Kossar Pourahmadi Meibodi

Curriculum Vitae/Resume

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Education

2015–present **B.Sc in Computer Engineering** , *University of Tehran*, Tehran, *16.78 / 20*.

2011–2015 **Diploma in Mathematics and Physics**, *Salam High school*, Tehran, *19.97 / 20*.

Research Interests

- Artificial Intelligence, Deep Learning, Machine Learning and Data Mining, Reinforcement Learning, Computer Vision, Natural Language Processing, Robotics
- Data Science, Economical Data Analysis
- Embedded Systems Design and Implementation
- Hardware Accelerator Designing for AI purposes

Research Experience

2018–present **Research Assistant**, *Institute for Research in Fundamental Sciences (IPM)*, Tehran.

Designing an accelerator for training *Deep Neural Networks*.
Achievements :

- A paper, *TaxoNN: a Light-Weight Accelerator for Deep Neural Network Training*, got **accepted** at **ISCAS2020**

2017–2018 **Research Intern**, *Machine Learning Laboratory at the University of Tehran*, Tehran.

Exploiting humans' characteristics from their collected choices in the n-armed bandit problem by training a specific neural network.

Publication

2019 **Small Object Detection algorithms**.

my teammate and I have been working on a computer vision project under supervision of one of our professors **Dr. Amin Sadeghi** and **Dr. Mohammad Rastegari** from **Allen Institute for AI (AI2)** in small object detection. We have done several experiments to find out why the average precision and average recall in the current state-of-the-art object detection methods in detecting small objects are low. We found that the error in the aspect ratio of the predicted bounding boxes is the major contributor to the low mAP for small objects. The interesting results are gathered and submitted as a paper to **CVPR2020**.

2019 **TaxoNN: a Light-Weight Accelerator for Deep Neural Network Training**.
Emerging intelligent embedded devices rely on Deep Neural Networks (DNNs) to be able to interact with the real-world environment. This interaction comes with the ability to retrain DNNs, since environmental conditions change continuously in time. Stochastic Gradient Descent (SGD) is a widely used algorithm to train DNNs by optimizing the parameters over the training data iteratively. In this work, we present a novel approach to add the training ability to a baseline DNN accelerator (inference only) by splitting the SGD algorithm into simple computational elements. Then, based on this heuristic approach, we propose TaxoNN, a light-weight accelerator for DNN training. TaxoNN can easily tune the DNN weights by reusing the hardware resources used in the inference process using a time-multiplexing approach and low-bitwidth units. Our experimental results show that TaxoNN delivers, on average, 0.97% higher misclassication rate compared to a full-precision implementation. Moreover, TaxoNN provides 2.1x power saving and 1.65x area reduction over the state-of-the-art DNN training accelerator. The result got **accepted** at **ISCAS2020**, the 2020 IEEE International Symposium on Circuits and Systems.

Honors and Awards

2020 **Best Undergraduate Project Award**, *University of Tehran*.
My bachelor's thesis, **"Generating Effective and Automatic Test Cases and Analyzing Energy Consumption of Android Applications"**, under supervision of Dr. Fathiyeh Faghih got the best undergraduate project award.

Notable Projects

2019-01 - present **Detection of Energy-Inefficiency Patterns in Android Applications**, *Bachelor's Thesis*.
Since android applications are continuously becoming increasingly complex, energy-related defects are of significant importance to developers and app users. In this thesis, under supervision of Dr. Fathiyeh Faghih, I am focusing on generating effective test cases based on the control-flow graph of the source code in order to detect the missing deactivation of energy-related resources by static and dynamic analyses. This thesis got the **best undergraduate project award**.

2018-01 - 2018-06 **Network routing algorithm**, *Computer Networks*.
Advised by *Dr. Ahmad Khonsari*, we designed a routing algorithm to route packets on a given simulated network environment. In this project, several approaches were used for each routing request. The algorithm was designed to choose among several routes proposed by different routing algorithms and setup the switching tables in such a way that the routing be the fastest possible path for the packet.

