Arash Pourhabibi-Zarandi

Computer Science PhD Candidate
Swiss Federal Institute of Technology in Lausanne (EPFL)

Contact Info

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Research Interests

I am broadly interested in the field of systems and interdisciplinary systems problems found in modern, large-scale datacenters. My current research revolves around efficiency and sustainability enhancement of server systems for datacenters. By characterizing modern server workloads and employing emerging memory subsystems, I look for minimizing the energy footprint and maximizing the compute density of server systems through specialization of various system components, and better system integration.

Education

2015-2021 (Expected)
Ph.D. in Computer & Communication Sciences
Swiss Federal Institue of Technology in Lausanne (EPFL), Lausanne, Switzerland
Doctoral Research Assistant at PARSA lab under supervision of Prof. Babak Falsafi
Related Courses: Advanced Multiprocessor Architecture, Topics on Datacenter Design, Understanding Datacenter Software Dynamics

2013-2015
M.Sc. in Computer Engineering (Software Engineering)
Shiraz University, Shiraz, Iran
Thesis: Design & Implementation of a Scheme for Big Data Processing on GPU
Advisor: Dr. Farshad Khunjush
Ranked First: Achieving the highest course GPA (19.84/20) among all M.Sc. students
Related Courses: Advanced OS, Advanced Computer Architecture, Multicore Programming, Parallel Algorithms, Grid Computing, Software Architecture, Text Mining

2009-2013
B.Sc. in Computer Engineering (Software Engineering)
Shiraz University, Shiraz, Iran
Ranked First: Achieved the highest GPA in CS courses (18.88/20) among all B.Sc. students

Work Experience

Current Sep. 2015
Doctoral Research Assistant
PARSA Lab, EPFL, Lausanne, Switzerland
Member of the Parallel Systems Architecture (PARSA) lab working under supervision Prof. Babak Falsafi. Member of the CloudSuite team, and part of the core team responsible for its 3rd release. Member of the Flexus simulator maintenance team, and part of the core team working on its new version branded as QFlex. Contributed to several other research projects focused on hardware and software co-design for future generations of datacenter servers.

2010-2013
Member of the IT Support Team
CS Deptartment, Shiraz University, Iran
In charge of the maintenance of department's IT services. Proposed and implemented new services for the department such as a CMS.

2011-2013
Freelance Java and iOS Developer

2010-2011
Intern at Shiraz University's CERT Center *(ShirazAPA)*
Involved in research and development of several security-related projects such a secure update manager.

Selected Projects

Current	**CloudSuite**
	CloudSuite is a benchmark suite of cloud services. The benchmarks are based on real-world software stacks and represent real-world setups. It is one of the early benchmark suites that is representative of modern datacenter services and is included in Google's PerfKit Benchmarker. It has become an industry standard and been used to drive the design of modern datacenter-oriented CPUs, such as Cavium ThunderX. I have been in the core team responsible for the maintenance and the third release of CloudSuite, which is a major enhancement over prior releases both in benchmarks and infrastructure.
Current	**QFlex**
	The QFlex project targets quick, accurate, and flexible simulation of multi-node computer systems proceeding along four fronts: QEMU, a popular open-source full-system machine emulator, Flexus, a powerful and flexible simulation framework that enables detailed cycle-accurate simulation, SMARTS, which applies rigorous statistical sampling theory to reduce the simulation time while achieving high accuracy, and NS-3, a popular and flexible network simulation stack. I have been a member of the Flexus maintenance team and the team responsible for its new version branded as QFlex.
2015-2016	**Toward Server Efficiency in the Post-Dennard Era**
	The popularity of online services drives the need for bigger datacenters with more server processors. As Moore's law continues, the number of transistors on chip rises exponentially, enabling us to have CMPs with hundreds of cores. However, due to the slowdown in Dennard's scaling, we cannot power up all of them at the same time. Hence, soon we will enter an era of "dark silicon", in which we cannot power up fast and dense processors. In this work, we explore the potential directions to improve the energy efficiency of server processors in the post-Dennard era. Moreover, we investigate the hardware- and software-related constraints of designing a server processor for modern cloud services, and we propose an approach based on near-threshold computing (NTC) to design energy efficient server processors. We propose an architecture based on the FD-SOI process technology for NTC in servers. Our study demonstrates the benefits of NTC and proposes several directions to synergistically increase the energy proportionality of a near-threshold server.
M.Sc. Thesis	**BigKernel**
	It was a joint research project with Reza Mokhtari under the supervision of Prof. Michael Stumm at the University of Toronto. The work is based on a scheme, named BigKernel, that provides pseudo-virtual memory to GPU applications and is implemented using a 4-stage pipeline with automated prefetching to optimize CPU-GPU communication and optimize GPU memory accesses. We proposed compile-time system that takes a BigData application as input and modifies it to automate the CPU-GPU data communications and improves the overall performance of the application. The compiler tool was developed using the LLVM/Clang infrastructure.
Spring 2015	**Building a Fault-Tolerant Key-Value Store**
	It's a Key-Value Store written in C++, which supports the four CRUD operations with additional support for load balancing and fault tolerance. It uses a ring-based DHT, and keeps three replicas of each key-value pair with a quorum-based consistency model. Beneath the KV store, there is a distributed membership protocol which keeps track of the ring in the event of a new node joining or when a node fails. It was the programming project of the University of Illinois's online Cloud Computing Concepts course, which I got the complete grade.
Fall 2011	**Pure P2P File Sharing Application Written in Java**
	A file sharing application based on P2P networking. Each peer keeps track of other peers and can add/remove peers to its peer list. A peer can ask other peers for a file and then can receive the file from those that have the requested file. For writing this application, I first wrote a general purpose P2P framework in Java, then I wrote a file sharing application on top of it.

