Zane Fink

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Research Interests

Programming Models and Runtime Systems; Parallel Algorithms; Interconnection Networks; Bioinformatics

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Education

Aug 2020 Present
PhD, Computer Science, *University of Illinois at Urbana-Champaign*.
Advisor: Laxmikant V. Kale

Aug 2016 May 2020
B.S., Computer Science, *Northern Arizona University*, GPA: 3.67.

Experience

Jan 2021 Present
Graduate Research Assistant, *Center for Exascale Enabled Scramjet Design*, UIUC.
- Adaptive runtime support for simulation library.

Aug 2020 Present
Graduate Research Assistant, *Parallel Programming Laboratory*, UIUC.
- Research in high-performance and scientific computing.
- Currently focusing on parallel programming models and runtime systems.

May 2019 Aug 2020
Undergraduate Research Assistant, *Community-Aware Networks & Information Systems (CANIS) Lab*, NAU.
- Conducting research on low-bandwidth, long-ranged network architectures for resource-constrained environments.
- Designing architecture at the application/transport layers to support delay-tolerant user access to online services.
- Supervisor: Morgan Vigil-Hayes

Jan 2019 June 2020
Undergraduate Research Assistant, *Gowanlock Lab*, NAU.
- Investigating the acceleration of systems utilizing response-based cryptography using the GPU.
- Investigated hybrid algorithms to accelerate memory-bound algorithms on heterogeneous CPU/GPU platforms.
- Supervisor: Michael Gowanlock

Mar 2018 May 2020	**Undergraduate Research Assistant**, *The Pathogen and Microbiome Institute*, NAU.

- Designed and implemented algorithms for efficient analyses to comprehensively determine an individual's viral exposure history. This algorithm achieves similar levels of coverage of the human virome with $37-54\%$ fewer probes than other algorithms.
- Proposed and received funding for the *PepSIRF* software package implementing these algorithms.
- Engaged in outreach activities to attract more students to participate in undergraduate research.
- Supervisor: Jason Ladner

Publications

[1] J. Wright, **Z. Fink**, M. Gowanlock, C. Philabaum, B. Donnelly, and B. Cambou. A symmetric cipher response-based cryptography engine accelerated using gpgpu. In *2021 IEEE Conference on Communications and Network Security (CNS)*.

[2] J. Choi, **Z. Fink**, S. White, N. Bhat, D. F. Richards, and L. V. Kale. Gpu-aware communication with ucx in parallel programming models: charm++, mpi, and python. In *2021 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW)*, 2021.

[3] **Z. Fink**, S. Liu, J. Choi, M. Diener, and L. V. Kale. Performance evaluation of python parallel programming models: charm4py and mpi4py. In *2021 IEEE/ACM Sixth International Workshop on Extreme Scale Programming Models and Middleware (ESPM2)*, 2021.

[4] M. Gowanlock, **Z. Fink**, B. Karsin, and J. Wright. A study of work distribution and contention in database primitives on heterogeneous cpu/gpu architectures. In *Proceedings of the 36th Annual ACM Symposium on Applied Computing*, SAC '21, New York, NY, USA. Association for Computing Machinery, 2021.

[5] J. T. Ladner, S. N. Henson, A. S. Boyle, A. L. Engelbrektson, **Z. W. Fink**, F. Rahee, J. D'ambrozio, K. E. Schaecher, M. Stone, W. Dong, S. Dadwal, J. Yu, M. A. Caligiuri, P. Cieplak, M. Bjørås, M. H. Fenstad, S. A. Nordbø, D. E. Kainov, N. Muranaka, M. S. Chee, S. A. Shiryaev, and J. A. Altin. Epitope-resolved profiling of the sars-cov-2 antibody response identifies cross-reactivity with endemic human coronaviruses. *Cell Reports Medicine*, 2(1), 2021.

[6] **Z. W. Fink**, V. Martinez, J. Altin, and J. T. Ladner. Pepsirf: a flexible and comprehensive tool for the analysis of data from highly-multiplexed dna-barcoded peptide assays. *arXiv preprint arXiv:2007.05050*, 2020.

[7] M. Gowanlock, B. Karsin, **Z. Fink**, and J. Wright. Accelerating the unaccelerateable: hybrid cpu/gpu algorithms for memory-bound database primitives.

In *Proceedings of the 15th International Workshop on Data Management on New Hardware*, pages 1–11, 2019.

Teaching Experience

August 2019– December 2019
CS-499: Principles of Parallel Programming Grader, *Northern Arizona University*.
- Read parallel programs to find race conditions and incorrect behavior.
- Helped students understand mistakes by providing feedback and fixing segmentation faults in submitted assignments.
- Submitted the grade each student earned as determined by a rubric.

Jan 2018–May 2018
Computer Science *II* Lab Instructor, *Northern Arizona University*.
- Presented and explained lab information to a class of 40 students.
- Explained technical details and helped guide students toward the proper solutions.
- Held office hours to further advance student understanding.

Service

Nov 2021 **Student Volunter**, *Supercomputing '21*.

Oct 2021 **General Co-Chair**, *19th Annual Workshop on Charm++ and Its Applications*.

Jan 2019 May 2020 **Student Representative, Academic Integrity Hearing Board**, *NAU's College of Engineering, Informatics, and Applied Sciences*.

Posters

- **Zane Fink**, Jordan Wright, & Michael Gowanlock. The Acceleration of Algorithms With Low Compute to Memory Access Ratios on Heterogeneous CPU/GPU Platforms. Northern Arizona Planetary Science Alliance STEM Poster Session.
- **Zane Fink** & Jason Ladner. (2019) Panviral PepSeq: A Highly Multiplexed Serological Diagnostic. 58th Annual ASM Regional Branch Conference.

Talks

- Performance Evaluation of Python Parallel Programming Models: Charm4Py and mpi4py
  19th Annual Workshop on Charm++ and Its Applications
- Charm4Py: Scaling Adaptive Runtime Support in a Productive Language.
  12th Workshop of the Joint Laboratory for Extreme Scale Computing.

Grants and Awards

April 2020	**2020 Keim Award for Excellence in Undergraduate Research — Runner Up**.
April 2019	**Hooper Undergraduate Research Award**. Introducing PepSIRF: PEPtide-Based Serological Immune Response Framework
March 2019	**Jean Shuler Research Mini-Grant**.