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Amanda Bienz

Research Interests

High performance computing, sparse matrix operations, collective algorithms, numerical methods, linear solvers, iterative methods

Education

August 2018 **PhD in Computer Science**, *University of Illinois at Urbana-Champaign*, Scientific Computing and High-Performance Computing, Dissertation: Reducing Communication in Sparse Solvers

May 2012 **B.S. in Computer Science, B.S. in Mathematics**, *Elon University*

Positions

Aug 2020 - Present **Assistant Professor**, *University of New Mexico*

Aug 2018 - June 2020 **Postdoctoral Researcher**, *University of Illinois at Urbana-Champaign*

Grant Support – PI

2025 - 2027 **Collaborative Research: CIRC: New: Next Generation Message-Passing Parallel Programming for Heterogeneous Architectures**, *Lead PI*, Recommended
UNM Portion $689 686, co-investigator Anthony Skjellum (TNTech)

2024-2029 **CAREER: Towards Exascale Performance of Parallel Applications**, *PI*, CCF2338077
Total award $557 837

2024-2026 **Sandia Faculty Loan Program**, *PI*

2022-2024 **Collaborative Research: EAGER: Real-time Strategies and Synchronized Time Distribution Mechanisms for Enhanced Exascale Performance-Portability and Predictability**, *PI*, CCF2151022
UNM Portion $75 000, co-investigators Anthony Skjellum (TnTech), Martin Herbordt (BU)

Grant Support – Co-PI

2025 - 2030 **PSAAP-IV (FIC): Center for Optimized Modern Parallel Adaptive System Software (COMPASS)**, *co-PI*, Recommended
Total Award $5 555 556, UNM PI Patrick Bridges

2025 - 2030 **ASCEND: Applied mathematics and Scientific Computing Ecosystem for the New Digital Era**, *co-PI*
UNM Portion $750 000, UNM PI Jacob Schroder

2023-2025 **Cybersecurity and Data Science Education and Workforce Development**, *co-PI*, P116Z230032
Total award $1 500 000, PI Patrick Bridges

2020 - 2025 **PSAAP-III Center for Understandable, Performant Exascale Communication Systems (CUP-ECS)**, *Senior Investigator*, DE-NA0003966
Total Award $3 967 218, UNM PI Patrick Bridges

Pending Grant Proposals

FEC: Good Fire: Enhance Spatial and Temporal Efficacy of Prescribed Fire and Managed Wildland Fire Use, *co-PI*, Pending
UNM Portion $706 887, PI Matthew Hurteau

Journal Publications

2023 **Characterizing the performance of node-aware strategies for irregular point-to-point communication on heterogeneous architectures**, S. Lockhart, **A. Bienz**, W. Gropp, and L. Olson. Parallel Computing, Vol. 116, 2023
7 Citations

2023 **Performance analysis and optimal node-aware communication for enlarged conjugate gradient methods**, S. Lockhart, **A. Bienz**, W. Gropp, and L. Olson. ACM Transactions on Parallel Computing 10 (1), 1-25
10 Citations

2022 **Tausch: A halo exchange library for large heterogeneous systems using MPI, OpenCL and CUDA**, L. Spies, L. N. Olson, A. Reisner, **A. Bienz**, and D. Moulton. Parallel Computing, Vol. 114, 2022
5 Citations

2020 **Reducing Communication in Algebraic Multigrid with Multi-step Node-Aware Communication**, **A. Bienz**, L. N. Olson, and W. D. Gropp. The International Journal of High Performance Computing Applications, 34(5), pp. 547–561.
35 Citations

2019 **Node-Aware Sparse Matrix Vector Multiplication**, **A. Bienz**, L. N. Olson, and W. D. Gropp. Journal of Parallel and Distributed Computing, vol. 130, pg 166-178.
41 Citations

2016 **Reducing Parallel Communication in Algebraic Multigrid through Sparsification**, **A. Bienz**, R. Falgout, W. D. Gropp, L. N. Olson, and J. B. Schroder. Siam Journal on Scientific Computing, vol. 38, no. 5, pg. S332-S357
51 Citations

2013 **Magic Polygrams**, **A. Bienz**, K. A. Yokley, and C. Arangala. Involve: A Journal of Mathematics, vol. 6, no. 2, pg. 169-189.

Conference Publications

2025 **MPI_Alltoallv Optimizations on GPU-Enabled Architectures**, Evelyn Namugwanya, **Amanda Bienz**, Derek Schafer, Anthony Skjellum. Computing Conference 2025 (to appear).

