Kevin McCoy

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Research Interests

I am passionate about harnessing the power of statistics and computer science to solve pressing biomedical problems. My broad research interests include machine learning, computational statistics, and data science, as well as their applications in biomedicine, engineering, and imaging.

Education

Ph.D. in Statistics — August 2022 – May 2026 (expected)
William Marsh Rice University, GPA: 3.63/4.0 — Houston, TX

B.S. in Biomedical Engineering — August 2018 – May 2022
The Georgia Institute of Technology, *With Highest Honor*, GPA: 3.97/4.0 — Atlanta, GA

Research Experience

The University of Texas MD Anderson Cancer Center — Houston, TX
Graduate Research Assistant — Christine Peterson, PhD — May 2023 – Present

- Trained and validated machine learning prediction models to accurately identify blood vessels in CT scans for the purpose of automatic quality assurance for patient imaging.

The Georgia Institute of Technology — Atlanta, GA
Cardiovascular Disease Team Lead — Cassie Mitchell, PhD — March 2021 – May 2022

- Led a diverse research team of undergraduate and graduate students.
- Developed novel network clustering algorithms and text mining systems.
- Identified relationships that could better predict the impact of favorable stem cell precursors for patients with cardiovascular disease or congenital heart disease.
- Presented research at the Undergraduate Research Opportunities Program 2021 Spring Symposium.

COVID-19 Team Lead — Cassie Mitchell, PhD — May 2020 – March 2021

- Led a research team of 10 undergraduate students.
- Used machine learning techniques to predict repurposed drugs and risk factors for COVID-19.
- Visualized data to provide quickly understandable insights for front-line healthcare workers.
- Published a first-author paper, titled "Biomedical Text Link Prediction for Drug Discovery: A Case Study with COVID-19," in the journal Pharmaceutics.

Children's Healthcare of Atlanta — Atlanta, GA
Research Assistant — Vahid Serpooshan, PhD; Holly Bauser-Heaton, MD-PhD — January 2019 – April 2020

- Used 3D bioprinting techniques to advance the understanding of hypoplastic left heart syndrome, pulmonary atresia, and other congenital heart defects.
- Created accurate models of the developing heart and conducted computational fluid dynamics and in vivo simulations in order to better understand the etiology of congenital heart defects.

- Trained in CAD, 3D printers and 3D bioprinters, creation of bioinks, cell culture growth, and bright field and fluorescence microscopy.
- Published work in high-impact journals including Advanced Healthcare Materials.

Publications

[1] D. Kartchner, **K. McCoy**, J. Dubey, D. Zhang, K. Zheng, R. Umrani, J. J. Kim, and C. S. Mitchell, "Literature-based discovery to elucidate the biological links between resistant hypertension and covid-19", *Biology*, vol. 12, no. 9, p. 1269, 2023.

[2] S. A. Allegri, **K. McCoy**, and C. S. Mitchell, "Compositeview: A network-based visualization tool", *Big data and cognitive computing*, vol. 6, no. 2, p. 66, 2022.

[3] A. Kirkpatrick, C. Onyeze, D. Kartchner, S. Allegri, D. Nakajima An, **K. McCoy**, E. Davalbhakta, and C. S. Mitchell, "Optimizations for computing relatedness in biomedical heterogeneous information networks: Semnet 2.0", *Big data and cognitive computing*, vol. 6, no. 1, p. 27, 2022.

[4] **K. McCoy**, S. Gudapati, L. He, E. Horlander, D. Kartchner, S. Kulkarni, N. Mehra, J. Prakash, H. Thenot, S. V. Vanga, *et al.*, "Biomedical text link prediction for drug discovery: A case study with covid-19", *Pharmaceutics*, vol. 13, no. 6, p. 794, 2021.

[5] M. L. Tomov, L. Perez, L. Ning, H. Chen, B. Jing, A. Mingee, S. Ibrahim, A. S. Theus, G. Kabboul, K. Do, *et al.*, "A 3d bioprinted in vitro model of pulmonary artery atresia to evaluate endothelial cell response to microenvironment", *Advanced Healthcare Materials*, vol. 10, no. 20, p. 2 100 968, 2021.

[6] A. S. Theus, M. L. Tomov, A. Cetnar, B. Lima, J. Nish, **K. McCoy**, M. Mahmoudi, and V. Serpooshan, "Biomaterial approaches for cardiovascular tissue engineering", *Emergent Materials*, vol. 2, pp. 193–207, 2019.

