Daniel Nichols

PhD Candidate

Department of Computer Science
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Education

2020–present **Ph.D., Computer Science**, *University of Maryland*, College Park, USA
Advisor: Abhinav Bhatele

2017–2020 **B.S., Computer Science**, *University of Tennessee*, Knoxville, USA

Research and Professional Experience

2020–present **Graduate Research Assistant**, *University of Maryland*, College Park

Summers 2022-2024 **Research Assistant**, *Lawrence Livermore National Laboratory*

2018–2020 **Undergraduate Research Assistant**, *Innovative Computing Laboratory and Joint Institute for Computer Science*, Knoxville

Summer 2019 **Research Assistant**, *Joint Institute for Computer Science REU*, Knoxville

Awards and Honors

2024 HPDC '24 Student Travel Grant

2024 ICPP IPDPS '24 Student Travel Grant

2023 Outstanding Graduate Assistant; *top 2% of graduate assistants university wide*

2021 GRFP Honorable Mention

2020 Dean's Fellowship, University of Maryland

2020 Summa Cum Laude, University of Tennessee

2017–2020 Dean's List, University of Tennessee

2017–2020 UT Volunteer Scholarship

2019 Herbert & Lillian Duggan Scholarship

2019 Harlan D. Mills Scholarship

2018 Edgar Wyman Mccall Scholarship

2017 Frederick T. Bonham Scholarship

2017 Henry, Robert, & Velma Scholarship

Professional Service

IEEE Cluster Conference 2022, Web Co-Chair

IEEE TPDS Reviewer (x3)
Reviews for HPDC, SC, IPDPS

Software Projects

Personal Projects

Slurm Dashboard	VSCode extension for interacting with the slurm workload manager
Performance Profile Viewer	VSCode extension for viewing and analyzing performance profiles
CSScholar	Computer science publication data dashboard

Research Projects

ParEval	Parallel code generation benchmark for LLMs
MagmaDNN	High performance deep learning framework

Teaching Experience

2021–2024	CUDA Lectures for UMD Intro to Parallel Computing
2019	Teaching Assistant for UTK Data Structures and Algorithms

Publications, Talks, & Reports

Publications

[1] **Daniel Nichols**, Harshitha Menon, Todd Gamblin, and Abhinav Bhatele. A probabilistic approach to selecting build configurations in package managers. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, SC '24, New York, NY, USA, November 2024. Association for Computing Machinery. **22.7% Acceptance Rate**.

[2] **Daniel Nichols**, Joshua H. Davis, Zhaojun Xie, Arjun Rajaram, and Abhinav Bhatele. Can large language models write parallel code? In *Proceedings of the 33rd International Symposium on High-Performance Parallel and Distributed Computing*, HPDC '24, New York, NY, USA, June 2024. Association for Computing Machinery. **17% Acceptance Rate**.

[3] **Daniel Nichols**, Alexander Movsesyan, Jae-Seung Yeom, Abhik Sarkar, Daniel Milroy, Tapasya Patki, and Abhinav Bhatele. Predicting cross-architecture performance of parallel programs. In *Proceedings of the IEEE International Parallel & Distributed Processing Symposium*, IPDPS '24. IEEE Computer Society, May 2024. **16.6% First-Round Acceptance Rate**, **26.1% Overall Acceptance Rate**.

[4] Harshita Menon*, **Daniel Nichols*** (* contributed equally), Abhinav Bhatele, and Todd Gamblin. Learning to predict and improve build successes in package ecosystems. In *International Conference on Mining Software Repositories*, MSR '24, April 2024. **26.3% Acceptance Rate**.

[5] **Daniel Nichols**, Aniruddha Marathe, Harshitha Menon, Todd Gamblin, and Abhinav

Bhatele. Hpc-coder: Modeling parallel programs using large language models. In *ISC High Performance 2024 Research Paper Proceedings (39th International Conference)*, pages 1–12, 2024. **30% Acceptance Rate**.

[6] Joshua H. Davis, Justin Shafner, **Daniel Nichols**, Nathan Grube, Pino Martin, and Abhinav Bhatele. Porting a computational fluid dynamics code with amr to large-scale gpu platforms. In *Proceedings of the IEEE International Parallel & Distributed Processing Symposium*, IPDPS '23, pages 602–612. IEEE Computer Society, May 2023. **25.7% Acceptance Rate**.

