Yunming Zhang

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Education

Massachusetts Institute of Technology June 2014- May 2020 (Expected)
Doctor of Philosophy in Computer Science, Cumulative GPA: **5.0/5.0**
Advisors: Prof. Saman Amarasinghe, Julian Shun
Focus: Compilers, Big Data Analytics, High-Performance Computing, Programming Languages

Rice University, Houston, Texas May 2013 - May 2014
Master of Science in Computer Science, Cumulative GPA: **4.0/4.33**
Advisors: Prof. Vivek Sarkar, Alan Cox
Focus: Optimizing Multi-Core Performance for Distributed MapReduce Runtime Systems

Rice University, Houston, Texas May 2009 - May 2013
Bachelor of Science in Computer Science
Cumulative GPA: **3.99/4.33, Magna Cum Laude, Distinction in Research and Creative Work**

Publications

PriorityGraph: A Unified Programming Model for Optimizing Ordered Graph Algorithms
Yunming Zhang, Ajay Brahmakshatriya, Xinyi Chen, Laxman Dhulipala, Shoaib Kamil, Saman Amarasinghe, Julian Shun
- International Symposium on Code Generation and Optimization (***CGO***) 2020

GraphIt – A High-Performance DSL for Graph Analytics
Yunming Zhang, Mengjiao Yang, Riyadh Baghdadi, Shoaib Kamil, Julian Shun, Saman Amarasinghe
- Object-oriented Programming, Systems, Languages, and Applications (***OOPSLA***) 2018

Project Page: https://graphit-lang.org/, **Github:** https://github.com/GraphIt-DSL/graphit
Used by Cornell, University of Washington, and NVIDIA to develop domain-specific architectures. Evaluated by Intel for potential adoption.

Making Caches Work for Graph Analytics
Yunming Zhang, Vladimir Kiriansky, Charith Mendis, Matei Zaharia, Saman Amarasinghe
- IEEE International Conference on Big Data (***BigData***) 2017 ***Best Student Pape*****r**

Tiramisu: a polyhedral compiler for expressing fast and portable code
Riyadh Baghdadi, Jessica Ray, Malek Ben Romdhane, Emanuele Del Sozzo, Abdurrahman Akkas, **Yunming Zhang**, Patricia Suriana, Shoaib Kamil, Saman Amarasinghe
- International Symposium on Code Generation and Optimization (***CGO***) 2019

Optimizing Indirect Memory References with Milk
Vladimir Kiriansky, **Yunming Zhang,** Saman Amarasinghe
- International Conference on Parallel Architectures and Compilation Techniques (***PACT***) 2016

HJ-Hadoop: An Optimized MapReduce Runtime for Multi-core Systems.
Yunming Zhang, Alan Cox, Vivek Sarkar.
- 5th USENIX Workshop on Hot Topics in Parallelism (***HotPar*** '13). June 2013. [poster with paper]

Experience

Massachusetts Institute of Technology Computer Science Department **June 2014 – Present**
Research Assistant **Advisors: Prof. Saman Amarasinghe, Julian Shun**

- Created and led the design and implementation of **GraphIt**, a domain-specific language for writing high-performance graph analytics. GraphIt is currently used by University of Washington, Cornell University, NVIDIA for the development of domain-specific accelerators and evaluated by Intel graph analytics team.
- Led the development of **PriorityGraph** extensions to GraphIt for supporting high-performance ordered parallelism for applications such as shortest paths queries, nearest neighbor search, KCore, and SetCover.
- Led the development of new cache optimizations, Graph Reordering and CSR segmenting (cache blocking for graphs). We implemented the techniques in a library, **Cagra,** and later integrated into **GraphIt**.
- Worked on using GraphIt to generate high-performance GPU implementations of graph algorithms.
- Worked on high-performance Sparse Linear Algebra kernels for SpMV.

Rice University Computer Science Department **Aug 2011 – May 2014**
Research Assistant, Habanero Multi-Core Software Group **Advisor: Prof. Vivek Sarkar**

- Designed and implemented the HJ-Hadoop MapReduce runtime. It integrates Habanero Java's shared memory model into the Hadoop MapReduce runtime's distributed memory model.

IBM Research Lab, Austin **May 2013 – Aug 2013**
Research Intern, Distributed High performance Key-Value Store **Mentor: Dr. Juan Rubio**

- Designed and implemented the query API for the key-value store.

Microsoft, Redmond **May 2012 – Aug 2012**
Software Developer Engineering Intern, Azure Data Market Team **Manager: David Shiflet**

- Improved search functionalities to match user interest with data or application offered by Azure Data Market.

Awards and Honors

- Best Student Paper, BigData 17 (2017)
- Third place, Undergraduate, ACM Student Research Competition at SPLASH 13 (2013)
- Research Fellowship for Master of Science in Computer Science (2013)

Talks

- "Writing High-Performance Graph Applications with GraphIt", Facebook Boston, 2019
- "Writing High-Performance Graph Applications with GraphIt",Google NY, 2019
- "GraphIt: A Domain-Specific Language for Writing High-Performance Graph Applications", MIT Fast Code Seminar, MIT Graphics Seminar 2019, MIT *Algorithm Engineering (6.886) 2019*
- *"Compiling Sparse Graphs and Tensors",* University of Texas at Austin ICES Seminar 2018
- "Optimizing Cache Performance for High-Performance Graph Analytics", MIT *Graph Analytics (6.886)* 2018

Teaching and Mentorship Experience

Teaching Assistants at MIT and Rice

- MIT: TA for *Performance Engineering of Software Systems (6.172)* in Fall 2016
- Rice: TA for *Fundamentals of Parallel Computing* (COMP 322) for 2 semesters. *Advanced Object Oriented Computing* (COMP 310), *Computational Thinking* (COMP 140). (From 2010 to 2013)

Mentoring Master and Undergraduate Students at MIT

- Mengjiao Yang, Master of Engineering, (coauthor of GraphIt paper at OOPSLA 2018)

- Xinyi Chen, Undergraduate Researcher, (coauthor of PriorityGraph at CGO 2020, SuperUROP award)
- Tugsbayasgalan Manlaibaatar, Master, Undergraduate Researcher (High-Performance Graph Algorithms)

Service

- International Conference on Very Large Data Bases **(VLDB)** 2020 External Reviewer
- Transaction on Parallel and Distributed Systems **(TPDS)** 2019 Reviewer
- Symposium on Parallelism in Algorithms and Architectures (**SPAA**) 2018 Reviewer
- ACM Computing Surveys 2017 Reviewer