

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, Machine Learning, and High-performance Computing.

Education

- 2021–present **Ph.D, Computer Science**, *University of Maryland*, College Park
Advised by Howard Elman and Abhinav Bhatele
- 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 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 **Software Engineer, Kythera Space Solutions**
2020–July 2021
- 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, L^AT_EX

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