2018-01 - 2018-06 **Dynamic Neural Network**, *Artificial Intelligence*.
A dynamic neural network with training and inference capability was implemented using python which its number of layers, activation function and number of neurons in each layer and loss function of net could be changed.

2018-01 - 2018-06 **Q-Maze**, *Artificial Intelligence*.
Solving any size of mazes with Q-learning algorithm. Different reward functions were defined and all of them solved the given maze in minimum time and maximum accuracy.

2018-01 - 2018-06 **Course Scheduling with Genetic algorithm**, *Artificial Intelligence*.
The list of class sections of all courses are given and a schedule generated with the most student satisfaction using genetic algorithm.

2018-01 - 2018-06 **Rich Web Application for real estate**, *Internet Engineering*.
Advised by *Dr. Ramtin Khosravi*, we designed a Rich Internet Application for a real estate agency. In this app, we use other real estate APIs for updating our SQLite database. The application is compatible with different browsers like Safari , Chrome, Mozilla and IE. Grid view of this app make it suitable for all sizes of screen like phone, tablet and PC. UI is developed with React, and Node.js is chosen for back-end.

2017-09 - 2018-01 **Obstacle avoidance robot**, *Micro Processors*.
Using AVR Microcontrollers and Ultrasonic sensors, we designed a vehicle (mount the robot chip on a RC car) that would stop in case of approaching an obstacle. The AI was programmed in C and embedded in ATMega32 chip. When the vehicle approaches to an obstacle, the AI unit triggers the brakes and when an object move toward the vehicle and doesn't stop, the AI unit triggers the engine to move in opposite direction.

2017-09 - 2018-01 **ATalk Compiler**, *Compiler Design and Implementation*.
Asynchronous Talk is an actor oriented programming language. We designed a full compiler(lexer, parser, two pass analysis and code generation) that implemented in java.

2017-09 - 2018-01 **File sharing system**, *Operating System*.
Synchronous file transferring between a server and multiple clients with socket programming was implemented using C language.

2015-09 - 2016-01 **Box Boy**, *Advanced Programming*.
Advised by *Dr. Ramtin Khosravi*, we implemented a game with c++ and SDL library for visual effects.

Teaching Experiences

2019-Fall **Data Structures and Algorithms**.

2019-Spring **Data Structures and Algorithms**.

2019-Spring **Artificial Intelligence**.

2016 **Mathematics Tutor in Salam High School**.

Computer skills

Machine Learning	Python, Tensorflow, PyTorch, Numpy, Pandas, scikit-learn, OpenCV
Programming Languages	C, C++, Java, Scheme, R, Prolog, Javascript, Node.js, PHP, MATLAB, Verilog, Alloy, SPIN, NuSMV
Softwares	Visual Studio, Git, CodeVision, Android Studio, Intellij IDEA, PyCharm, WebStorm
Simulators	Modelsim, Quartus, PSPICE, ISE, Proteus
Databases	SQLite, MySQL, SQL Server

Scientific Skills	Algorithm design and implementation, Object Oriented design, Designing Rich Internet Applications, Designing hardware systems with HDL, Designing embedded systems using Microcontrollers and FPGAs (Arduino , AVR , etc.)
Other Programming Skills	ReactJs, Django, jQuery, OpenSSL, UML Design, Tex
Operating Systems	Windows, Linux

Languages

Persian	Native
English	Fluent

Related Courses

- Design and Analysis of Algorithms
- Data Structures and Algorithms
- Engineering Probability and Statistics
- Artificial Intelligence

Online Courses

- Stanford CS231n - Winter 2016
- Stanford CS224d - Winter 2016
- Stanford CS229 - 2008

References

- Dr. Mohammad Rastegari - mohammadr@allenai.org
- Dr. Mohammad Amin Sadeghi - asadeghi@ut.ac.ir
- Dr. Fathiyeh Faghih - f.faghih@ut.ac.ir
- Dr. Ahmad Khonsari - ak@ipm.ir
- Dr. Dara Rahmati - dara.rahmati@ipm.ir