[7] **Daniel Nichols**, Aniruddha Marathe, Kathleen Shoga, Todd Gamblin, and Abhinav Bhatele. Resource utilization aware job scheduling to mitigate performance variability. In *Proceedings of the IEEE International Parallel & Distributed Processing Symposium*, IPDPS '22, pages 335–345. IEEE Computer Society, May 2022. **9.7% First-Round Acceptance Rate**, **25.9% Overall Acceptance Rate**.

[8] Rick Archibald, Edmond Chow, Eduardo F. D'Azevedo, Jack J. Dongarra, Markus Eisenbach, Rocco Febbo, Florent Lopez, **Daniel Nichols**, Stanimire Tomov, Kwai Wong, and Junqi Yin (Authors Alphabetical). Integrating deep learning in domain sciences at exascale. In *SMC 2020*, volume 1315 of *Communications in Computer and Information Science*. Springer, 2020.

[9] **Daniel Nichols**, Nathalie-Sofia Tomov, Frank Betancourt, Stanimire Tomov, Kwai Wong, and Jack Dongarra. Magmadnn: Towards high-performance data analytics and machine learning for data-driven scientific computing. In *High Performance Computing*, pages 490–503, Cham, 2019. Springer International Publishing.

[10] **Daniel Nichols**, Kwai Wong, Stan Tomov, Lucien Ng, Sihan Chen, and Alex Gessinger. Magmadnn: Accelerated deep learning using magma. PEARC '19, New York, NY, USA, 2019. ACM.

[11] Frank Betancourt, Kwai Wong, Efosa Asemota, Quindell Marshall, **Daniel Nichols**, and Stanimire Tomov. opendiel: A parallel workflow engine and data analytics framework. In *Proceedings of the Practice and Experience in Advanced Research Computing on Rise of the Machines (Learning)*, PEARC '19, New York, NY, USA, 2019. ACM.

Pre-Prints

[12] **Daniel Nichols**, Pranav Polasam, Harshitha Menon, Aniruddha Marathe, Todd Gamblin, and Abhinav Bhatele. Performance-aligned llms for generating fast code, 2024. arXiv. cs.DC. 2404.18864.

[13] Onur Cankur, Aditya Tomar, **Daniel Nichols**, Connor Scully-Allison, Katherine E. Isaacs, and Abhinav Bhatele. Automated programmatic performance analysis of parallel programs, 2024. arXiv. cs.DC. 2401.13150.

[14] **Daniel Nichols***, Siddharth Singh* (* contributed equally), Shu-Huai Lin, and Abhinav Bhatele. A survey and empirical evaluation of parallel deep learning frameworks, 2022. arXiv. cs.LG. 2111.04949.

Talks & Tutorials

[15] **Daniel Nichols**. Evaluating the capability of large language models for parallel and high performance code generation. The 21st Annual Workshop on Charm++ and Its Applications, 2024.

[16] **Daniel Nichols**. Large language models for parallel and hpc code. Talk at PASC 2024 in *Machine Learning Support for the Lifetime of Software* Minisymposia, 2024.

[17] Abhinav Bhatele, Siddharth Singh, and **Daniel Nichols**. Distributed training of deep neural networks. ISC High Performance 2024 Tutorials (39th International Conference), 2024.

[18] **Daniel Nichols**. Probabilistic package builds: Guiding spack's concretizer with predicted build outcomes. PackagingCon, 2023.

[19] Kwai Wong, Stanimire Tomov, **Daniel Nichols**, Rocco Febbo, and Xianfeng Ma. How to build your own deep neural network framework. Tutorial at PEARC, 2020.

Posters

[20] **Daniel Nichols**, Aniruddha Marathe, Harshitha Menon, Todd Gamblin, and Abhinav Bhatele. Modeling parallel programs using large language models. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, SC '23, Nov 2023.

[21] **Daniel Nichols**, Dilan Gunawardana, Aniruddha Marathe, Todd Gamblin, and Abhinav Bhatele. Noncommital commits: Predicting performance slowdowns in version control history. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, SC '22, November 2022.

[22] **Daniel Nichols**, Jae-Seung Yeom, and Abhinav Bhatele. Predicting cross-platform relative performance with deep generative models. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, SC '22, November 2022.

[23] Joshua Hoke Davis, Justin Shafner, **Daniel Nichols**, Nathan Grube, Pino Martin, and Abhinav Bhatele. Extreme-scale computational fluid dynamics with amr on gpus. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, SC '22, November 2022.