MohammadHossein Soltani

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EDUCATION

Shahid Beheshti University (SBU) - Tehran, Iran   Sept 2019 - July 2024
Bachelor of Science, Electrical Engineering
– Last Two Years GPA: **3.92**/4 – Cumulative GPA: 3.29/4 (Avg. Electrical Engineering Department GPA: 2.88/4)
– **Thesis:** Small-Scale Autonomous Car: Design, Implementation, and Remote Monitoring · **Grade: 20/20**

PUBLICATIONS

Alireza Morsali, MohammadJavad Vaez, <u>MohammadHossein Soltani</u>, Amirhossein Kazerouni, Babak Taati, Morteza Mohammad-Noori **"STAF: Sinusoidal Trainable Activation Functions for Implicit Neural Representation"** *(Submitted to ICLR2026, arXiv preprint)*

WORKING PAPERS

Moein Heidari[*], <u>MohammadHossein Soltani</u>[*], Reza Rezaeian[*], Hamid Soltanian-Zadeh, Ilker Hacihaliloglu **"MedActINR: Neural Representation with Bias Modulation for Ultrasound Videos"** *(In progress)*

RESEARCH EXPERIENCE

University of British Columbia (UBC) - Vancouver, Canada   Aug 2025 - Present
Remote Research Assistant Under Supervision of Moein Heidari and Dr. Ilker Hacihaliloglu

- Exploring the application of Implicit Neural Representations (INRs) for medical video representation.
- Optimized video representation INR model and training pipeline, reducing training time by 80% and model size by 90%.
- Currently, I'm working on applying Meta-learning method for video representation INR model.

McGill University - Montreal, Canada   Sept 2023 - May 2025
Remote Research Assistant Under Supervision of Dr. Morsali

- Investigated the usage of trainable activation functions in Implicit Neural Representations (INRs) for signal representation.
- Implemented the main model and experimental results setup in PyTorch, achieving an 11% improvement over SOTA with 50% fewer parameters.
- Conducted literature review of over 10 key papers on Neural Tangent Kernel (NTK) analysis of STAF and other SOTA Implicit Neural Representation (INR) methods.
- Research led to the submitted paper "STAF: Sinusoidal Trainable Activation Functions for Implicit Neural Representation".

Shahid Behehsti University, *Computer and Microprocessor Lab* - Tehran, Iran   Oct 2023 - June 2024
Research Assistant Under Supervision of Dr. Asharioun, *In-Person*

- Investigated and evaluated SOTA methods and paradigms for autonomous driving.
- Designed and implemented a data collection pipeline in Python, collecting and labeling 5GB of raw test track images using fish-eye camera sensor.
- Developed an end-to-end CNN-based regression model, achieving 95% prediction accuracy for steering angle commands.
- Optimized and deployed the model on NVIDIA Jetson Nano, reducing inference latency by 30% for real-time processing.

Institute for Research in Fundamental Sciences (IPM) - Tehran, Iran   June 2023 - Sept 2023
Summer Intern, *Hybrid*

- One of Iran's leading research institutes. Contributed to the project "Image Segmentation on Aerial Images of Natural Disasters".
- Conducted Exploratory Data Analysis (EDA) on the LPCV2023 dataset, identifying key class imbalances and data anomalies.
- Designed and implemented a U-Net inspired model in PyTorch, trained on the LPCV2023 challenge dataset and achieved competitive results. code available here

HONORS AND REWARDS

- **Masters University Entrance Exam** - Ranked within the top 3.5% in Electrical Engineering nationwide.   Sanjesh Institute - 2025
- **10th WSS Poster Session Competition** - Ranked 1st nationwide (results and poster). SUT - 2025
- **ChillinWarsAI Challenge** - Ranked 3rd nationwide as team Covid-404 (results).   IUST - 2019
- **National University Entrance Exam** - Ranked within the top 1% among approximately 164,000 participants.   Sanjesh Institute - 2019

