

# Yunming Zhang

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## Education

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**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

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### 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 Graph Analytics team 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 Paper*

### 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

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**Massachusetts Institute of Technology Computer Science Department**  
Research Assistant

**June 2014 – Present**  
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**  
Research Assistant, Habanero Multi-Core Software Group

**Aug 2011 – May 2014**  
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**  
Research Intern, Distributed High performance Key-Value Store

**May 2013 – Aug 2013**  
Mentor: Dr. Juan Rubio

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

**Microsoft, Redmond**  
Software Developer Engineering Intern, Azure Data Market Team

**May 2012 – Aug 2012**  
Manager: David Shiflet

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

## Awards and Honors

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- 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)

## Teaching and Mentorship Experience

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### 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

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- 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

## Invited Talks

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- “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
- “Optimizing Cache Performance for High-Performance Graph Analytics”, MIT *Graph Analytics* (6.886) 2018