Fatemeh Mirzadeh Sarcheshmeh

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RESEARCH INTERESTS

Applied Machine Learning, Deep Learning, Artificial Intelligence, Image Processing, Signal Processing.

EDUCATION

University of Tehran — Tehran, Iran
Master of Science - Mechatronics Engineering - GPA: 4/4 — *Sep 2022 - Sep 2024*
Thesis: Design and development of children's cry collection system using deep learning
Courses: Artificial Neural Networks, Artificial Intelligence, Machine Learning, Analysis and Design of Deep Neural Networks

Shahid Beheshti University (SBU) — Tehran, Iran
Bachelor of Science - Mechanical Engineering - GPA: 3.44/4 (Last two years) — *Sep 2017 - Sep 2022*
Thesis: Numerical study of the effect of infill on mechanical properties by Fused Deposition Modeling

PUBLICATIONS

Automated Spleen Segmentation Using Hybrid Deep Learning Framework — Nature, 2025

Karimi, Ali, Javad Seraj, **Fatemeh Mirzadeh Sarcheshmeh**, Abdoulreza Sajjadian Moosavi, Masoud Shariat Panahi.

Enhancing Disease Detection in Corneal Maps: A Comparative Analysis — Under review, 2024

Saeidi, Sourena, **Fatemeh Mirzadeh Sarcheshmeh**, Masoud Shariat Panahi, Hamideh Sabbaghi. Survey of Ophthalmology

RESEARCH EXPERIENCE

Advanced Robotics and Intelligent Systems Lab — University of Tehran
Research Assistant — *Jan 2023 - Present*

- **Machine Learning Engineer**:
  - **Smart Device for Early Autism Screening**: Prototyped a Raspberry Pi-based smart device and implemented a fully automatic machine learning pipeline utilizing the YamNet model and advanced signal processing to acquire children's crying audio and perform early autism screening tests.
  - **Ultrasound-based Intestinal Adhesion Detection**: Designed and implemented a deep learning pipeline to feature select and feature engineer ultrasound films segmented data for intestinal adhesion screening using YOLOv8 architecture and a custom semantic segmentation method.
  - **Corneal Disease Classification System**: Developed a multi-branch network for Keratoconus disease classification using ResNet50, MobileNet, DenseNet, and Xception across 16 maps, achieving high diagnostic accuracy and identifying key discriminatory maps.
  - **Advanced Spleen Segmentation Framework**: Engineered an AI framework for spleen segmentation from ultrasound images, integrating CGANs alongside UNET to enhance accuracy and automate measurement.
  - **Image Similarity Detection System**: Employed Siamese Networks with Triplet and Contrastive Losses to refine image similarity detection. Achieved robust feature extraction, enhancing accuracy in image recognition, utilizing the People Dataset.
  - **Speech Emotion Recognition System**: Designed a speech emotion recognition system using CNN-LSTM networks and signal processing techniques like MFCC extraction and data augmentation to aid people with alexithymia in recognizing emotions and improve human-computer interaction and mental health monitoring.
  - **Image Generation and Quality Optimization**: Designed and implemented a diffusion model pipeline to generate images, verify image quality and optimize reliability. Incorporated a salting process and denoising network, while hardening the UNET network to improve image quality and resolution.
  - **BEIT Model for Environmental Image Analysis**: Implemented the BEIT model to accurately identify and outline objects and understand context in various environmental images. Optimized this model for environmental analysis and augmented reality applications, using datasets like COCO, Cityscapes, ADE20K, and the 150-Parse-Scene dataset.
  - **Thyroid Disease Diagnosis**: Developed a deep learning framework for accurate diagnosis and classification of thyroid disease stages, employing Genetic Algorithms on a dataset derived from comprehensive clinical assessments and blood biomarker analysis.
  - **Pneumonia Screening Model**: Developing an EfficientNet-based model using transfer learning methods on chest X-rays dataset for pneumonia screening.
  - **TA-Unet Model for Drivable Area Mapping**: Constructed the TA-Unet model with an encoder-decoder structure that includes symmetric skip connections and cross-dimensional interactions to accurately map drivable areas. Used the UAS dataset and implemented real-time segmentation in a CARLA simulation environment with GPU acceleration.

