Fatemeh Mirzadeh Sarcheshmeh

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Portfolio: fatemehmirzade.github.io

Research Interests

Applied Machine Learning, Biomedical Engineering, Signal Processing, Image Processing, Generative adversarial network, Artificial Intelligence.

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

- **Enhanced Spleen Segmentation in Ultrasound Images: A deep learning approach** — Under review, 2024

  Karimi, Ali, **Fatemeh Mirzadeh Sarcheshmeh**, Masoud Shariat Panahi. American Journal of Roentgenology (AJR)

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

  Saeidi, Sourena, **Mirzadeh Sarcheshmeh, Fatemeh**, 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.
    - **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.
    - **Intelligent Agent Design for Parking Panic Game**: Developed an intelligent agent for the Parking Panic game using reinforcement learning algorithms, optimizing state accessibility, convergence, and hyperparameters in the 3v-taxi-gym environment for efficient problem-solving and enhanced rehabilitation outcomes.
    - **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.
    - **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-cene dataset.
    - **Handwritten Digits Generation**: Benchmarked multiple GAN algorithm on handwritten digits generation, optimized DCGAN network for more realistic results.
    - **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.
    - **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.

- **Faculty of Mechanical and Energy Engineering** — Shahid Beheshti University
  Undergraduate Researcher — *Sep 2021 - Jun 2022*
  - **Python Developer**:
    - **An Autonomous Agent for Bounce Ball Classic Game**: Implemented a reinforcement learning agent using deep Q-learning in the "Bouncing Ball" game environment. Refined the reward system to enhance the agent's performance and improve problem-solving strategies.
    - **An Intelligent Supervisory Platform for Lathe Machines**: Engineered an intelligent supervisory platform to optimize lathing machine operations for novices. Advanced access control mechanisms were incorporated and detailed risk assessments were conducted to thoroughly address potential hazards. This resulted in a more user-friendly and secure environment within the manufacturing setting, significantly improving operational efficiency and safety standards.
  - **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=333, Quantitive=170, Verbal=163, Analytical Writing=

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