2024 **A More Scalable Sparse Dynamic Data Exchange**, Andrew Geyko, Gerald Collom, Derek Schafer, Patrick Bridges, and **Amanda Bienz**. 31st IEEE International Conference on High Performance Computing, Data, and Analytics (HiPC) 2024

2024 **Compressed Cannon's Algorithm**, Louis Jencka and **Amanda Bienz**. 28th Annual IEEE High Performance Extreme Computing Virtual Conference

2024 **Persistent and Partitioned MPI for Stencil Communication**, Gerald Collom, Jason Burmark, Olga Pearce, and **Amanda Bienz**
28th Annual IEEE High Performance Extreme Computing Virtual Conference

2024 **Optimizing Neighbor Collectives with Topology Objects**, Gerald Collom, Derek Schafer, **Amanda Bienz**, Patrick Bridges, Galen Shipman. 2024 IEEE International Conference on Cluster Computing (CLUSTER)

2023 **Optimizing Irregular Communication with Neighborhood Collectives and Locality-Aware Parallelism**, Gerald Collom, Rui Peng Li, **Amanda Bienz**. SC-W '23: Proceedings of the SC '23 Workshops of The International Conference on High Performance Computing, Network, Storage, and Analysis
7 Citations

2023 **MPI Advance: Open-Source Message Passing Optimizations**, **Amanda Bienz**, Derek Schafer, Anthony Skjellum. EuroMPI 2023
3 Citations

2023 **Evaluating the Viability of LogGP for Modeling MPI Performance with Non-contiguous Datatypes on Modern Architectures**, Nicholas H Bacon, Patrick Bridges, Scott Levy, Kurt Ferreira, **Amanda Bienz**
Proceedings of the 30th European MPI Users' Group Meeting

2023 **Invited Paper: Benchmarking and Optimizing Data Movement on Emerging Heterogeneous Architectures**, **A. Bienz**
2023 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW)

2022 **A Locality-Aware Bruck Allgather**, **A. Bienz**, S. Gautam, A. Kharel, and S. Singh. EuroMPI/USA'22: 29th European MPI Users' Group Meeting, Chattanooga, TN, USA, September 2022
14 Citations

2021 **Partitioned Collective Communication**, D. J Holmes, A. Skjellum, J. Jaeger, R. E. Grant, P. V. Bangalore, M. GF Dosanjh, **A. Bienz**, D. Schafer
19 Citations

2021 **Modeling Data Movement Performance on Heterogeneous Architectures**, **A. Bienz**, L. N. Olson, and W. D. Gropp, and S. Lockhart. 2021 IEEE High Performance Extreme Computing Conference (HPEC), 2021, pp. 1-7
18 Citations

2019 **Node-Aware Improvements to Allreduce**, **A. Bienz**, L. N. Olson, and W. D. Gropp. Proceedings of 2019 IEEE/ACM Workshop on Exascale MPI (ExaMPI), Denver, CO, November 17, 2019.
19 Citations

2018 **Improving Performance Models for Irregular Point-to-Point Communication**, **A. Bienz**, L. N. Olson, and W. D. Gropp. Proceedings of the 25th European MPI Users' Group Meeting, Barcelona, Spain, September 23-26, 2018.
21 Citations

2011 **A Generalized Parallel Genetic Algorithm in Erlang**, **A. Bienz**, K. Fokle, Z. Keller, E. Zulkoski, and S. Thede. MCURCSM, Granville, OH, September 2011.
6 Citations

Teaching

Assistant Professor at University of New Mexico:

Fall 2020, 2022, 2023, 2025 — **CS442/542 Introduction to Parallel Processing**, Elective undergraduate and graduate 30-60 students

Spring 2021, 2023, 2025 — **CS481/ECE437 Operating Systems**, Required undergraduate ∼60 students

Fall 2024 — **CS108L CS4ALL**, Introduce non-majors to simple python programming concepts ∼25 students

Fall 2021 **CS491/591 Parallel Numerical Algorithms**, Elective undergraduate and graduate ∼25 students

Advising

Graduate student advisor, University of New Mexico:

2025 - Present **Christopher Ong**, PhD student, pre-proposal, expected graduation 2030

2025 - Present **Saif Ryan Gangaram**, PhD student, pre-proposal, expected graduation 2030

2025 - Present **Vanessa Surjadidjaja**, PhD student, pre-proposal, expected graduation 2030

2023 - Present **Jackson Wesley**, PhD student, pre-proposal, expected graduation 2028

2023 - Present **Michael Adams**, PhD student, pre-proposal, expected graduation 2028

2023 - Present **Shannon Kinkead**, PhD student, pre-proposal, expected graduation 2028

2020 - Present **Gerald Collom**, PhD student, post-proposal, expected graduation summer 2025

Mentoring

Graduate student mentor, University of New Mexico:

2020 - Present **Evelyn Namugwanya**, PhD student at TNTech

Undergraduate student mentor, University of New Mexico:

