

# ALIREZA FATHOLLAH POUR

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## RESEARCH INTERESTS

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Deep Learning   Learning Theory   Capacity of Learning Algorithms   Generalization in Deep Learning

## EDUCATION

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**McMaster University**, Canada

*2021 - Present*

M.Sc. in Computer Science

Current research direction: Capacity of (deep) learning algorithms and proving generalization bounds for (noisy) classes of functions such as (noisy) neural networks

Supervisor: Hassan Ashtiani, PhD

Courses: Foundations of Unsupervised Learning: A+, Engineering Optimization: A+, Software Design: A, Mobility in the Aging Population I: A+, Mobility in the Aging Population II: A+

**Amirkabir University of Technology (Tehran Polytechnic)**, Tehran, Iran

*2014 - 2019*

B.Sc. in Electrical Engineering

Overall GPA based on WES scale 3.54 out of 4 (16.94 out of 20)

Last 2 year's GPA based on WES scale 3.7 out of 4 (17.64 out of 20)

**GRE socre:** Quantitative Reasoning: 168, Verbal Reasoning: 150, Analytical Writing: 3.5

**Allameh Helli High School(NODET)**, Tehran, Iran

*2014*

Diploma in Mathematics and Physics

GPA based on WES scale 4 out of 4 (19.75 out of 20)

National Organization for Development of Exceptional Talents(NODET)

## RESEARCH EXPERIENCE

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### Graduate Research Assistant

Research project: Studying generalization bounds for neural networks and their capacities. Introducing a new notion of covering number with respect to distances between distributions to provide a framework for studying the capacity of (random/noisy) function classes and their compositions

Supervisor: H. Ashtiani, PhD

*January 2021 - Present*

### Undergraduate Research Assistant

Research Project: Optimal Constellation Design by Minimizing SER Using Deep Learning and Autoencoders

Supervisor: M. Emadi, PhD

*January 2019 - May 2019*

### Undergraduate Research Assistant

Bachelor's Degree Project: Feature-Based Digital Modulation Classification Using Statistical Analysis and Machine Learning

Supervisor: M. Emadi, PhD

*February 2018 - May 2019*

## PUBLICATIONS

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A. Fathollah Pour and H. Ashtiani, "Benefits of Additive Noise in Composing Classes with Bounded Capacity", *ArXiv preprint arXiv:2206.07199*, Jun. 2022

Github: [https://github.com/fathollahpour/composition\\_noise](https://github.com/fathollahpour/composition_noise)

## HONORS AND AWARDS

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**Awarded “Executive Committee Member”** *December 2016*  
The Second International Conference on Signal Processing and Intelligent Systems(ICSPIS)

**Awarded the title “Excellent Bachelor's Degree Student”** *October 2016*  
Organization of Exceptional Talents, Amirkabir University of Technology, Tehran, Iran

**Awarded to Study Software Engineering as a Second Major** *September 2016*  
Organization of Exceptional Talents, Amirkabir University of Technology, Tehran, Iran

**Certified for Completing “Matlab in Electrical Engineering” Course** *October 2015*  
Tehran Institute of Technology

**Ranked 454th Among Roughly 192,000 Students in the Nationwide Universities Entrance Exam (Top 0.36 Percentile)** *August 2014*

**Awarded “the Best Student Project” Among More than 60 Projects in Electrical Section** *January 2011*  
Allameh Helli High School 27th Seminar on Student Projects  
Allameh Helli High School(NODET), Tehran, Iran

**Achieved Top 100 Rank Among All Participants (Approximately 55000 Participants) for the NODET High School Entrance Exam** *September 2009*  
National Organization for Development of Exceptional Talents(NODET), Tehran, Iran

## TEACHING EXPERIENCE

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**Teacher Assistant for “Introduction to Machine Learning” Course** *January - April 2022*  
McMaster University  
Professor: H. Ashtiani, PhD

**Teacher Assistant for “Communication Skills” Course** *September - December 2021*  
McMaster University  
Professor: V. Maccio, PhD

**Teacher Assistant for “Communications Systems” Course** *January - April 2021*  
McMaster University  
Professor: W. He, PhD

**Teacher Assistant for “Linear Algebra” Course** *September 2018 - May 2019*  
Amirkabir University of Technology  
Professor: H. Atrianfar, PhD

**Teaching High School Mathematics and Calculus to Prepare Individuals for Taking Nationwide Entrance Exam as a “Private Tutor”** *February 2015 - March 2016*  
Danesh Vahid High School

**Teaching High School's 2nd Year Mathematics as a Class Teacher for a Semester**  
Danesh Vahid High School *September 2014 - February 2015*

## PREVIOUSLY SELECTED COURSES

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Advanced Programming (Java), Machine Learning (Polytechnic University of Milan(Polimi)), Data Mining (Polimi), Data Intelligence Applications (Polimi), Artificial Neural Networks and Deep Learning (Polimi), Discrete Mathematics, Data Structures and Algorithms, Database, Game Theory (Polimi), Principles and Applications of Artificial Intelligence

## ACADEMIC COURSE PROJECTS

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### **Designing fully connected networks and Convolutional Neural Networks (CNN) to de-noise images from MNIST dataset** *November 2021*

Trying to design and learn fully connected network and CNN in order to reconstructs images in MNIST dataset given their noisy versions. The noisy image is constructed by dropping each pixel of the original image with a certain probability.

Course: Mobility in the Aging Population I, McMaster University

Professor: H. Ashtiani, PhD

### **Preparing an exercise research proposal for a grant in “Mobility and Public Transport” provided by Social Sciences and Humanities Research Council of Canada** *October 2021*

Working on the interdisciplinary project of writing an exercise research proposal including summary of research, motivation, research questions and proposed evaluation plans.

