Mohammadreza **Tavasoli Naeini**

MACHINE LEARNING ENGINEER ·

✉ tavasoli@umich.edu | ⦿ MohammadrezaTavasoli | in mohammadreza-tavasoli-88baa992

Summary

A highly motivated Machine Learning Engineer with a master's degree in Signal Processing and Machine Learning from the University of Michigan. Expertise in computer vision, natural language processing, reinforcement learning, and optimization. Seeking opportunities to apply these skills in internships and further studies.

Education

University of Michigan   *Ann Arbor*

M.S. IN SIGNAL AND IMAGE PROCESSING AND MACHINE LEARNING   *Sept. 2018 - Sept. 2020*

Isfahan University of Technology   *Isfahan*

B.S. IN ELECTRICAL ENGINEERING   *Sept. 2013 - Sept. 2017*

- Cumulative GPA: 18.19/20(Cumulative GPA of the faculty: 15.27/20)

Research Experience

Neural Bounds on Bayes Error: Advancing Classification and Generative Models.   *University of Michigan*

SUBMITTED TO A MAJOR MACHINE LEARNING CONFERENCE, [2023]. (UNDER REVIEW)AUTHOR: **MOHAMMADREZA TAVASOLI**   *2019*
NAEINI

- In this paper, we defined an upper bound for Bayes error for binary classes to find optimal classifiers.
- We extended this method to the multi-class problem.
- we compute the bound that converge to Bayes error by the loss function of the neural network, and then we found the threshold to classify our data in test time.

Using LEO satellite constellation for navigation via a stochastic greedy algorithm with budget constraint   *Remote,Purdue University*

ADVISOR:PROF.ABOLFAZL HASHEMI   *2021*

- We developed a stochastic greedy algorithm with budget constraints. We derived approximation bounds.
- We indicated that our algorithm can solve the submodular maximization problem near optimally.
- We compared our method with the greedy algorithm with budget constraints, and we showed our algorithm is computationally more efficient.
- In the practical scenario, there are limitations in resources, power consumption, and communication bandwidth; therefore, we have to select a subset of satellites with budget constraints to estimate the position of vehicles.

FUNDNA Software for Computing Mathematical Functions by DNA   *Remote,University of Kentucky*

SUBMITTED TO NATURAL COMPUTING, SPRINGER, [2023]. (UNDER REVIEW) AUTHORS:JACKSON HUSE, SAYED AHMAD SALEHI,   *2023*
MAHDI AHMADI,**MOHAMMADREZA TAVASOLI NAEINI**

- FUNDNA is a software tool for automating CRN design in molecular computing.
- It approximates target mathematical functions using McLaurin series.
- Functions are transferred to cascades of molecular AND/NAND units.
- Computation relies on fractional encoding with molecule pairs.
- Validated for 14 functions, FUNDNA achieves low mean square error.

Professional Experience (Internship):

Classifying OCT (Optical Coherence Tomography)   *Isfahan University of Technology*

ADVISOR:PROF.SAIED SADRI   *2017*

- Classifying OCT (Optical Coherence Tomography) of patients who are suffering MS(Multiple Sclerosis) from other peoples OCT with VGG NET and RESNET and extracting features such as texture from OCTs via wavelets which can help doctors to detect MS sooner.
- MS decreases the thickness of retina layers especially the Ganglion cell layer in Maculas region and the Nerve Fiber layer in Optic Nerve Heads region

Teaching Experience (TA):

Digital Signal Processing   *Isfahan University of Technology*

INSTRUCTOR:PROF.M.S.FAZEL   *2017*

Digital System Design Lab II   *Isfahan University of Technology*

INSTRUCTOR:PROF.N.KARIMI   *2017*

Selected Projects

Robust TCAV
<div align="right">Remote, IPM</div>

ADVISOR: PROF. MOHAMMAD SABOKRU
<div align="right">2022</div>

- I designed an attack based on a projected gradient decent attack that the attacker perturbs concept images such that the logistic classifier of TCAV classifies them as random images.
- By adversarial training, we can make TCAV more robust to the attack, causing TCAV to be more applicable to the general concepts

Identifying and Categorizing Offensive Language in Social Media
<div align="right">University of Michigan</div>

COURSE PROJECT PROF. DAVID JURGENS
<div align="right">2020</div>

- In this porject, we used a new dataset, the Offensive Language Identification Dataset (OLID). Sentences in this dataset are labeled based on offensive or non-offensive.
- In this project, we got state-of-the-art results based on tasks of the OLID dataset by using new deep learning model(BERT).

3D Reconstruction from Single Image
<div align="right">University of Michigan</div>

COURSE PROJECT-ADVISOR: PROF. ANDREW OWENS
<div align="right">2020</div>

- We present an architecture in this project to predict the 3D representation given a single image.
- The architecture is called the TL-embedding network and consists of an autoencoder and a CNN pre-trained on the ImageNet classification task
- The proposed network performs well on dense objects like beds and sofas but poorly on objects with sparse components like chairs.

Quantum Enhanced LSTM and Quantum transformer with Torch-Quantum library
<div align="right">Remote, MIT</div>

ADVISOR: DR. HANRUI WANG
<div align="right">2022</div>

- Recent articles indicate quantum advantages for deploying some learning algorithms, such as support vector machines, even on near-term quantum device
- I wrote tutorials on how to build and train quantum-enhanced transformers and quantum-enhanced LSTM with the Torch- Quantum library.

Stock Trading System with Recursive Neural Network and Reinforcement Learning
<div align="right">University of Michigan</div>

COURSE PROJECT-ADVISOR: PROF. HONGLAK LEE
<div align="right">2019</div>

- Using momentum as our primary market movement indicator, we trained a DNN, RNN, and LSTM neural network to predict whether the index fund would move up or down the following day.
- We achieved our best returns by predicting price movement by classes, meaning we would predict not just whether the price would move up or down, but if it would move up or down by a certain percentage.

Counting cows for a rancher with various algorithms
<div align="right">Remote, UCSD</div>

ADVISOR: PROF. TARA JAVIDI
<div align="right">2021</div>

- I used different detecting algorithms such as YOLO and fast R-CNN, and various tracking algorithms such as Kalman filter and extended Kalman filter for tracking cows.
- Ranchers might miss cows in the field. This application helped them to count their cows via their drone.

TECHNICAL SKILLS

Programming Languages and Frameworks:: C++, Verilog , Julia, Python ,Pytorch, Tensorflow,Keras **Software :** MATLAB, Simulink

Fields of Interests

- Meta Learning
- Graph Neural Network
- Robustness
- Tiny ML
- Reinforcement Learning
- DNA Computing
- Interpretability
- Quantum Machine Learning

Honors & Awards

INTERNATIONAL

| 2012 | **3rd place**, International Mathematics A-lympiad | *Netherlands* |
| 2010,2012 | **Member of the selected group**, City tournaments mathematics competition | *Russia* |

DOMESTIC

| 2017 | **Admission Offer**, to Masters program in ECE Department at Isfahan University of Technology, without participating in Nationwide University Entrance Exam (as an Exceptional Talented Student) |
| | **first prize**, in the festival of short- time training film. |

Selected Courses

Introduction to Numerical methods	A	Dr.Tiago Salvador	2020
Joint Time-Frequency Analysis of Signals	17.7/20	Prof.Saied Sadri	2017
Probability and Random Processing	A-	Prof. Demosthenis Teneketzis	2018
Convex Optimization	17.3/20	Prof.Mohammad Mahdi Nagesh	2017