. Server dynamically spawns worker processes for concurrent encryption. Commander process monitors fault tolerance and replaces failed workers. Purpose: ensure reliable encrypted data transmission in distributed systems. | |
| Teaching Assistant | |
| Compiler Design | |
| <i>Instructed by: Dr.Ali Gholami Rudi Project Design and Phase Planning</i> | <i>2025</i> |
| Software Systems Analysis & Design | |
| <i>Instructed by: DR.Mehdi Emadi Project Mentorship and Phase Design & Planning</i> | <i>2024</i> |
| Operating Systems | |
| <i>Instructed by: Dr.Ali Gholami Rudi Final Project Design</i> | <i>2024</i> |
| Compiler Design | |
| <i>Instructed by: Dr.Ali Gholami Rudi Project Design and Phase Planning</i> | <i>2024</i> |
| Databases | |
| <i>Instructed by: DR.Mehdi Emadi Project Phase Design and Computer-Based Exercises</i> | <i>2024</i> |
| Data Structures | |
| <i>Instructed by: Mahyar Hassanpour Design and Evaluation of Paper-Based Exercises</i> | <i>2023</i> |
| Theory of Formal languages & Automata | |
| <i>Instructed by: Mahyar Hassanpour Holding Problem-Solving Sessions</i> | <i>2023</i> |
| Awards and Honors | |
| Ranked top 6% among the Participants of the 6th edition AlgoNIT Programming Competition | |
| <i>ranked the 11th team in 167 Participants</i> | <i>2025</i> |
| Ranked top student to finish in 7 main semesters | |
| <i>Among All the Faculties at the university</i> | <i>2025</i> |
| Finished a four year bachelor program in three and half years | |
| <i>Achieved 140 credits at Babol Noshirvani University of Technology</i> | <i>2025</i> |
| Ranked top 15% among students of Computer Science faculty | |
| <i>Among about 70 students over last four semesters</i> | <i>2025</i> |
| Ranked top 11% among the Participants of the 4th edition AlgoNIT Programming Competition | |
| <i>ranked the 25th team in 247 Participants</i> | <i>2024</i> |
| Ranked top 19% among the Participants of the 2nd edition AlgoNIT Programming Competition | |
| <i>ranked the 5th team in 27 teams</i> | <i>2023</i> |
| Ranked top 5% in Iranian university entrance exam | |
| <i>Among about 130,000 participants</i> | <i>2021</i> |
| Ranked top student in High School for Iranian university entrance exam | |
| <i>Among fellow students specializing in Mathematics and Physics</i> | <i>2021</i> |
| Achieved silver medal in the national jujitsu competition. | |
| <i>ranked 2nd place in the National Tournament of Martyr Hossein Ali Moradi Cup</i> | <i>2016</i> |

Notable Courses

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| Fundamentals of Computational Intelligence <i>Instructed by: DR.Hesam Omranpour & DR.Fateme Zamani Babol Noshirvani University of Technology</i> | 2024 |
| Fundamental of Computer Vision <i>Instructed by: DR.Mehdi Ezoji Babol Noshirvani University of Technology</i> | 2024 |
| Fundamentals of Secure Computing <i>Instructed by: DR.Hassan Nasiraei Babol Noshirvani University of Technology</i> | 2024 |
| Introduction to the Information Retrieval <i>Instructed by: DR.Mpjtaba Mansoori Babol Noshirvani University of Technology</i> | 2024 |
| Fundamentals and Applications of Artificial Intelligence <i>Instructed by: DR.Fateme Zamani Babol Noshirvani University of Technology</i> | 2023 |
| Algorithm Design <i>Instructed by: DR.Fateme Zamani Babol Noshirvani University of Technology</i> | 2023 |
| Applied Linear Algebra <i>Instructed by: DR.Nooshin Maghsoodi Babol Noshirvani University of Technology</i> | 2023 |

Extracurricular Activities

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|---|------|
| Executive Member of the 5th National Programming Contest (AlgoNIT) <i>Electrical & Computer Engineering Faculty Babol Noshirvani University of Technology</i> | 2024 |
| Part of the Public Relations Team of the RainoCup International Event <i>Multiple Faculties Babol Noshirvani University of Technology</i> | 2023 |

Technical Skills

- Programming Languages & Frameworks: Python, C#, Java, VHDL, Matlab, Shell, .NET
- Libraries: scikit-learn, Pandas, Numpy, OpenCV, matplotlib, pytorch, LangChain, Entity Framework
- Technologies: Docker, Microservices, ChatGPT API, Git, Unity, LaTeX

Test Scores

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| IELTS Academic: Overall Band 8.0 | |
| * Listening: 9.0 | * Writing: 6.5 |
| * Reading: 9.0 | * Speaking: 7.5 |

References

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| DR. Mehdi Emadi <i>Faculty of Electrical & Computer Engineering Babol Noshirvani University of Technology</i> | Assistant Professor <i>m.emadi@nit.ac.ir</i> |
| DR. Ali Gholami Rudi <i>Faculty of Electrical & Computer Engineering Babol Noshirvani University of Technology</i> | Assistant Professor <i>gholamirudi@nit.ac.ir</i> |
| DR. Hesam Omranpour <i>faculty of Electrical & Computer Engineering Babol Noshirvani University of Technology</i> | Associate Professor <i>h.omranpour@nit.ac.ir</i> |

Hobbies and Interests

- Playing the guitar

· Reading novels
- Playing video games

· Calisthenics
- jujitsu