Faculty of Mechanical and Energy Engineering — Shahid Beheshti University
Undergraduate Researcher — *Sep 2021 - Jun 2022*

- **Python Developer**:
  - **Breast Cancer Tumor Analysis System**: Implemented feature extraction and feature selection methods on breast cancer tumor datasets, benchmark various regression model, design a custom logistic regression model for optimized accuracy and performance.
  - **Comparative Analysis of PSPNet and UNet for Underwater Monitoring**: Conducted a comparative analysis of PSPNet and UNet for underwater semantic segmentation and object detection to monitor the health of aquatic habitats.
  - **Optimized VGG Architectures in Medical Imaging**: Optimized VGG11 and VGG16 using ImageNet and Medical ImageNet datasets, applying separation index in medical image analysis adaptation.
- **Finite Element Analyst**:
  - **Thermal Stress Analysis Using Piezoelectric Sensors**: Conducted a thermal stress analysis project aimed at designing a sensor using piezoelectric materials. Utilized Abaqus to simulate the impact of thermal effects on stress and strain within diverse material configurations.
- **Matlab Developer**:
  - **Geothermal Power Plant Control System**: Engaged in a geothermal power plant control project, specializing in valve controller design and advancing control algorithms using MATLAB.

Teaching & Mentoring Experience

Advanced Robotics and Intelligent Systems Lab — University of Tehran
Teaching assistant — *Sep 2023 - Present*

- **Artificial Intelligence**: Python 101, Git, NumPy data manipulation, Multilayer Perceptron (MLP), Convolutional Neural Networks (CNN), Long Short-Term Memory (LSTM)
- **Neural Network**: PyTorch, Long Short-Term Memory (LSTM), Generative Adversarial Networks (GANs), Convolutional Neural Networks (CNN), Deep Learning Architectures, U-Net (including Encoder-Decoder architecture)
- **Medical Artificial Intelligence**: Python 101, Markov Models, Machine Learning Models

Faculty of Mechanical and Energy Engineering — Shahid Beheshti University
Teaching assistant — *Sep 2021 - Jun 2022*

- **CAD/CAM**: Solidworks, Abaqus

Selected Work Experience

CAD/CAM engineer — Shahid Beheshti University
Mechanical Engineer — *Feb 2022 - Aug 2022*

- Benchmarked multiple topology optimization methods for stress/strain analysis using SolidWorks, Abaqus, and MATLAB.

English Teacher — Safir Language Academy
Instructor — *Dec 2019 - Dec 2022*

- Educated adult learners in English language skills.

Data scientists — Iran Migration Observatory (IMOBS)
Researcher in collaboration with the University of Turku — *Jul 2019 - Nov 2019*

- Prepared the questionnaire and managed data collection processes.
- Utilized SPSS software for coding questions and answers to ensure system compatibility.
- Performed comprehensive analysis of the collected data to draw conclusions on the challenges faced by Afghan migrants in Iran and Finland.

Internship — University of Tehran
Intern — *Jul 2018 - Sep 2018*

- Focusing on acquired skills in Pyomo for advanced Python optimization, mastering modeling, solver integration, and real-world problem-solving proficiency.

English Test Score

IELTS: Overall Score=7, Listening=8, Reading=7, Speaking=6.5, Writing=6
GRE General: Overall Score=334, Quantitive=170, Verbal=164, Analytical Writing=4.5

Skills Summary

- **Frameworks**: Scikit-Learn, PyTorch, OpenCV, TensorFlow, Keras, Seaborn, Hugging Face, SciPy
- **Tools**: Jupyter Notebook, CUDA, Simulink, Simscape, Git, Proteus
- **Programming**: Python, C, C++, MATLAB, Fortran, Ladder (PLC)
- **CAD/CAM/CAE**: SolidWorks, Abaqus, 3D Slicer, AutoCAD
- **Platforms**: Linux, Raspberry Pi, Arduino
- **Soft Skills**: Critical Thinking, Team Leadership, Autonomous Learning, Problem Solving
- **Languages**: English (Proficient), Turkish (Intermediate), Farsi (Native)

References

- **Dr. Manouchehr (Hadi) Moradi Sabzevar**   Thesis Supervisor,Professor, University of Tehran
  moradih@ut.ac.ir
- **Dr. Masoud Shariat Panahi**   Project Supervisor, Professor, University of Tehran
  Mshariatp@ut.ac.ir
- **Dr. Ahmad Kalhor**   Project Supervisor, Professor, University of Tehran
  ad.kalhor@gmail.com
- **Dr. Mehdi Teimouri**   Project Supervisor, Professor, University of Tehran
  dsc.fnst@ut.ac.ir