Oliver Alvarado Rodriguez
Computer Scientist

1 EDUCATIONAL BACKGROUND

Degree	University	Field	Year
Ph.D.	New Jersey Institute of Technology	Computer Science	2025
B.S., *Summa Cum Laude*	William Paterson University	Major: Computer Science Minor: Mathematics	2020

2 EMPLOYMENT HISTORY

Research Assistant — **New Jersey Institute of Technology** — **09/2020—05/2025**

Designed, implemented, and optimized parallel algorithms and specialized data structures in Chapel for high-performance graph and data analytics within the revolutionary Arachne extension to the Arkouda analytics framework, significantly advancing capabilities in large-scale exploratory graph analytics. Led comprehensive research initiatives from rigorous literature reviews to advanced algorithm design, efficient parallel implementations, and systematic performance tuning on distributed computing architectures. This groundbreaking work culminated in my dissertation titled "On the Design of a Framework for Large-Scale Exploratory Graph Analytics", with peer-reviewed research outcomes published in prestigious venues including IEEE's High Performance Extreme Computing Conference (HPEC), IEEE's International Parallel and Distributed Processing Symposium (IPDPS), IEEE's International Conference on High Performance Computing, Data, and Analytics (HiPC), MDPI's Algorithms journal, and Nature's Scientific Reports journal.

Chapel Programming Language Intern — **Hewlett Packard Enterprise (HPE)** — **06/2024—08/2024**

Benchmarked high-performance distributed and parallel graph generation and breadth-first search (BFS) implementations in Chapel against the Graph500 benchmark suite utilizing optimized C with MPI, identifying key performance bottlenecks in irregular memory access and network communication. Presented detailed findings and actionable recommendations to the Chapel development team and HPE's High-Performance Computing Advanced Development Organization, advocating enhancements in runtime support for atomic operations and improved communication aggregation libraries. Integrated optimized Chapel implementations into the Arachne graph analytics framework, achieving up to a 76x speedup in distributed BFS performance compared to Arachne's original implementation.

Data Science Intern — **Chubb Insurance** — **06/2020—08/2020**

Applied advanced machine learning classification techniques specifically tailored for textual data to enhance advertising relevance by accurately modeling user context. Developed expertise in key Python libraries including Scikit-Learn, Pandas, NumPy, TensorFlow, and Keras, and created a robust API to streamline text classification workflows, seamlessly integrating database-driven data sources to deliver actionable insights directly to Chubb Insurance's sales teams. Managed code development and version control using Chubb's enterprise GitHub environment, employing Agile methodologies and regularly presenting weekly progress updates and analytical insights to supervisors and the broader data science team.

Research Assistant — **William Paterson University (WPU)** — **09/2017—05/2020**

Researched academic literature on cryptography and feedback carry shift registers (FCSRs), calculating the periods of AND-FCSR stream ciphers and developing a brute-force C++ program for XOR-FCSR analysis. Evaluated bitstream randomness using the NIST pseudorandom number generator statistical test suite within a UNIX environment, compiling and visually analyzing the results with Excel, and presenting positive findings at the 2019 Explorations Conference at WPU. Employed machine learning algorithms—including min-max normalization, k-means clustering, k-nearest neighbors (KNN), and linear regression—to predict software performance in digital signal processors, transitioning the analysis pipeline from Excel and R into Python using SciKit and Pandas libraries. Managed research communication through a SharePoint site, ensuring accurate data by comparing, updating, and consolidating outdated files.

3 SKILLS

Programming Languages: C, C++, Python, Chapel
Parallel and Distributed Frameworks: OpenMP, MPI
Deep Learning Frameworks: TensorFlow, PyTorch, Keras
Programming Libraries: NumPy, Pandas, Scikit-Learn
Configuration Management: Git
Tools: PyTest, Slurm
Platforms: AWS, Microsoft Azure, Docker
Data Visualization Tools: Matplotlib, Seaborn

4 SERVICE AND LEADERSHIP

4.1 CONFERENCE COMMITTEE ACTIVITIES

4.1.1 ARTIFACT DESCRIPTION AND EVALUATION COMMITTEE MEMBERSHIPS

- Member, *The 8th Annual Parallel Applications Workshop, Alternatives to MPI+X (PAW-ATM 25)*, co-located with *The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC 25)*, St. Louis, Missouri, November 16-21, 2025.
- Member, *The 7th Annual Parallel Applications Workshop, Alternatives to MPI+X (PAW-ATM 24)*, co-located with *The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC 24)*, Atlanta, Georgia, November 17-22, 2024.