2023-2024 **Andrew Geyko**, BS, Computer Science

Fall 2020 **Shreeman Gautam**, BS, Computer Science

Fall 2020 **Amun Kharel**, BS, Computer Science

Awards and Achievements

2012-2017 **National Science Foundation Graduate Research Fellow**

2015 **National Science Foundation GROW Awardee**

2014 **First Place in Student Research Competition, Graduate Division**, *Supercomputing 2014*

Selected Invited Talks

Oct 2019 **SPPEXA Final Symposium, Dresden, Germany**, Node-Aware Communication for Multigrid Methods

Jun 2018 **PETSc User Meeting 2018, London, UK**, A Parallel Algebraic Multigrid Solver with Reduced Communication Costs

Selected Contributed Talks

Feb 2022 **SIAM Conference on Parallel Processing for Scientific Computing (PP22), Virtual**, Sparse Neighborhood Collectives on Heterogeneous Architectures

Feb 2020 **SIAM Conference on Parallel Processing for Scientific Computing (PP20), Seattle**, Towards Efficient Communication on Heterogeneous Architectures

Oct 2019 **Rising Stars in EECS, Urbana, IL**, Scalable Sparse Solvers and Graph Algorithms

Apr 2019 **Rising Stars in CSE, Austin, TX**, Reducing Parallel Communication Costs in Sparse Matrix Operations

Feb 2019 **SIAM Conference on Computational Science and Engineering (CSE19), Spokane, WA**, RAPtor: Parallel Algebraic Multigrid with Node-Aware Communication

Nov 2017 **Doctoral Showcase at Supercomputing 2017, Denver, CO**, Reducing Communication Costs in Parallel Algebraic Multigrid

Feb 2017 **SIAM Conference on Computational Science and Engineering (CSE17), Atlanta, GA**, Reducing Parallel Communication Costs in Algebraic Multigrid

Apr 2016 **SIAM Conference on Parallel Processing for Scientific Computing (PP16), Paris, France**, Topology-Aware Performance Modeling of Parallel SpMVs

Nov 2014 **ACM Student Research Competition at Supercomputing 2014, New Orleans, LA**, Reducing Network Contention Associated with Parallel Algebraic Multigrid

Software

2022 **MPI Advance**, *A lightweight optimization library that sits on top of MPI*

2019 **BenchPress**, *Benchmarking for heterogeneous architectures*

2017 **RAPtor: parallel algebraic multigrid solver**, *A parallel algebraic multigrid solver with node-aware communication*

Service Leadership Positions

2025-2026 **SIAM PP 2026 Organizing Committee**, *Co-chair for mini symposiums and mini tutorials*

2024-2025 **Algorithms Track co-Chair for HiPC 2025**, *Co-chair for Algorithms track papers*

2023-Present **Tutorial Program co-Chair for Hot Interconnects**, *Co-chair for tutorials at HotI*

2022-2023 **Workshop Chair for ISC23**, *Chair for all workshops at ISC 2023*

2022-Present **Technical Program co-Chair for ExaMPI Workshop at SC**, *Co-chair for technical program of the ExaMPI workshop at SC*

2022 **Tutorial Chair for EuroMPI/USA'22**, *Chair for tutorials at EuroMPI/USA'22.*

2021-2022 **Workshop Deputy Chair for ISC22**, *Deputy chair for all workshops at ISC 2022.*

Technical Committees and Peer Reviews

2025 **CLUSTER Technical Program Committee Member**

2024 **HiPC Technical Program Committee Member**

2022 - Present **IPDPS Technical Program Committee Member**

2022 - Present **SC Technical Program Committee Member**

2021, 2025 **EuroMPI Technical Program Committee Member**

2021 **ICPP 2021 Technical Program Committee Member**

2021 **ExaMPI Workshop at SC21 Technical Program Committee Member**

2020 - Present **Journal Peer Reviewer**, *Parallel Computing, JPeer, TOPC, Cluster Computing, SISC, IEEE Micro, Transactions on Computers*

Additional Service

2024-Present **Faculty Advisor for CSGSA**

2023-Present **Faculty Advisor for UNM Women in Computing Organization**

2024-2025 **UNM CS Faculty Search Committee**

2022-2023 **UNM CS Faculty Search Committee**

2020-2022 **UNM CS Graduate Student Committee**

2018 **JLESC Student Committee**, *University of Illinois's student representative for the joint laboratory on extreme scale computing.*

2015-2017 **CS Graduate Academic Council**, *Committee for improving the graduate student experience*

2013-2017 **CS Graduate Student Ambassador**, *Helped run visit weekend for prospective graduate students*

2016 **CS Graduate Application Review Student Volunteer**, *Reviewed prospective graduate student applications.*

2014-2015 **SIAM Student Chapter President**, *President of UIUC's student chapter*

2013-2014 **SIAM Student Chapter Treasurer**, *Treasurer of UIUC's student chapter*

Memberships

Institute of Electrical and Electronics Engineers

Associated for Computing Machinery

Society for Industrial and Applied Mathematics