Ebrahim **Pichka**

Graduate Research Assistant

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EDUCATION

University of Windsor Windsor, ON, Canada
M.A.Sc. • Industrial Engineering Jan. 2023 – Present (Expected Jul. 2024)
- **CGPA:** 4.0/4.0
- **Supervisor:** Dr. Guoqing Zhang

Amirkabir University of Technology (Tehran Polytechnic) Tehran, Iran
B.Sc. • Industrial Engineering Sept. 2017 – Sept. 2022
- **CGPA:** 3.18/4.0 (**3.58**/4 for the last 2 years)
- **Thesis:** Algorithmic Trading in Financial Markets using Deep Reinforcement Learning Algorithms.
- **Supervisor:** Dr. Masoud Mahootchi

EXPERIENCE

Graduate Research Assistant • University of Windsor Jan. 2023 – Present • Windsor, ON, Canada
- Conducted research on the intersection of optimization and machine learning with the aim of improving existing optimization solvers or utilizing ML models to generate high-quality solutions for different problem structures.
- Leveraged deep reinforcement learning methods (Policy Gradient Optimization) to solve the dynamic financial portfolio construction and allocation problem and attempted to improve the existing optimization methods.
- Studied representation learning on graph-structured problems (i.e. graph ML and graph neural networks) with a focus on their application in combinatorial optimization (e.g. assignment problem, traveling salesperson problem, and vehicle routing problem).
- Technologies used: Gurobi, Pyomo, Google OR-tools, Python, PyTorch, TensorFlow, TorchRL, Scikit-Learn

Machine Learning Intern • Astyage Apr. 2021 – Sep. 2021 • Tehran, Iran
- Contributed to a diverse team collaboration in researching and developing an intent-based conversational chat-bot system for enterprise customer support management.
- Designed and trained a transformer-based model for the intent classification task.
- Managed data gathering and cleaning and created pipelines for the training data and collaborated in periodic model training and deployment to server clusters with a team of software and operations engineers.
- Technologies used: Python, TensorFlow, Keras, transformers, SQL, PostgreSQL, Linux, Git, Docker

Data Science Intern • Dayche Data Mining Group Jan. 2021 – Apr. 2021 • Tehran, Iran
- Contributed to developing an end-to-end market segmentation system based on user transactions using unsupervised learning in Python in a team of interns.
- Technologies used: Python, scikit-learn, pandas, numpy, Linux, Git

RESEARCH INTERESTS

- Machine learning for Optimization (Learning-to-Optimize) & Decision-focused Learning.
- Deep Reinforcement Learning & Sequential Decision-making.
- Graph Representation Learning & Deep Learning on Graphs.
- Combinatorial Optimization & Operations Research.

SKILLS

Programming	Python, Julia, C++
ML	PyTorch, JAX, TensorFlow, Keras, PyG, TorchRL, Scikit-learn, XGBoost
Optimization & OR	CVXPy, Pyomo, JuMP, Gurobi, Google OR-tools
Statistics & Data Sci.	Statsmodels, Pandas, NumPy, SciPy, Polars, Matplotlib, Plotly, Seaborn
Software	Linux, Git, Docker, MongoDB, SQL

SELECTED PROJECTS

Re-implementations (Independent projects)

- **Graph Attention Networks** (Veličković et. al., 2017): Implemented the Graph Attention Network architecture for graph representation learning and node classification using PyTorch framework. **[GitHub]**
- **Attention Is All You Need** (Vaswani et. al., 2017): Implemented the Transformer encoder-decoder architecture for sequence-to-sequence modeling with PyTorch **[GitHub]**
- **Learning Heuristics for the TSP by Policy Gradient** (Deudon et. al., 2018): Developed, tested, and experimented on a PyTorch implementation of an attention-based Policy Gradient agent for learning to solve Travelling Salesperson Problem. **[GitHub]**
- **Continuous control with deep reinforcement learning** (Lillicrap et. al., 2015): An implementation of the Deep Deterministic Policy Gardient (DDPG) algorithm using the Pytorch framework. **[GitHub]**

Research Projects

- **Solving the Quadratic Assignment Problem (QAP) with Reinforcement Learning** (in progress)**:** Mapping QAP to a Markov Decision Process with proper reward and transition mechanism to find feasible near-optimal solutions via Deep RL algorithms.
- **Multi-portfolio Optimization using Deep Reinforcement Learning** (in progress)**:** Active optimization of multi-account financial portfolios considering intra-account action costs and risk measures using Deep RL.
- **Knowledge Distillation in Neural Networks:** Distilled a trained ResNet50 model into a ResNet18 on CIFAR10 dataset. And compared results with ResNet18 when trained from scratch and a fine-tuned pre-trained ResNet50. **[GitHub]**
- **Options Pricing with Machine Learning:** Applied LightGBM, Multi-layer Perceptron, and Support Vector Machine to estimate the market price of option contracts and compared their performance to that of the Black-Scholes pricing model as a baseline. **[GitHub]**

TEACHING EXPERIENCE

Teaching Assistant

- Treatment of Experimental Data	University of Windsor	Winter 2024
- Operations Research I	University of Windsor	Fall 2023
- Production Analysis	University of Windsor	Summer 2023
- Numerical Analysis	University of Windsor	Winter 2023
- Fuzzy Intelligent Systems	University of Tehran	Fall 2021
- Statistical Quality Control	Amirkabir University of Technology	Fall 2021
- Corporate Finance	Amirkabir University of Technology	Spring 2020

TEST SCORES

GRE (Graduate Record Examinations) General: Oct. 2021

- Quant: **169**/170 - Verbal: **153**/170 - Analytical Writing: **3.5**/6

IELTS (International English Language Testing System) Academic: (band score of 9) June 2021

Overall: **8** Reading: **9** Listening: **8.5** Writing: **7** Speaking: **7**

CERTIFICATES

- Machine Learning Engineer Nanodegree	Udacity (AWS)
- Computer Science Fundamentals	Coursera (University of Illinois at Urbana-champaign)
- Deep Learning Specialization	Coursera (DeepLearning.ai)
- Reinforcement Learning Specialization	Coursera (University of Alberta/AMII)
- TensorFlow Developer	Coursera (DeepLearning.ai)
- Machine Learning	Coursera (Stanford Online)

SELECTED COURSEWORK

- Computational Intelligence	(A)	- Artificial Intelligence	(A+)
- Data & Information Analysis	(A+)	- Optimization I (Operations Research)	(A+)
- Principles of Simulation	(A+)	- Optimization II	(A)
- Production & Inventory Control Systems	(A+)	- Supply Chain Management & Logistics	(A)

AWARDS & HONORS

- **AWS Scholarship** recipient for the Machine Learning Engineer Nanodegree tuition exemption from Udacity.
- **Ranked top 1%** in Iran's National University Entrance Exam among more than 600,000 students.

OTHER

- **Technical Blogging:** Wrote in-depth technical posts on different topics in ML and optimization algorithms.
- **Open Source:** Contributed to development of open-source projects such as Pytorch, Pytorch-geometric, etc.
- **Voluntary Activities:** Served as the committee member of the Students' Scientific Association of the Industrial Engineering Department at Amirkabir University of Technology, responsible for organizing the industry-university collaboration division.