

# Carl Yang

## Curriculum Vitae

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### Education

- 2014–Present **Ph.D. Student, Computer Engineering, University of California, Davis.**
- Research Area: Parallel computing, sparse matrix multiplication and graph algorithms
  - Advisors: Prof. John D. Owens and Dr. Aydin Buluç
- 2006–2010 **B.A.Sc., Electrical Engineering, University of British Columbia, Vancouver.**
- Research Area: Mathematical modeling of MEMS

### Experience

- Jan-2016–  
Present **Graduate Student Research Assistant, Lawrence Berkeley National Laboratory, Berkeley.**
- Building multi-GPU implementation of sparse matrix multiplication for GraphBLAS.
- Extended sparse matrix-sparse vector multiplication (SpM<sub>Sp</sub>V) kernel to distributed network of GPUs using MPI.
  - Working on single-GPU sparse matrix-sparse matrix multiplication (SpGEMM) kernel with applications in algebraic multigrid, Markov clustering and betweenness centrality.
  - Working on single-GPU sparse matrix-dense matrix multiplication (SpMM) kernel with applications in betweenness centrality, all-pairs shortest-paths and sparse convolutional neural networks.
- Jun-2017–  
Sep-2017 **Research Intern, NVIDIA, San Jose.**
- Building multi-GPU graph partitioner.
- Used Markov Chain Monte Carlo (MCMC) sampling to find optimal partition as defined by the stochastic blockmodel, a type of Bayesian mixture model for graphs.
  - Used CUDA to write GPU implementation of parallel MCMC.
  - Achieve performance speed-up using sparse matrix operations.
- Jul-2015–  
Aug-2015 **Student Researcher, DARPA, Arlington.**
- Apply Gunrock to solve big data analytic challenges.
- Investigate how Gunrock can solve problems for US governmental organizations.
  - Analyze geodata based on social media to aid UN peacekeeping first response efforts in Yemen.
  - Detect patent troll cases for US Patent and Trademark Office using open data.
  - Contributor to Gunrock: High-Performance GPU Graph Processing Library: (<http://gunrock.github.io>)

- Jan-2015– **Graduate Student Researcher**, *University of California, Davis*.
- Dec-2015 Built graph algorithms based on shared-memory parallelism of GPU.
- Investigate linear algebraic formulations of graph algorithms.
  - Formulated first sparse matrix-sparse vector (SpM<sub>Sp</sub>V) kernel on GPU that generalizes to arbitrary semi-rings with applications in breadth-first-search, single-source shortest-path and maximal independent set.
  - Provides up to 3.3x speed-up over comparable sparse matrix-dense vector (SpMV) kernel.

## Professional skills

- Proficient C, C++, CUDA,  $\LaTeX$ , Linux development
- Familiar Python, MPI, HTML, Bash, Git, Windows development

## Publications

Tim Mattson, **Carl Yang**, Scott McMillan, Aydin Buluç and José Moreira. GraphBLAS C API: Ideas for future versions of the specification. *IEEE High Performance Extreme Computing (HPEC)*, September 2017.

Yuechao Pan, Yangzihao Wang, Yuduo Wu, **Carl Yang** and John D. Owens. Multi-GPU Graph Analytics. *IEEE International Parallel and Distributed Parallel Symposium (IPDPS)*, May 2017.

Aydin Buluç, Tim Mattson, Scott McMillan, José Moreira and **Carl Yang**. Design of the GraphBLAS API for C. *Workshop on Graph Algorithm Building Blocks (GABB)*, May 2017

Yangzihao Wang, Yuechao Pan, Andrew Davidson, Yuduo Wu, **Carl Yang**, Leyuan Wang, Muhammad Osama, Chenshan Yuan, Weitang Liu, Andy T. Riffel and John D. Owens. Gunrock: GPU Graph Analytics. *ACM Transactions on Parallel Computing (TOPC)*, January 2017.

Jeremy Kepner, Peter Aaltonen, David Bader, Aydin Buluç, Franz Franchetti, John Gilbert, Dylan Hutchison, Manoj Kumar, Andrew Lumsdaine, Henning Meyerhenke, Scott McMillan, José Moreira, John D. Owens, **Carl Yang**, Marcin Zalewski, and Timothy Mattson. Mathematical Foundations of the GraphBLAS. In *IEEE High Performance Extreme Computing Conference (HPEC)*, September 2016.

Leyuan Wang, Yangzihao Wang, **Carl Yang** and John D. Owens. A Comparative Study on Exact Triangle Counting Algorithms on the GPU. In *High Performance Graph Processing Workshop (HPGP)*. May 2016

Yuduo Wu, Yangzihao Wang, Yuechao Pan, **Carl Yang** and John D Owens. Performance characterization for high-level programming models for gpu graph analytics. In *IEEE International Symposium on Workload Characterization (IIWCS)*, October 2015

**Carl Yang**, Yangzihao Wang and John D Owens. Fast sparse matrix and sparse vector multiplication algorithm on the gpu. In *Workshop on Graph Algorithm Building Blocks (GABB)*, May 2015.