4.1.2 PROGRAM COMMITTEE MEMBERSHIPS

- Member, *The 3rd Workshop on Serverless, Extreme-Scale, and Sustainable Graph Processing Systems (GraphSys 25)*, co-located with *The 31st International European Conference on Parallel and Distributed Computing (EuroPar 25)*, Dresden, Germany, August 25-29, 2025.

4.1.3 OTHER MEMBERSHIPS

- Member, Best Open-Source Contribution Award Committee, *The 39th IEEE International Parallel and Distributed Processing Symposium (IPDPS 25)*, Milano, Italy, June 3-7, 2025.

4.2 UNIVERSITY SERVICE — WILLIAM PATERSON UNIVERSITY

- Student Member, Information Technology Advisory Committee, 2019-2020.
- Student Member, Middle States Commission on Higher Education, 2019-2020.
- Student Member, Committee 2022, 2017-2020.

5 HONORS AND AWARDS

- IPDPS 23 Student Travel Award from IEEE's Technical Community on Parallel Processing (TCPP), 2023.
- SC 22 Student Travel Award from IEEE's Technical Community on High Performance Computing (TCHPC), 2022.
- Mathematics Research Community Participant from the American Mathematical Society, 2022.
- The Omicron Omega Excellency in Computer Science Award from William Paterson University.
- Membership to the Upsilon Pi Epsilon International Honor Society of Computing Disciplines awarded by William Paterson University, 2019.
- The Student Success Scholarship awarded by William Paterson University, 2017.
- Membership to the Dean's List of the College of Science and Health at William Paterson University, 2016-2020.
- Honors College Scholar at William Paterson University, 2016-2020.

6 RESEARCH

6.1 DOCTORAL DISSERTATION

Title: "On the Design of a Framework for Large-Scale Exploratory Graph Analytics"
Completed: May 2025
Advisor: David A. Bader
University: New Jersey Institute of Technology

6.2 PUBLISHED JOURNAL PAPERS

1. J. Kritschgau, D. Kaiser, O. Alvarado Rodriguez, I. Amburg, J. Bolkema, T. Grubb, F. Lan, S. Maleki, P. Chodrow, and B. Kay, "Community Detection in Hypergraphs via Mutual Information Maximization," *Scientific Reports*, vol. 14, no. 6933, 2024.

2. Z. Du, O. Alvarado Rodriguez, J. Patchett, and D. A. Bader, "Interactive Graph Stream Analytics in Arkouda," *Algorithms*, vol. 14, no. 8, 2021.

6.3 PUBLISHED BOOKS AND PARTS OF BOOKS

3. Z. Du, O. Alvarado Rodriguez, J. Patchett, and D. A. Bader, "Interactive Graph Analytics in Arkouda," in *Massive Graph Analytics*, D. Bader, Ed., Chapman and Hall/CRC, 2022, ch. 21, pp. 549–589.

6.4 PRESENTATIONS

6.4.1 PRESENTATIONS WITH PROCEEDINGS

4. M. Dindoost, O. Alvarado Rodriguez, S. Bagchi, P. Pauliuchenka, Z. Du, and D. A. Bader, "VF2-PS: Parallel and Scalable Subgraph Monomorphism in Arachne," in *The 28th Annual IEEE High Performance Extreme Computing Conference (HPEC)*, 2024.

5. O. Alvarado Rodriguez, Z. Du, and D. A. Bader, "Arachne: A Productive Massive-Scale Graph Analytics Framework," in *The 22nd SIAM Conference on Parallel Processing for Scientific Computing (PP)*, 2024.

