Ryan Synk

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I am a Ph.D Student in Computer Science at the University of Maryland. My research interests are in the fields of Numerical Linear Algebra and High-performance Computing.

Education

2021–present	**Ph.D, Computer Science**, *University of Maryland*, College Park
2016–2020	**B.S, Mathematics**, *University of Maryland*, College Park Cum Laude, High Honors in Mathematics
2016–2020	**B.S, Computer Science**, *University of Maryland*, College Park Cum Laude

Publications

[1] Pieter Ghysels and Ryan Synk. High performance sparse multifrontal solvers on modern GPUs. *Parallel Computing*, 110:102897, 2022.

Research Experience

Summer 2023 — **Research Scientist/Engineer Intern**, *Adobe Inc.*
- Benchmarked implementations of a performance-critical Sparse Cholesky factorization kernel.
- Contributed efficient sparse solver wrappers to the open-source PolySolve library
- Created interactive visualization to explore benchmark data using Altair
- Worked with Jeremie Dumas, Danny Kaufman, and Qingnan Zhou

Summer 2019 — **BLUR Fellow (Berkeley Lab Undergrad Research)**, *Lawrence Berkeley National Laboratory*
- Contributed to the Structured Matrices Package, a high-performance computing (HPC) software library written in C++ designed for solving large sparse linear systems.
- Accelerated application by porting it to GPUs via CUDA. Outperformed the original, CPU-parallelized application and achieved 3x speedup
- Gained knowledge of GPU architectures and tested work on the Summit supercomputer
- Advised by Dr. Pieter Ghysels

Summer 2018 — **UMD Computer Science Research Experience for Undergraduates**, *UMD CS*
- Studied adversarial attacks on facial recognition neural networks.
- Created adversarial attacks and trained neural networks on standard datasets using Pytorch.
- Collaborated with a team of undergraduates under the direction of Prof. Tom Goldstein
- Advised by Dr. Tom Goldstein

Industry Experience

Nov 2020-July 2021
Software Engineer, *Kythera Space Solutions*
- Revamped a software library used for the management of a satellite network. The network provided internet and telecommunications to the entire continent of Australia.
- Extended functionality of satellite resource management software to allow for up to 8 network service providers
- Codebase was written in C++

Awards and Honors

2019 **Strauss Teaching Assistantship**, *UMD Mathematics Dept*

2018 **Strauss Teaching Assistantship**, *UMD Mathematics Dept*
Teaching assistantship award given every year to select group of undergraduate mathematics majors

2018 **Higgenbotham Award**, *UMD Mathematics Dept*
Award given once a year to an outstanding junior mathematics major

Technical Skills

Programming Languages
Python, C/C++, Matlab

Libraries and Platforms
Cuda, Pytorch, Tensorflow

Operating Systems and Development Tools
Git, Linux/Unix, Windows, LaTeX

Relevant Coursework

Graduate Courses
Numerical Linear Algebra, Advanced Numerical Optimization, Scientific Computing I/II, Deep Learning

Undergraduate Courses
Computer Systems, Image Processing, Algorithms, Numerical Analysis, Real Analysis, Partial Differential Equations

Seminar Talks

2021 **An Introduction to Density Functional Theory and the Quantum Many-Body Problem**, *Seminar on ML for Rare Events*

Posters

2019 **Synk, Ryan, and Ghysels, Pieter**, *A GPU-Accelerated Structurally-Symmetric Sparse Multifrontal Solver. United States: N. p., 2019. Web.*

Teaching Experience

Spring 2020 **Teaching Assistant**, *Calculus II*

Fall 2019 **Teaching Assistant**, *Calculus I*

Spring 2019	**Teaching Assistant**, *Calculus II*
Fall 2018	**Teaching Assistant**, *Calculus I*
Summer 2017	**Teaching Assistant**, *HiTech Program*
	Designed and taught free week-long classes to middle and high schoolers in a variety of STEM topics through the Howard County Library System's HiTech Program