TEACHING ASSISTANT

- **Digital Systems 1** - Dr. Pouladi — Winter 2024
- **Artificial Intelligence** - Dr. Nabavi — Fall 2023
- **Linear Algebra** - Dr. Jahangiri — Winter 2023
- **Programming and Software Architecture** - Dr. Asharioun — Fall 2023
- **Probability and Statistics** - Dr. Mansouri — Winter 2022

WORK EXPERIENCE

Paya Communication Industries
Back-end developer — March 2022 – Sept 2022

- Helped developing an IoT-based in-door positioning system used by service providers in their headquarters across Iran.
- Dockerized the entire stack (including Node.js back-end and Nginx webserver), resulting in a 60% reduction in deployment time.
- Designed and implemented comprehensive testing methods for API and webserver, including 400 unit and load tests.

RadarShop
Back-end Developer Intern — Oct 2021 – Feb 2022

- Developed and integrated RESTful API endpoints in Node.js/Express, handling 1,000+ daily requests.
- Managed and optimized MongoDB queries, improving data retrieval speed by 25% for core user and product data lookups.

SELECTED PROJECTS

STAF - Sinusoidal Trainable Activation Functions for Implicit Neural Representation.
– Implemented the main model in PyTorch.
– Developed experimental results setup including Inverse problems, Image representation, SDF, NTK, etc.

EBSE-Yolo - An implementation of the EBSE-Yolo paper.
– Implementation of the EBSE-Yolo model by extending the YOLOv5 codebase in PyTorch.
– Adapted and integrated key modules such as ECA-Net and BiFPN-inspired feature fusion.
– Trained and validated the model on the DOTA dataset, ensuring proper preprocessing and augmentation.

Neo Pilot E2E - End-to-End Lane Follower AI.
– An end-to-end deep learning model implemented in PyTorch that predicts output commands from camera images.
– Preprocessing pipeline containing image normalization, resizing, and data-augmentation to improve model robustness.
– Optimized to run on NVIDIA Jetson Nano and tested on a test track with a model car.

Neo Pilot Modular - Small-scale navigation system based on Modular paradigm.
– Designed in AVIS Engine simulation environment based on FIRA Self-driving cars league rules.
– Lane following using image processing techniques and digital PID controller.
– A sign detection module preprocesses images and uses a CNN model in TensorFlow to classify traffic signs.

Inverter AI Fault Detection - 5-level H-bridge cascaded inverter fault detection using AI.
– Extensive data collection pipeline in MATLAB/Simulink to represent various fault conditions.
– Feature extraction using FFT and Wavelet Transform to capture characteristics of input voltage and current signals.

Tron.AI - My submission for IUST ChillinWars AI challenge.
– Implemented search algorithms for pathfinding in Tron challenge: BFS, DFS, Dijkstra's algorithm, and A*.
– Secured 3rd place in the competitive leaderboard, showing algorithmic efficiency and accuracy (team Covid-404).

SKILLS

Programming: Git, C/C++, Python, MATLAB, HTML, CSS

Packages and Frameworks: NumPy, Pandas, Matplotlib, Scikit-learn, TensorFlow, PyTorch, Jax Ecosystem, OpenCV

Hardware: Arduino, RaspberryPi, Jetson Nano

Deployment: Linux, Ubuntu server, TensorFlow Lite

SELECTED COURSES

Online: ML for Intelligent Systems (Cornel CS4780) · Deep Learning (NPTEL) · Artificial Intelligence (MIT) · DL for Computer Vision (Stanford CS231n) · Computer Vision and Image Processing (MaktabKhooneh) · Generative Vision Models (internet) · Probability and Statistics (MaktabKhooneh) · ASP for Music Applications (Coursera)

SBU: Linear Algebra (19.36/20) · Machine Learning (18.3/20)
Introduction to AI (20/20) · Advanced Programming (19.5/20) · IoT (Graduate) (20/20)

OnGoing: Deep Reinforcement Learning (Stanford CS224R)

VOLUNTEERING

- **OpenSource Contributions** - PySpice, INR Dictionaries, INCODE
- **Held a summarizing webinar for Linear Algebra** - EE Scientific Association of SBU

LANGUAGES

- **English** (Proficient, TOEFL: Scheduled for Nov 2025)
- **Persian** (Native)