Konghao (Shelton) Zhao

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Education

Wake Forest University **August 2020 – May 2024**
B.S. in Computer Science and B.A. in Mathematics *Winston Salem, North Carolina*
GPA: 3.978 | Upsilon Pi Epsilon Member | Pi Mu Epsilon Member | ACM Member | Dean's List of All Semesters
Relevant Coursework: Data Mining (grad. level), Reinforcement Learning, GPU Programming, Computer Vision, Operating Systems, Bioinformatics Algorithms, Database Management System, Numerical Methods, Statistical Inference, Codes and Cryptography
Undergraduate Honors Thesis: Evolutionary Multi-Objective Coreset Selection for Data-Centric AI

Skills

Research: Evolutionary multi-objective optimization, interpretable deep neural networks, algorithmic instability and fairness, genetic algorithms for cluster analysis, biomedical data integration

Programming: Python, C, R, Java, CUDA, Unix Shell, MATLAB, SQL

Toolkits: Pytorch, Tensorflow, Scikit-learn, OpenCV, Ray, Gym, Captum, PyCUDA, Seurat, Scanpy, Python Multi-processing

Publications

1. **K. Zhao**, S. Bhandari, N.P. Whitener, J. M. Grayson and N. Khuri, "An Ensemble Machine Learning Approach for Benchmarking and Selection of scRNA-seq Integration Methods", ACM-BCB, September 2023 [**Top 10% regular paper with oral presentation**]
2. **K. Zhao**, J. M. Grayson and N. Khuri, "Multi-Objective Genetic Algorithm for Cluster Analysis of Single-Cell Transcriptomes", J. Pers. Med., January 2023 [**Monthly cover**]
3. N. Khuri, S. Bhandari, E. Murillo Burford, N.P. Whitener and **K. Zhao**, "Multi-target integration and annotation of single-cell RNA-sequencing data", ACM-BCB, August 2022 [**Short paper**]
4. S. Bhandari, N. P. Whitener, **K. Zhao** and N. Khuri, "An evolutionary approach to data valuation", ACM-BCB, August 2022 [**Regular paper**]
5. N.P. Whitener, **K. Zhao**, J. M. Grayson and N. Khuri, "scrnabench: A Package for Metamorphic Benchmarking of scRNA-seq Data Analysis Methods", Bioinformatics [**Under Review**]
6. R. Zabounidis, I. Oguntola, **K. Zhao**, J. Campbell, S. Stepputtis, K. P. Sycara, "Benchmarking and Enhancing Disentanglement in Concept-Residual Models", CVPR [**Under Review**]

Research Experience

DataMine Research Group, Wake Forest University **February 2021 – Present**
Undergraduate Researcher advised by Dr. Natalia Khuri *Winston Salem, NC*

- Co-authored and published 1 journal article and 3 ACM conference proceedings papers
- Collaborated with researchers from WFU School of Medicine to develop novel approaches for the analysis of biomedical dataset
- Designed, implemented, and optimized a Multi-objective Genetic Algorithm for clustering high-dimensional and noisy datasets
- Created a metric and implemented a system to access algorithmic and data bias in integration methods for heterogeneous dataset
- Implemented a systematic and parallel approach to evaluate the algorithmic instability of Machine Learning algorithms
- Co-developed an open-source R package for the metamorphic evaluation and benchmarking of the robustness of data analysis tools in scRNA-seq data

Advanced Agent-Robotics Technology Lab, Carnegie Mellon University **June 2023 – October 2023**
Robotics Institute Summer Scholar (RISS) advised by Dr. Katia Sycara *Pittsburgh, PA*

- Improved the performance and interpretability of Concept Bottleneck Models (CBMs) by mitigating the information leakage (IL)
- Implemented three novel latent space disentangling approaches with a semi-supervised CBM to address IL with CUB 200 dataset
- Benchmarked the performance and interpretability by test-time intervention through extensive empirical experiments

Oral and Poster Presentations

- "Addressing High-level Concepts Limitation in CBMs with Residuals and Vector Disentanglement", poster presentation, 2023 Robotics Institute Summer Scholar Research Showcase, Pittsburgh, PA, August 4, 2023
- "Evolutionary Multi-Objective Clustering of Single-Cell RNA Sequencing Data", poster presentation, 2022 Supercomputing conference ACM Student Research Competition, Dallas, TX, November 16, 2022
- "Evolutionary Multi-Objective Clustering of Single-Cell RNA Sequencing Data", oral presentation, 2022 International Forum on Research Excellence Student Presentation, virtual, November 4, 2022

Guest Lectures

- Lecture, "Introduction to Python Programming Language", WFU undergraduate course, Winston Salem, NC September 5, 2023
- Seminar, "Introduction to High Performance Computing", Beijing NO.35 High School, Beijing, China May 26, 2023
- Lecture, "Introduction to Parallel Computing", WFU CS department undergraduate course, Winston Salem, NC April 21, 2023

Professional Service and Extracurricular

ACM/IEEE Supercomputing Conference **September 2021 – November 2023**

- Competed in a student HPC cluster competition (IndySCC) at SC23 lasting for two months (ranked 4^{th} overall and 1^{st} in the US)
  - Provisioned a slurm cluster on Chameleon cloud with 1 head node and 85 computing nodes
  - Built and installed the HPL benchmark, configured the benchmark, and reached 8.4 TFLOP/s performance
  - Benchmarked GROMACS simulation of protein and ligand interactions with varied number of MPI and openMP processes
  - Benchmarked the processor layouts and parameters of Community Earth System Model by simulation discrepancies
  - Compiled Intel OSPRay from source and produced high-fidelity renders of large volumetric data with optimized performance
- Presented a Student Research Competition poster and supported conference operation as a student volunteer at SC22
- Selected to participate in a student immersion program funded by award covering registration, travel, and living expenses at SC21

WFU Chinese Men's Basketball Team **October 2021 – Present**

WFU Chinese Students and Scholars Association - Public Relation Dept **September 2021 – Present**

Awards and Grants

- CRA Outstanding Undergraduate Researcher Award, Computing Research Association, Honorable Mention — December 20, 2023
- RISS 2023 Summer Scholarship, Carnegie Mellon Robotics Institute, 2023 summer research — June 1, 2023
- Chris Conde Fund Travel Grant, WFU CS Department, SC22 conference traveling and expenses — November 13, 2022
- Starr Travel Grant, The Wake Forest URECA Center, IFoRE conference registration — November 1, 2022
- Chris Conde Fund Travel Grant, WFU CS Department, SC21 conference traveling and expenses — November 13, 2021
- Wake Forest Research Fellowship, Wake Forest URECA Center, 2022 summer research — May 1, 2022
- SC21 HPC Immersion Grant, SC21 HPC immersion committee, conference traveling, registration, and expenses — November 13, 2021