Talks

- **Using Unsupervised Machine Learning Techniques and 3D Visualization Tools to Better Understand Cardiovascular Disease**
  Undergraduate Research Opportunities Program Spring Symposium *April 2021*

Poster Presentations

- **Automatic Vessel Intensity Measurement for Quality Control of Contrast-enhanced CT**
  Rice Ken Kennedy Institute AI in Health Conference *October 2023*
- **Using Text Mining Link Prediction to Expedite COVID-19 Research**
  Biomedical Engineering Society *October 2020*
- **3D Bioprinted Hemodynamic Flow Models of the Developing Heart to Study Congenital Heart Disease**
  Undergraduate Research Opportunities Program Spring Symposium *April 2019*

Teaching Experience

- **Research Mentor**, Rice University's Data to Knowledge Lab August 2023 – December 2023
  Data Science Capstone (COMP 449/DSCI 435)
- **Teaching Assistant**, Rice University August 2022 – May 2023
  Statistics for Data Science (STAT 315)
- **Teaching Assistant**, The Georgia Institute of Technology January 2020 – May 2021
  Computing for Engineers (CS 1371)

Work Experience

Data Engineer May 2021 – August 2021
Georgia Tech Office of Research Atlanta, GA

- Used research administration data and research commercialization data to enhance visibility into campus research operations.
- Conducted data mining, data cleaning, and data wrangling on multiple data sources internal and external to Georgia Tech.
- Constructed a Neo4J graph database to store relational data and visualization tools to display graph data.
- Presented findings to senior leadership to guide strategic decision-making.

Engineering Technician June 2019 – August 2019
PepsiCo Research and Development Valhalla, NY

- Designed and carried out experiments for the Nitro Pepsi project to ensure that the new product met all customer demands.
- Analyzed data from these experiments and presented my findings to senior leadership in order to guide decision-making.
- Worked with other PepsiCo teams effectively to carry Nitro Pepsi to market.
- Troubleshot faulty fountain equipment, and trained in basic fountain system repair.

Relevant Graduate Coursework

Biostatistics	*Engineering Biostatistics*, Brani Vidakovic
Probability	*Statistical Inference*, George Casella and Roger L. Berger
Statistical Inference	*Statistical Inference*, George Casella and Roger L. Berger
Statistical Machine Learning	*Elements of Statistical Learning*, Trevor Hastie et al.
Real Analysis	*Principles of Mathematical Analysis*, Walter Rudin
Neural Machine Learning	*Neural Networks: A Comprehensive Foundation*, Simon Haykin
Applied Time Series and Forecasting	*Time Series Analysis and Its Applications*, Shumway and Stoffer
Reinforcement Learning	*Reinforcement Learning: An Introduction*, Sutton and Barto
Bayesian Statistics	*A First Course in Bayesian Statistics*, Peter Hoff

Service and Outreach

Graduate Student Representative August 2022 – Present
Department of Statistics, Rice University Houston, TX

- Dedicated graduate student representative advocating for the needs and interests of statistics department students to foster a supportive academic environment.

Executive Team Leader January 2021 – May 2022
Laboratory for Pathology Dynamics, Georgia Tech Atlanta, GA

- Maintain the lab website by regularly publishing the research being done by a group of 40 lab members.
- Advertise ways for prospective members to get involved in the lab's research.
- Created, organized, and hosted learning opportunities and social events for the lab of 40 people.

Emergency Medical Technician May 2018 – August 2020
Newtown Volunteer Ambulance Corps Newtown, CT

- Responded to emergency 911 calls and delivered life-saving care to the critically ill and injured, and then transported patients to a nearby medical facility.

– Trained student EMTs to deliver a high standard of care to all patients.

Undergraduate Research Ambassador August 2019 – December 2020
Undergraduate Research Opportunities Program Atlanta, GA

– Mentored Georgia Tech students and connected them with the various research opportunities inside and outside the university.

– Developed workshops and informational sessions to educate the student body about research.

– Presented to first-year student seminar classes about how to find research opportunities, what is expected of student researchers, and how to present one's research.

Honors and Awards

- National Science Foundation Graduate Research Fellowship Program March 2023
- Georgia Tech Department of Biomedical Engineering Outstanding Senior March 2022
- Georgia Tech 2022 Sigma Xi Best Undergraduate Research Award March 2022
- The Ken Kennedy Institute Computational Science and Engineering Graduate Recruiting Fellowship February 2022
- Faculty Honors December 2018 – May 2022
- Con Edison Scholarship May 2018

News Spotlights

- *22 from Rice Engineering earn NSF Graduate Research Fellowships* April 2023
- *Persistence, Confidence, Community: Graduating Students Share Final Thoughts...* May 2022
- *Senior Leadership Awards Honor Outstanding Coulter BME Undergraduates* March 2022
- *Kevin McCoy Wins Sigma Xi Undergrad Research Award for 2022* March 2022
- *Covid Seed Grant Yields Data Mining Discoveries* April 2021

Skills

- **Programming Languages:** R, Python, MATLAB, HTML, CSS
- **Tools:** LaTeX, Git, Terminal, SQL, Tableau, Neo4j, Conda
- **Operating Systems:** MacOS, Linux, Windows
- **Libraries:** Pandas, NumPy, Matplotlib, Seaborn, Scikit-Learn, PyTorch
- **Languages:** English (Native Proficiency), German (Elementary Proficiency)
- **Machine Learning:** Supervised and Unsupervised Learning, Deep Learning, Natural Language Processing, Graphical Models, High Dimensional Data, Reinforcement Learning
- **Statistical Modelling:** Descriptive and Inferential Statistics, Bayesian Inference, Time Series Forecasting, Data Visualization

Memberships

- **American Statistical Association** March 2022 – Present
- **Institute of Mathematical Statistics** February 2022 – Present