Oliver Alvarado Rodriguez

Computer Scientist
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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

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

Benchmarked high-performance distributed and parallel implementations of graph generation and breadth-first search in Chapel against the Graph500 benchmark that uses C with MPI. Presented results to the Chapel development team and HPE's High-Performance Computing Advanced Development Organization. Provided actionable feedback to enhance Chapel's support for irregular applications like graph analytics, including recommendations for improved user support in selecting between processor and network atomics, as well as suggestions for a more flexible communication aggregation library. Integrated this work into the Arachne graph analytics framework, achieving up to 76x speedup in distributed breadth-first search over the original implementation.

Research Assistant — New Jersey Institute of Technology — 05/2021 - Present

Designed, implemented, and optimized parallel algorithms and data structures in Chapel for high-performance graph and data analytics within the open-source Arachne extension for Arkouda. Led the research process from literature review through algorithm design, implementation, and performance tuning, with results published in leading venues, including IEEE's High Performance Extreme Computing Conference and MDPI's Algorithms journal. For a complete list of publications and presentations, refer to page 4.

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

Applied machine learning classification algorithms tailored to text data to optimize ad relevance based on user context. Developed proficiency in Python libraries including scikit-learn, pandas, numpy, and requests. Designed an API to streamline classification workflows, integrating data from databases and providing actionable insights for the sales team. Managed project on Chubb's enterprise GitHub platform within an Agile development framework, with weekly progress presentations to supervisors and the data science team.

Teaching Assistant / Substitute Lecturer — New Jersey Institute of Technology — 09/2020 - 05/2021

Served as a substitute lecturer planning and delivering lessons for the course "CS103 Python for Business Problems". Instructed lab sessions for 50+ students to demonstrate the practicability of topics learned in lecture. Provided extra tutoring for 20+ students who struggled with the material presented in both lab and lecture. Assisted professor with grading all lab and homework assignments. Reviewed exam and lab results with students.

Research Assistant in Machine Learning | William Paterson University | 09/2019 - 06/2020

Utilized machine learning algorithms such as min-max normalization, k-means, k-nearest neighbors (knn), and linear regression for software performance prediction in digital signal processors. Converted machine learning techniques from Excel spreadsheets and R to Python. Implemented the SciKit and Pandas libraries in Python to preprocess data via min-max normalization and then perform statistical analysis on the data with k-means, knn, and linear regression. Exported data to files and compared with previous iterations of results from Excel and R to confirm or reject the data. Managed SharePoint site for research communication and file sharing. Combined, reviewed, and refined out-of-date data files.

Computer Science Tutor | William Paterson University | 09/2019 - 05/2020

Tutored 6+ students weekly on subjects such as Computer Science 1 & 2, Data Structures, Hardware Fundamentals, Digital Logic, Networking, and Cloud Computing. Advised students regarding class registration, time management, and completing assignments. Taught students studying techniques to better their understanding of computer science concepts. Provided the tutor supervisor, Dr. Erh-Wen Hu, with feedback to aid students who required extra guidance. Gathered feedback from students and other tutors to better tutoring experiences and provide better service.

Web Development Intern | William Paterson University | 06/2019 - 05/2020

Accessed databases through the Toad for Oracle SQL application to create new tables and run queries in OracleSQL and utilized OracleDB. Maintained university enterprise applications through testing and monitoring user traffic. Developed enterprise web applications including a new search page that queries the university databases and utilizes Google's custom search engine to return specific web pages and a custom Google search. Programmed in HTML, CSS, JavaScript, jQuery, Adobe's ColdFusion, and SQL. Utilized web development frameworks such as Bootstrap 3 and 4. Collaborated with different departments at WPU such as Marketing and Public Relations to create responsive web applications that met student and staff standards. Learned new skills and techniques constantly to better the quality of web applications created. Assisted with the rollout of a new student interface for 10,000+ students, faculty, and staff through the university's homegrown WPConnect central communication hub. Trained 5+ clients to use the Qualtrics Survey Research Suite.

Research Assistant in Cryptography | William Paterson University | 09/2018 - 05/2019

Researched academic papers to gather information on the properties of feedback carry shift registers (FCSRs) and background information on cryptography and stream ciphers. Calculated the periods of AND-FCSR stream ciphers; those that utilize an AND gate to combine an initial sequence a with a coefficient q. Developed a C++ program to calculate the period of an XOR-FCSR stream cipher via brute forcefully finding the initial sequence a in a bitstream and finding the number of bits until the sequence a was repeated. Installed the NIST pseudorandom number generator statistical test suite in a UNIX environment. Analyzed bitstream files by utilizing the NIST suite and compiled generated data (p-values) into an Excel sheet for further visual analysis via graphs and tables. Presented positive findings at the 2019 Explorations Conference at WPU.

Technology Assistant/Supervisor/Student Manager | William Paterson University | 01/2017 - 06/2019

Supported 5+ faculty, staff, and students with Qualtrics surveys monthly for research experiments, human resource trainings, and miscellaneous survey builds. Presented and taught Qualtrics Survey Suite to students, faculty, and staff. Created a presentation for first year students and coordinated presentation times with multiple Pioneer Success Seminar professors. Assisted with rolling out Duo Mobile Multifactor Authentication to 1,000+ faculty/staff. Aided 7-10 clients daily with technological questions via answering Help Desk calls and documenting tickets on the SolarWinds Help Desk system. Oversaw 20+ technology assistants and shift supervisors to provide a technical knowledge resource. Trained 10+ newly hired technology assistants and promoted shift supervisors every academic year to answer Help Desk calls, complete Help Desk tickets, and provide exceptional customer service. Updated and mantained documentation consistently to provide accurate information to both end users and internal staff. Utilized Active Directory and Microsoft System Center Configuration Manager to manage computers on campus. Assisted with the reimaging of computers and subsequent deployment. Managed SharePoint site for intradepartmental communication.

3 SERVICE AND LEADERSHIP

3.1 CONFERENCE COMMITTEE ACTIVITIES

3.1.1 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.

3.1.2 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.

3.2 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

4 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.

5 TEACHING

Course	Institution	Number Students	Semester
Computer Science with Business Problems	New Jersey Institute of Technology	~50	F2020
Roadmap to Computing	New Jersey Institute of Technology	~50	S2021
Computer Science with Business Problems	New Jersey Institute of Technology	~25	S2021

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 CONFERENCE PRESENTATIONS

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. Z. Du, O. Alvarado Rodriguez, F. Li, M. Dindoost, and D. A. Bader, "Minimum-Mapping based Connected Components Algorithm," in *The 10th Annual Chapel Implementers and Users Workshop (CHIUW)*, 2023.

11. 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*.

12. 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.

13. 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.

14. 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*.

15. 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.

16. 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.

17. Z. Du, O. Alvarado Rodriguez, D. A. Bader, M. Merrill, and W. Reus, "Exploratory Large Scale Graph Analytics in Arkouda," in *The 8th Annual Chapel Implementers and Users Workshop (CHIUW)*, 2021.

18. 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

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

6.4.3 TUTORIALS

20. 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

21. O. Alvarado Rodriguez, *Large-Scale Graph Analytics in Arkouda*, New Jersey Big Data Alliance Symposium, 2021.

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

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

7 PERSONAL INFORMATION

LinkedIn: linkedin.com/in/oliver-alvarado-rod
ResearchGate: researchgate.net/profile/Oliver-Alvarado-Rodriguez
Google Scholar: scholar.google.com/citations?user=dV5vV3gAAAAJ&hl=en
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