Publications

1. **Towards near-thresholdserver processors.** A. Pahlevan, J. Picorel, A. P. Zarandi, D. Rossi, M. Zapater, A. Bartolini, P. G. Del Valle, D. Atienza,L. Benini, and B. Falsafi. *In Proceedings of the 2016 Conference on Design, Automation & Test in Europe (DATE)*, Dresden, Germany, March 2016

2. The official Persian translation of "Engineering SaaS: An Agile Approach Using Cloud Computing" written by Armando Fox and David Patterson. It is under preparation.

Technical Skills

Programming:	Python, C, Java, PThreads, OpenMP, CUDA, MPI
Operating Systems:	macOS, Linux, Windows
Miscellaneous:	Git, Docker, LaTeX, Shell Scripting, Agile Development
Basic Knowledge:	Objective-C, Ruby, PHP, HTML, JavaScript

Languages

Persian:	Mother Tongue
English:	Fluent
French:	Basic Knowledge

Awards & Honors

Summer 2014 — Ranked **2ⁿᵈ** in the Java section of the First Iran Programming Skill Challenge
Held by Sharif University of Technology and Tehran University's Faculty of Entrepreneurship, Iran

Sep. 2013 — Honorary admission to the M.Sc. program without university entrance exam
Shiraz University, Shiraz, Iran

June 2013 — Awarded as the **Best Undergraduate Student** in Computer Engineering
Shiraz University, Shiraz, Iran

Feb. 2012 — Nominated for the **Best Mobile Application** for SAHA
The First Iran Mobile Innovation Awards, held by Sharif University of Technology, Tehran, Iran

Teaching Assistantships

Spring 2018 | Systems for Data Science
Will be grading students' assignments, projects and exams, leading weekly lab sessions and giving guidance to students. | EPFL

Fall 2017
Fall 2016 | Introduction to Multiprocessor Architecture
Constructed syllabus and prepared course material including lecture slides, exercises, programming assignments, and exams. Graded assignments and exams. Led weekly lab sessions and gave guidance to students. | EPFL

Spring 2017 | Programming II (Using C++)
Graded students' programming assignments, projects and exams. Led weekly lab sessions and gave guidance to students. | EPFL

Spring 2014 | Grid Computing
Graded students' programming assignments and projects. | Shiraz University

Spring 2014 | Software Architecture
Graded students' programming assignments and projects. | Shiraz University

Spring 2014
Spring 2013 | Database Laboratory
Constructed syllabus and prepared the course material. Led weekly lab sessions, gave guidance to students and graded their assignments and projects. | Shiraz University

Fall 2013 | GPU Programming
Prepared and graded students' programming assignments and projects, led weekly lab sessions and gave guidance to students. | Shiraz University

Spring 2013 | Design & Implementation of Programming Languages
Prepared students' programming assignments and projects. | Shiraz University

Fall 2012
Fall 2010 | Fundamentals of Computer and Programming Using Python
Constructed syllabus and prepared the course material (programming assignments, labs, and projects). Led weekly lab sessions, gave guidance to students and graded their assignments and projects. | Shiraz University

Spring 2012
Spring 2011 | Principles of Programming Using C
Prepared and graded students' programming assignments and projects, led weekly lab sessions and gave guidance to students. | Shiraz University

Fall 2011 | Advanced Programming Using Java
Prepared and graded students' programming assignments and projects, led weekly lab sessions and gave guidance to students. | Shiraz University

Online Education

WINTER 2015   **UC Berkeley's Introduction to Big Data with Apache Spark**
With score of 100% | Taught by Anthony D. JOSEPH through edX

WINTER 2015   **U of Illinois's Cloud Computing Concepts (Part 1 & 2)**
With score of 97.6% for both the courses | Taught by Indranil GUPTA through Coursera

JAN. 2015   **University of Maryland's Developing Innovative Ideas for New Companies**
With score of 100% | Taught by Dr. James V. GREEN through Coursera

DEC. 2013   **IIT Delhi's Web Intelligence and Big Data**
With score of 100% | Taught by Gautam SHROFF through Coursera

SUMMER 2013   **UC Berkeley's Engineering SaaS I & SaaS II**
With scores of 94% and 92% | Taught by David PATTERSON & Armando Fox through edX

DEC. 2011   **Stanford's Introduction to Databases**
With score of 91% | Taught by Jennifer WIDOM

Last Update: February 2018