Course: Mobility in the Aging Population I, McMaster University

Professor: R. Zheng, PhD

### **Solving an optimization problem for fitting Gaussian Mixture Models(GMMs) to piece-wise polynomial distribution in an efficient setting** *April 2021*

Trying to find an optimization setting for fitting GMMs to piecewise polynomials that are estimating a distribution. The problem was implemented in Matlab efficiently by finding a linear program to approximate the solution and solve the Newton method using Matlab’s Optimization Toolbox.

Course: Engineering Optimization, McMaster University

Professor: T. Davidson, PhD

### **Building a Domain Specific Language(DSL) and an editor for machine learning tasks that involve data processing, training, and performance evaluation** *April 2021*

Building a DSL using Eclip’s Epsilon framework to define metamodels for machine learning tasks. Constructing a graphical editor to design models that conform to the metamodel and integrating it with validation, error detection, and corrections. Including model to text transformation to build a Python code generator for designed machine learning models.

Course: Software Design, McMaster University

Professor: R. Paige, PhD

### **Designing a modified pill box to help seniors remember their medication schedule** *April 2021*

Producing a smart pill box that is complemented with LEDs programmed by Arduino to remind the user of their medication schedule. The pill box is accompanied with a Java application that can save each user’s personal schedule and set reminders based on their preference.

Course: Mobility in the Aging Population II, McMaster University

Professor: R. Zheng, PhD

### **Building a Deep Neural Network for Image Classification of Mask Dataset** *November 2020*

Designing deep neural networks for classification of images that contain people with mask, without masks, or a mixture of them and to use them to compete in Kaggle with other groups.

Course: Artificial Neural Networks and Deep Learning, Polytechnic University of Milan(Polimi)

Professor: M. Matteucci, PhD

**Designing and Optimizing the Model of an Advertiser and Publisher**

*June 2020*

Designing advertisers that compete to advertise on websites and both the advertisers and publishers are learning in an online fashion by using bandit algorithms and context generation

Course: Data Intelligence Applications, Polytechnic University of Milan(Polimi)

Professor: N. Gatti, PhD

**Channel Coding With Set-Partitioning**

*June 2020*

Designing and implementing channel coding with partitioning the constellation into subconstellations which was brought by Nokia

Course: Information Theory, Polytechnic University of Milan(Polimi)

Professor: M. Magarini, PhD

**Analysing the Patterns of Mobile Users During the Lockdown in Milan, Italy**

*May 2020*

Clustering user classes and analysing their behaviour and mobility by taking into account the data patterns of base stations before and after the lockdown

Course: Mobile Radio Networks, Polytechnic University of Milan(Polimi)

Professor: A. Capone, PhD

**Programming and Building a “Normal Tanks” Game Using Java**

*July 2018*

Using JAVA programming language

Course: Advanced Programming, Amirkabir University of Technology(Computer Engineering Department)

Lecturer: M. Ahmadpanah

**Modeling and Designing a Lead-Lag Controller**

*June 2018*

Using MATLAB's SIMULINK and programming environment

Course: Linear Control Systems, Amirkabir University of Technology

Professor: M. Khosravi

**Programming and Building a “Java Download Manager(JDM)” Using Java**

*May 2018*

Implementing a Download Manager similar to Internet Download Manager(IDM) using JAVA programming language

Course: Advanced Programming, Amirkabir University of Technology(Computer Engineering Department)

Lecturer: M. Ahmadpanah

**Programming a “Matrix Calculator” Using Java**

*March 2018*

Implementing a Matrix Calculator which can detect an input expression and apply desired calculations to matrices

Course: Advanced Programming, Amirkabir University of Technology(Computer Engineering Department)

Lecturer: M. Ahmadpanah

**Designing a CMOS differential amplifier using HSPICE**

*February 2018*

Designed an amplifier with the 90-nm technology. Also simulated the design both in AC and transient environments

Course: Electronics III, Amirkabir University of Technology

Professor: M. Yavari, PhD

**Simulation of Digital Communication Systems (QAM, PSK and etc.)**

*December 2017*

Using MATLAB's programing environment  
Course: Communications II, Amirkabir University of Technology  
Professor: M. Emadi, PhD

**Designing an optimized array antenna (by using “Genetic Optimizing Algorithm”) by MATLAB** *April 2017*

Writing a genetic-based algorithm program with MATLAB  
Course: Antenna, Amirkabir University of Technology  
Professor: P. Dehkhoda, PhD

**Simulating AM, FM, SSB and VSB communication systems** *November 2016*

Using MATLAB's SIMULINK and programing environment  
Course: Communications I, Amirkabir University of Technology  
Professor: H. Beyranvand, PhD

**Designing a two stage BJT amplifier using ADS** *May 2016*

Satisfied all the parameters of the design by tuning different variables (resistors or capacitors) or by adding other kinds of stages to the circuit  
Course: Electronics II, Amirkabir University of Technology  
Professor: M. Moezzi, PhD

**Implementing a “Hokm” cards game using C++** *December 2014*

Designed the algorithm and interface for a card game in which a single player can play with 3 computer players, which were intelligent enough to decide the best move in each round  
Course: Programming, Amirkabir University of Technology  
Professor: Pourmohammad, PhD

## **PROGRAMMING AND MARKUP LANGUAGES**

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Python including TensorFlow, Keras, and Pytorch , C++, Java, Matlab, Epsilon Modeling Framework, SQL, Gnu Radio, HSPICE, ADS, and VHDL

## **LANGUAGE SKILLS**

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<b>English</b>	Fluent
<b>Persian</b>	Native
<b>Kurdish</b>	Fluent
<b>Turkish</b>	Intermediate
<b>German</b>	Beginner (A1 Degree)