Amin Ravanbakhsh

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github.com/aminravanbakhsh

Research Interests

Statistical Machine Learning, Reinforcement Learning and Symbolic Regression

Education

University of Waterloo May. 2023 - Now
Master of Science in Computer Science

Sharif University of Technology Sep. 2017 - Jul. 2022
Bachelor of Science in Computer Engineering, GPA = 17.4/20

Young Scholars Club Jun. 2016 - Jul. 2017
Member of Iran's Physics Olympiad team

Honors and Awards

International Physics Olympiad (IPHO) Gold Medalist Jul. 2017

Iran's National Physics Olympiad Gold Medalist Jul. 2016

Research Experience

Automated Scientific Discovery University of Waterloo
Research Assistant *Jan. 2023 - Now*

Developing a Reasoning-based Symbolic Regression tool that leverages background knowledge and axioms to interpretably discover hidden equations within datasets. This tool aims to identify underlying equations in physics datasets. As lead researcher, I am conducting the research under guidance of Professor Vijay Ganesh.

Deep Bayesian Neural Networks Sharif University of Technology
Undergraduate Research Assistant *Sep. 2021 - Jun. 2022*

Employed Bayesian Inference in conjunction with Thompson sampling to address the Multi-armed Bandit problem through Reinforcement Learning. My research involved a comprehensive survey of Bayesian algorithms, including Metropolis-Hasting, Hamiltonian Monte Carlo, Variational Inference, Monte Carlo Dropout, Bootstrap Sampling, etc., to determine the most suitable algorithm for designing a recommendation system based on industry-specific data. This research was undertaken under the guidance of Professor Seyed Abbas Hosseini.

Concept Drift Adaptive Systems for Federated Learning McGill University
Undergraduate Research Assistant *Jun. 2021 - Apr. 2022*

Utilized Attentive Aggregation with Federated Learning to develop a system robust against unexpected data changes, known as Concept Drift. The results of our research have been applied to the field of the Internet of Vehicles. As a contributing member of the team, I assisted the lead researcher, Amir Estiri, in conducting empirical tests on the attentive model.

Teaching – Teaching Assisting

CE 401717: Machine Learning (Graduate course) Spring 2022, Fall 2021
Designed and graded course projects.

CE 40951.5: Intelligent Analysis of Biomedical Images (Graduate course) Spring 2022
Designed and graded practical and theoretical assignments.

CE 40417: Artificial Intelligence Fall 2021
Designed and graded assignments. Instructed the discussion classes.

CE 40181: Probability and Statistics Fall 2020
Designed course notebooks.

CE 40124: Electrical and Electronic Circuits Spring 2021

Head TA. Designed and graded midterm and final exams. Designed and graded assignments.

Physics Olympiad Teacher 2017 - 2023

Taught advance concept of physics in several top-ranking high schools of Iran.

Main Projects

Factorization Machines Medium link

Comparison of factorization machines method with common methods for classification and clustering about categorical data. Implementation of a recommendation system for YektaNet company's merchandise.

Brain Tumor Diagnosis

Employed the VGG16 network for detecting tumors in brain images, and utilized the Grad-CAM algorithm to visualize the underlying reasons for VGG16's malignant tumor detection.

Heartbeat classification

Classified ECG time series data using LSTM and CNN networks, and conducted a comparative analysis to highlight the advantages of LSTM over CNN.

Digit Image Generator

Implemented a Generative Adversarial Network (GANs) to generate artificial digit images that closely resemble real handwritten digits.

Driver Drowsiness Detection Assistant

Designed and implemented a driver drowsiness detection system, leveraging a neural network to analyze facial expressions and issue warnings. Successfully deployed the project on an Arduino board.

Movie Recommendation System

Implemented a recommendation system using movie synopsis. The system includes a search engine that employs the TF-IDF (Term Frequency - Inverse Document Frequency) algorithm to find movies related to specific search terms. Furthermore, a Gaussian Mixture model is utilized to categorize movies into distinct clusters.

Courses

Formal Courses:

- Machine Learning
- ML for Bioinformatics
- Artificial Intelligence
- Modern Information Retrieval
- Probability and Statistics
- Linear Algebra
- Signals and Systems
- Algorithms Design

Self Study

- Deep Learning
- Reinforcement Learning
- Queuing Theory

Skills

Programming Languages: Python, C++, C, Java, SQL

Technologies: PyTorch, TensorFlow, Keras

Languages: English (TOEFL:97, R:25, L:25, S:21, W:26), Persian (Native)

References

Vijay Ganesh vganesh@uwaterloo.ca

Professor at University of Waterloo, Professor at Georgia Institute of Technology

Seyed Abbas Hosseini abbashosseini@sharif.edu

Assistant Professor at Sharif University of Technology

Mohammad Hossein Rohban rohban@sharif.edu

Assistant Professor at Sharif University of Technology