Benoît GALLET, Ph.D.

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SUMMARY

- Postdoctoral scholar in computer science/ecoinformatics, and cybersecurity, at Northern Arizona University.
- PhD in Informatics and Computing from Northern Arizona University: *"Efficient Euclidean Distance Calculations and Distance Similarity Searches: An Examination of Heterogeneous CPU, GPU, and Tensor Core Architectures"*.
- Interests include high-performance computing, parallel and GPU computing, machine learning, and algorithm optimizations.
- Authored and presented several publications in journals and international conferences.
- *Willing to relocate*.

SKILLS

- Proficient with C, C++, CUDA, Python, OpenMP, MPI.
- Familiar with TensorFlow and Keras.
- High-performance computing, parallel and GPU computing, algorithms, data structures, data analysis and clustering algorithms, algorithm optimizations.
- Conducting research, presenting, public speaking.
- French (native), English (bilingual), German (beginner).

EXPERIENCE

Northern Arizona University   **Flagstaff, AZ**
Postdoctoral Scholar in Computer Science/Ecoinformatics Jun 2023 – Jun 2024

- Part of a multi-disciplinary team, focusing on the scalability and performance of the project.
- Designing and developing an algorithm to periodically retrieve satellite images for the state of Arizona and from multiple sources, using Python.
- Designing and developing an algorithm to periodically process new imagery, modeling and computing the trees water and bark beetle stresses of up to *40B* pixels. Uses C++, and MPI for distributed computing and scalability.

Postdoctoral Scholar in Cybersecurity   Jun 2023 – Jun 2024

- Porting and optimizing Number Theoretic Transform (NTT) operations of the Post-Quantum Cryptography (PQC) algorithm Kyber from the CPU to GPU Tensor Cores using CUDA.

Graduate Research Assistant   Aug 2018 – May 2023

- Worked on data analysis and clustering algorithms, with an emphasis on similarity searches and Euclidean distance calculations.
- Designed: multiple GPU algorithms and optimizations (up to $9.7\times$ speedup over prior GPU solution); a heterogeneous CPU-GPU algorithm (up to $5.5\times$ speedup); and a novel GPU algorithm using Tensor Cores (up to $2.2\times$ speedup), to compute distance similarity searches.
- Published and presented several articles in international conferences.

CS Instructor   May 2022 – Aug 2022

- Instructor of record for the CS450 Instruction to Parallel Programming class.
- Taught shared memory parallelism including pthreads, OpenMP, and vectorization.
- Average course evaluation: 3.86 / 4.

Université d'Orléans   **Orléans, France**
MSc Internship   Apr 2018 – Sep 2018
- *GPU Kernel Performance Optimizations for Efficient Similarity Joins.*
- Proposed several optimizations for a GPU distance similarity searches algorithm using CUDA.

Université d'Orléans / National Center for Scientific Research   **Orléans, France**
BSc Internship   Apr 2016 – Jun 2016
- *GPU Detection of Pulse Radio Signals.*
- Ported C code detecting pulse radio signals from neutron stars with a radio telescope and using FFTs to the GPU using CUDA.

EDUCATION

Northern Arizona University   **Flagstaff, AZ**
PhD in Informatics and Computing   2023
- *Efficient Euclidean Distance Calculations And Distance Similarity Searches: An Examination of Heterogeneous CPU, GPU, and Tensor Core Architectures*, supervised by Dr. Michael Gowanlock.
- Worked as a Graduate Research Assistant.
- Multiple first author publications, and presented in several international conferences.

Université d'Orléans   **Orléans, France**
MSc in Computer Science   2018
- Emphasis on Mobile Computing, Intelligence, and Security.
- With Honors.

Université d'Orléans   **Orléans, France**
BSc in Computer Science   2016

CERTIFICATES

Fundamentals of Deep Learning
Nvidia Deep Learning Institute   Feb 2024
- Credential id: 459a9d067084444a9354e9823d75ab1d

PUBLICATIONS

1. Michael Gowanlock, **Benoit Gallet** and Brian Donnelly, *Optimization and Comparison of Coordinate- and Metric-Based Indexes on GPUs for Distance Similarity Searches*. Proceedings of the International Conference on Computational Science (ICCS), pp. 357-364. doi: 10.1007/978-3-031-36021-3_37, Prague, Czech Republic, July 2023.

2. **Benoit Gallet** and Michael Gowanlock, *Leveraging GPU Tensor Cores for Double Precision Euclidean Distance Calculations*. Proceedings of the 29th IEEE International Conference on High Performance Computing, Data, and Analytics (HiPC), pages 135–144, doi: 10.1109/HiPC56025.2022.00029, Bengaluru, India, December 2022.

3. Michael Gowanlock and **Benoit Gallet**, *Data-Intensive Computing Modules for Teaching Parallel and Distributed Computing*. NSF/TCPP Workshop on Parallel and Distributed Computing Education, Proceedings of the IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW), pages 350–357, doi: 10.1109/IPDPSW52791.2021.00062, Portland, USA, June 2021.

4. **Benoit Gallet** and Michael Gowanlock, *Heterogeneous CPU-GPU Epsilon Grid Joins: Static and Dynamic Work Partitioning Strategies*. Data Science and Engineering, Volume 6, pages 39–62, doi: 10.1007/s41019-020-00145-x, October 2020.

5. **Benoit Gallet** and Michael Gowanlock, *HEGJoin: Heterogeneous CPU-GPU Epsilon Grids for Accelerated Distance Similarity Join*. Proceedings of the 25th International Conference on Database Systems for Advanced Applications (DASFAA), pages 372–388, doi: 10.1007/978-3-030-59419-0_23, Jeju, South Korea, September 2020.

6. **Benoit Gallet** and Michael Gowanlock, *Load Imbalance Mitigation Optimizations for GPU-Accelerated Similarity Joins*. IEEE High-Performance Big Data, Deep Learning, and Cloud Computing Workshop, Proceedings of the 2019 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW), pages 396–405, doi: 10.1109/IPDPSW.2019.00078, Rio de Janeiro, Brazil, May 2019 **(Best Paper Award)**.

POSTER PRESENTATIONS

1. **Benoit Gallet** and Michael Gowanlock, *Optimizing GPU-Accelerated Similarity Joins Addressing Data-Dependent Workloads*. IEEE International Parallel and Distributed Processing Symposium (IPDPS), PhD Forum, Rio de Janeiro, Brazil, 2019.

2. **Benoit Gallet** and Michael Gowanlock, *Exploring The Design-Space of GPU-Efficient Similarity Self-Join Kernels*. High-Level Parallel Programming and Applications (HLPP), 11th International Symposium, Orléans, France, 2018.

SERVICE

- Co-supervised MSc student research projects at Northern Arizona University (Flagstaff, USA), and University of Orléans (Orléans, France).
- Co-designed a Python coding course for the Tuba City high school.
- External reviewer for the International Conference on Computational Science (ICCS): 2020–2024.
- Reviewer for the Journal of Parallel and Distributed Computing (JPDC), Elsevier.
- Reviewer for the IEEE Transactions on Knowledge and Data Engineering (TKDE) journal.
- Reviewer for the Journal of Statistical Software.