

Milad Hakimi

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Summary

- I'm research assistant and masters student at Simon Fraser University. My area of interest is software analysis using compiler tools and designing and building hardware accelerators.

Education

2020–now **M.Sc. in Computer Science**, GPA: 3.92, Simon Fraser University, Vancouver, Canada.

- under supervision of **Prof. Arrvindh Shriraman**
- **Thesis Idea:** Hardware Accelerator for Memoization: I'm currently working on a hardware accelerator that memoizes regions of code with high computational complexity to skip their execution if possible. To capture these regions, I'm statically and dynamically analysing the programs using LLVM. The static analysis determines the computational cost of the function in terms of arithmetic operations. The dynamic analysis is performed by instrumenting the code and helps specifying the hardware features such as key size, table size (for the hash table), approximation accuracy, possible hit rate, etc. The end result would be the mentioned hardware which accepts parameters such as region, approximation method, etc., and produces the result of the specified region based on the previous invocations.

2015–2020 **B.Sc. in Computer Engineering**, GPA: 3.46/4, University of Tehran, Tehran, Iran.

- **B.Sc. Thesis:** "*Predicting the Network Traffic in Data Centers*," under supervision of **Prof. Ahamad Khodari**

Research Experiences

2020–now **Research Assistant**, *Simon Fraser University*, Computer Architecture Lab.

- **X-Cache** (*in prep*): X-Cache is a cache generator for Domain Specific Architectures (DSAs) implemented by chisel. X-Cache can be used by the DSAs to define and generate a cache based on their specific data orchestrations and saves the burden of implementing a cache from scratch (reduces the NRE). My contribution to this paper was implementing a near memory computation unit for the X-Cache using chisel. Also, I used LLVM to analyse the benchmarks of different applications such as TPC-H (database), BlackScholes(vector processing), PageRank(graph processing), etc, to provide the data for the cache evaluation.

- **Program Analysis Tool:** I started learning LLVM throughout this project. This tool instruments and runs the program in order to extract the function calls and dependencies between the functions. Also, it captures the memory accesses of the functions (and their precedence) and generates two different graphs at the end. The first one shows the order of executions of the functions and the second one shows their memory accesses pattern.

2018–2020 **Research Assistant**, Institute for Research in Fundamental Sciences.

- Implementing a stochastic multiplier based convolution calculator and adding it to Tensorflow so that it can be used as one of its default functions.
- **CloNet:** A NOC hardware accelerator for neural networks. It was a hierarchical network of switches and routers connecting the processing elements on FPGA. Considering the fact that most of the messages in the system are broadcast or multicast, it reduced the delay of the network significantly in comparison to Mesh architecture.

Experiences

Work

2020 **Software Engineer at Yektanet.**

- Developing and optimising BidManager system (a system that generates optimum bids such that the advertisers' ads get a high chance to be viewed) using Django framework.
- Developing a monitoring system to show the impacts of the BidManager on the whole bidding system and provide a feedback on its functionality by comparing to other bidding methods.

Side Projects

- **SyncWatch**

SyncWatch connects two systems through internet using IP forwarding and without using a centralized server. It then enables them to watch a movie synchronously which means whenever somebody pauses or fast forwards the movie, the same thing will happen at the other end.

- **Bia** (*Mobile Application*)

Bia is an android application that enables you to inform people when you reach in a certain distance of them.

- **Medyab** (*Backend Developer*)

Designing and implementing database models, APIs, and unit tests using **Django Rest Framework**.

Selected Course Projects

- **Software Engineering**

Dynamic Analysis using LLVM: In this project, I built a dynamic analysis tool that could detect specific bugs in the program (invalid writes and reads from memory, division by zero, ...) and fix them gracefully.

- **Database Systems II**

Database Engine(YASE): YASE is a database engine that consists different components such as Storage Management, Indexing, Logging, and Concurrency Control(Locking). It was also tested using the standard benchmarks suits such as TCP-C.

- **Hardware and Software Co-Design**

hardware accelerator: An accelerator for neural networks by implementing a multi layer perceptron on NIOS II and use it as custom instruction instead of a cpu-based MAC.

- **Realtime Embedded Systems**

Segway Machine: It's a self-balancing machine that can stand and move on its two wheels. It receives the incline and acceleration on different axis through the sensors connected to the arduino and then decides how to move in order to keep its balance.

Teaching

2021 **Teaching Assistant**, Computer Architecture.
Simon Fraser University

2018–2020 **Teaching Assistant**, Realtime Embedded systems, Operating Systems, Computer Networks, Computer-Aided Design.
University of Tehran

Related Courses

- Software Engineering
- Machine Learning
- Parallel and Distributed Computing
- Database Systems II
- Compiler Design and Implementation
- Hardware and Software Co-Design
- Realtime and Embedded Systems

Skills

- **Software Programming**
c/c++ (LLVM), python (Keras, Tensorflow), Java, Matlab
- **Hardware Descriptor Languages and tools**
Verilog, VHDL, Chisel
Quartus, ISE, Design Compiler, Modelsim
- **Web/Mobile Developing**
Python(Django), React, React Native, Java Script

Interests

Reading Philosophy, Mythology, Anthropology

Coding Developing simple but handy applications for myself