6. Z. Du, O. Alvarado Rodriguez, F. Li, M. Dindoost, and D. A. Bader, "Contour Algorithm for Connectivity," in *The 30th Annual International Conference on High Performance Computing, Data, and Analytics (HiPC)*, 2023.

7. O. Alvarado Rodriguez, Z. Du, and D. A. Bader, "Arachne: High-Performance Algorithms and Software for Large-Scale Graph Analytics," in *The 1st Annual SIAM New York-New Jersey-Pennsylvania Section Annual Meeting (NNP)*, 2023.

8. D. A. Bader, F. Li, A. Ganeshan, A. Gundogdu, J. Lew, O. Alvarado Rodriguez, and Z. Du, "Triangle Counting Through Cover-Edges," in *The 27th Annual IEEE High Performance Extreme Computing Conference (HPEC)*, 2023. *Student Innovation Award*.

9. O. Alvarado Rodriguez, F. V. Buschmann, Z. Du, and D. A. Bader, "Property Graphs in Arachne," in *The 27th Annual IEEE High Performance Extreme Computing Conference (HPEC)*, 2023.

10. O. Alvarado Rodriguez and D. A. Bader, "Arachne: An Open-Source Framework for Interactive Massive-Scale Graph Analytics," in *2023 IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, 2023. *Poster*.

11. Z. Du, J. Patchett, O. Alvarado Rodriguez, and D. A. Bader, "High-Performance Truss Analysis in Arkouda," in *The 29th Annual International Conference on High Performance Computing, Data, and Analytics Conference (HiPC)*, 2022.

12. O. Alvarado Rodriguez, Z. Du, J. T. Patchett, F. Li, and D. A. Bader, "Arachne: An Arkouda Package for Large-Scale Graph Analytics," in *The 26th Annual High Performance Extreme Computing Conference (HPEC)*, 2022.

13. O. Alvarado Rodriguez and D. Bader, "Adapting Arkouda for Enabling Large Scale Graph Algorithms," in *2022 IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, 2022. *Poster*.

14. Z. Du, O. Alvarado Rodriguez, and D. A. Bader, "Large Scale String Analytics in Arkouda," in *The 25th Annual IEEE High Performance Extreme Computing Conference (HPEC)*, 2021.

15. Z. Du, O. Alvarado Rodriguez, and D. A. Bader, "Enabling Exploratory Large Scale Graph Analytics through Arkouda," in *The 25th Annual IEEE High Performance Extreme Computing Conference (HPEC)*, 2021.

16. O. Alvarado Rodriguez, D. Dave, W. Liu, and B. Su, "A Study of Machine Learning Inference Benchmarks," in *The Proceedings of the 4th International Conference on Advances in Image Processing (ICAIP)*, 2020. *Best Student Paper Presentation Award*.

6.4.2 KEYNOTE PRESENTATIONS

17. O. Alvarado Rodriguez, *Enabling Exploratory Large Scale Graph Analytics through Arkouda*, Academic Data Science Alliance Annual Meeting, 2022.

6.4.3 TUTORIALS

18. O. Alvarado Rodriguez, N. Khatwani, Z. Du, and D. A. Bader, "Interactive Large-Scale Data and Graph Analytics," in *The 28th ACM SIGPLAN Annual Symposium on Principles and Practice of Parallel Programming (PPoPP)*, 2023.

6.4.4 OTHER RESEARCH PRESENTATIONS

19. O. Alvarado Rodriguez, O. Nuñez, D. Dave, and K. Lim, "A Comparative Study on Machine Learning Techniques for Weather Prediction," in *The WPUNJ Explorations Conference*, 2020.

20. O. Alvarado Rodriguez, J. Albanese, and W. Liu, "The Statistical Properties of XOR-FCSRs," in *The WPUNJ Explorations Conference*, 2019.

7 PERSONAL INFORMATION

LinkedIn: linkedin.com/in/oliver-alvarado-rod
ResearchGate: researchgate.net/profile/Oliver-Alvarado-Rodriguez
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