Davood Mohajerani

Curriculum Vitae

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I am a software developer/researcher in the field of high performance computing. I have experience in the design, implementation, and optimization of parallel algorithms on CPUs (Cilk/OpenMP) and GPUs (CUDA) for several problems in computational algebra (primarily used in solving systems of polynomial equations and cryptography).

As a team member, I focus on iterative development, effective (written and verbal) presentation of ideas, simplifying the workflow, and most importantly, maximizing the outcome within the time and budget constraints.

Interests

- Performance portability, optimizing compilers, and automatic parallelization.
- Design, implementation, and optimization of parallel algorithms for CPUs, GPUs, and accelerators.
- Developing software tools for computational number theory and parallel arbitrary-precision integer arithmetic.

Education

2017-Present **Ph.D. candidate in Computer Science**, University of Western Ontario, Canada
Thesis: Parallel arbitrary-precision integer arithmetic on GPUs and multi-core CPUs.
Supervisor: Professor Marc Moreno Maza. Expected to graduate by March 2021.

2015-2016 **M.Sc. in Computer Science**, University of Western Ontario, Canada
Thesis: "FFT over Prime Fields of Large Characteristic and Their Implementation on GPUs"

2010-2015 **B.Sc. in Computer (Software) Engineering**, Isfahan University of Technology, Iran

Open Source Portfolio

2015-Present: Software developer and research assistant at Symbolic Computing Laboratory (ORCCA)

- In progress: Author of a new library for parallel arbitrary-precision integer arithmetic on GPUs (CUDA).
- In progress: Author of a new parallel algorithm for arbitrary-precision integer multiplication on GPUs (CUDA).
- Maintainer of CUMODP (a CUDA library for modular arithmetic on GPUs).
- Lead developer of KLARAPTOR (a tool for improving running time of CUDA kernels by estimating block dimensions).
- The first parallel implementation of FFT over big prime fields on CPUs (Cilk), integrated in BPAS library.
- The first parallel implementation of FFT over big prime fields on GPUs (CUDA), integrated in CUMODP library.
- A new parallel implementation of 6-step FFT over small prime fields on CPUs (Cilk), integrated in BPAS library.
- A new parallel univariate polynomial division on GPUs (CUDA).

Skills

Programming	C, C++, CUDA, PTX, Cilk, OpenMP, x86 Assembly, AVX/AVX2, Python, bash, Make
Libraries/API	LLVM (Pass Framework), NVIDIA CUPTI, GNU GMP, POSIX, NTL
Tools/DBMS	LaTeX, GDB, valgrind, perf, SQL
Familiar with	MATLAB, Maple, OpenGL, OpenCL, NumPy/SymPy, Verilog, Web development

Awards

- "Distinguished Software Demonstration Award" for presenting CUMODP library in ACM ISSAC 2017 conference.
- University of Western Ontario Graduate Research Scholarship (WGRS) for Ph.D. in Computer Science.
- University of Western Ontario Graduate Research Scholarship (WGRS) for M.Sc. in Computer Science.
- Ranked among the top 1% in the Iranian university entrance exam in 2010 ($\sim$ 320,000 participants).

Volunteer Experience

Linux System Administrator at Ontario Research Center for Computer Algebra (ORCCA Lab)

- Designed a new website for the research group (http://orcca.on.ca)
- Troubleshooting occasional hardware/software issues.
- Partially maintaining our group's Linux cluster.
- Configuring new workstations for the group.

Teaching Experience

Teaching Assistant, University of Western Ontario

- CS3350: Computer Architecture (Winter 2017, Winter 2018, Winter 2020)
- CS2214: Discrete Structures for Computing (Winter 2019, Fall 2019)
- CS1026: Computer Science Fundamentals (Fall 2015, Fall 2017, Fall 2018, Spring 2019)
- CS1046: Inotroduction to Programming Using JavaScript (Winter 2016)
- CS1032: Information Systems and Design (Fall 2016)

Teaching Assistant, Isfahan University of Technology

- Digital Logic Design (Fall 2012, Spring 2013, Fall 2013, Spring 2014)
- Operating System (system programming in Minix) Lab. (Fall 2013, Spring 2014)

Instructor, Isfahan University of Technology

- Essentials of Linux (December 2014)
- Workshop on "Parallel Programming in CUDA" (May 2014)

Publications

[1] S. Covanov, Davood Mohajerani, M. M. Maza, and L. Wang, "**Big Prime Field FFT on Multi-core Processors**," in *ISSAC 2019*.

[2] A. Brandt, Davood Mohajerani, M. M. Maza, J. Paudel, and L. Wang, "**KLARAPTOR: A Tool for Dynamically Finding Optimal Kernel Launch Parameters Targeting CUDA Programs**," *CoRR*, vol. abs/1911.02373, 2019.

[3] S. A. Haque, X. Li, F. Mansouri, M. M. Maza, Davood Mohajerani, and W. Pan, "**CUMODP: a CUDA library for modular polynomial computation**," *ACM Commun. Comput. Algebra*, vol. 51, no. 3, pp. 89–91, 2017.

[4] S. A. Haque, A. Hashemi, Davood Mohajerani, and M. M. Maza, "**Plain, and Somehow Sparse, Univariate Polynomial Division on Graphics Processing Units**," in *PASCO@ISSAC 2017*, ACM, 2017.

[5] L. Chen, S. Covanov, Davood Mohajerani, and M. M. Maza, "**Big Prime Field FFT on the GPU**," in *ISSAC 2017*, ACM, 2017. DOI: 10.1145/3087604.3087657.

References

- Available upon request.