

Benjamin Cobb

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 US Citizen

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 Ben_Cobb

Education

- 2019 – present



Georgia Institute of Technology
PhD student in Computer Science. GPA: 3.9
Minor in Mathematics. Expected graduation August 2026.
- 2015 – 2019



Wake Forest University
Bachelor of Science with Honors in Computer Science
Bachelor of Science in Mathematical Business
Minor in Chinese
Graduated Magna Cum Laude

Research Publications (Accepted)

- 1

B. Cobb, R. Kannan, K. Pieper, *et al.*, “Fast Active-Set Thresholding Method for Nonnegative Least Squares,” Macau, China: IEEE Big Data, to appear, 2025.
- 2

B. Cobb, R. Velasquez, R. Vuduc, and H. Park, “Clustering and Topic Discovery of Multiway Data via Joint-NCMTF,” Washington, DC: IEEE Big Data, 2024.  DOI: 10.1109/BigData62323.2024.10825741.
- 3

S. Eswar, K. Hayashi, B. Cobb, *et al.*, “On Rank Selection for Nonnegative Matrix Factorization,” Washington, DC: IEEE Big Data, 2024.  DOI: 10.1109/BigData62323.2024.10825324.
- 4

S. Eswar, B. Cobb, K. Hayashi, *et al.*, “Distributed-Memory Parallel JointNMF,” in *Proceedings of the 37th International Conference on Supercomputing*, ser. ICS ’23, Orlando, FL, USA: Association for Computing Machinery, 2023, pp. 301–312, ISBN: 9798400700569.  DOI: 10.1145/3577193.3593733.
- 5

B. Cobb, H. Kolla, E. Phipps, and Ü. V. Çatalyürek, “FIST-HOSVD: Fused In-place Sequentially Truncated Higher Order Singular Value Decomposition,” in *Proceedings of the Platform for Advanced Scientific Computing Conference*, ser. PASC ’22, Basel, Switzerland, 2022, ISBN: 9781450394109.  DOI: 10.1145/3539781.3539798.

Research Publications (Under Review)

- 1

B. Cobb, R. Kannan, Y. Soh, *et al.*, *LORACX: Low Rank Approximations with Constraints at Exascale*, 2025.
- 2

Y. Soh, B. Cobb, P. Sao, R. Kannan, R. Vuduc, and J. Choi, *Fastbpp: A high-throughput framework for active-set nnls on massively parallel architectures*, 2025.

Employment History

- 2019 – present



Graduate Research and Teaching Assistant
Georgia Institute of Technology, Atlanta, GA
- Summer 2024, Spring 2025



Discrete Algorithms Intern
Oak Ridge National Laboratory, Oak Ridge, TN
- Summer 2020



Computer Science Research Institute Intern
Sandia National Laboratories, Albuquerque, NM (Virtual due to COVID-19)
- Summer 2018



Undergraduate Researcher
Wake Forest University, Winston-Salem, NC
- 2016 – 2019



Resident Advisor,
Wake Forest University, Winston-Salem, NC

Contributed Projects

■ LORACX: Low Rank Approximations with Constraints at Exascale

- Distributed Python and PyTorch port of the PLANC software package. Achieved exascale performance by computing Nonnegative Matrix Factorization (NMF) of a 2.1 Petabyte matrix at a rate of .67 Exaflops on 8192 nodes (65536 GPUs) of the Frontier supercomputer at Oak Ridge National Laboratories, significantly outperforming previous state-of-the-art methods. Currently in the process of being prepared for publication.

■ Joint-NCMTF: Joint-Nonnegative Coupled Matrix Tensor Factorization

- State-of-the-art method for computing nonnegativity constrained low-rank embeddings of heterogeneous tensor datasets whilst fully preserving NMF properties. Demonstrated to yield higher quality clustering and topic modeling results than existing factorization methods on multiple synthetic and text datasets. Implemented in MatLab. Resulted in publication at the IEEE Big Data conference (Big Data'24).

■ PLANC: Parallel Low-rank Approximations with Non-negativity Constraints

- Distributed C++ and MPI software package for large-scale matrix and tensor factorizations. Helped implement first distributed MPI based implementation of Joint-NMF to process previously computationally infeasible datasets. Improved I/O routines and build procedures. Overlapped communication and computation of distributed NMF kernels. Resulted in publication at the International Conference on Supercomputing (ICS'23).

■ GenTen Portable Tensor Decompositions

- C++ and Kokkos based performance portable software package for data analysis and compression. Implemented high performance tensor kernels used for in-situ data compression. Developed FIST-HOSVD algorithm, the most memory efficient algorithm for computing dense Tucker Decomposition ever created. Applied algorithm implementations to compressing large-scale combustion simulation datasets, demonstrating unprecedented memory efficiency. Resulted in publication at the Platform for Advanced Scientific Computing (PASC'22).

■ MATLAB Tensor Toolbox

- Implemented minimum cost bipartite matching algorithm for least-squares cosine differences.

Fellowships and Scholarships

2019 - 2023

■ **Presidential Fellowship (PF)**
Georgia Institute of Technology, Atlanta, GA

Summer 2018

■ **Wake Forest Research Fellowship (WFRF)**
Wake Forest University, Winston-Salem, NC

June 2018 – May 2019

■ **H. Howell Taylor, Jr. Risk Management Scholarship**
Wake Forest University, Winston-Salem, NC

Skills

Main Programming Languages

■ C/C++, MatLab, Python

High Performance Computing

■ MPI, PyTorch, Kokkos, CUDA, OpenMP, BLAS, LAPACK, performance analysis

Software Development

■ Git, CMake, Unit Tests, Slurm, Linux, Scripting, VTune, GDB, NVIDIA Nsight

Machine Learning

■ Strong foundations in calculus, linear algebra, low-rank embeddings, automation, distributed computing, large-scale data processing, analysis, and compression.

Research

■ Communicates complex ideas clearly and concisely. Ability to conduct complete research process, from ideation, implementation, experimentation, and publication.