

# KATHERINE BROWN

🌐 [www.linkedin.com/in/katherinebrown6847](https://www.linkedin.com/in/katherinebrown6847) ✉ [katherine.e.brown.68@gmail.com](mailto:katherine.e.brown.68@gmail.com)

## EDUCATION AND TRAINING

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### Tennessee Technological University

August 2018 - July 2023

*PhD in Engineering (Computer Science)*

Dissertation Title: *Evaluating, Explaining, and Utilizing Model Uncertainty in High-Performing, Opaque Machine Learning Models*

Advisor: Dr. Doug Talbert

### Tennessee Technological University

August 2018 - May 2021

*Master's of Computer Science*

Area of Emphasis: Artificial Intelligence

Cumulative GPA: 4.0/4.0

Advisor: Dr. Doug Talbert

### Tennessee Technological University

August 2014 - May 2018

*Bachelor's of Computer Science*

Concentration: Data Science

Cumulative GPA: 3.96/4.0

Member of Kappa Mu Epsilon

*Summa Cum Laude*

## SKILLS

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**Programming:** Python, R, Java, C++, NoSQL, MySQL, PostgreSQL

**Software & Tools:** Scikit-Learn, Keras, PyTorch, Pandas, SciPy, Numpy, Git, Weka, Splunk, Splunk ITSI

## PROFESSIONAL EXPERIENCE

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### Postdoctoral Research Fellow Trainee (T15 Grant)

August 2023 - Present

*Vanderbilt University Medical Center, Nashville, TN*

- Funded through National Library of Medicine.
- Perform research in biomedical and clinical informatics.
- Develop computational solutions to research tasks.
- Write and present scholarly works.

### Graduate Research Assistant (Machine Learning Research Consulting)

August 2022 - May 2023

*Tennessee Technological University, Cookeville, TN*

- Developed and piloted a research consulting service for Tennessee Technological University.
- Includes one-on-one consultation appointments with researchers from multiple engineering and science disciplines, development of machine learning resources, and delivery of informative seminars.

### PhD Student Research Mentor

August 2022 - July 2023

*Tennessee Technological University, Cookeville, TN*

- Mentor to an undergraduate research team performing research on computerized trauma triage.
- Cleaned and processed the National Trauma Data Bank for machine learning use.
- Helped supervise development of machine learning tools.

### Graduate Teaching Assistant

August 2021 - May 2022

*Tennessee Technological University, Cookeville, TN*

- Instructor of record for a sophomore undergraduate course on algorithm analysis and algorithm design techniques.
- Delivered lectures, prepared and graded written and programming assignments and exams.

### Graduate Research Assistant

August 2018 - May 2021

*Tennessee Technological University, Cookeville, TN*

- Design experiments in the areas of Artificial Intelligence, Machine Learning, and Healthcare Informatics.
- Develop computational solutions to research tasks.
- Write and present scholarly works.

## Adjunct Instructor

Summer 2019 & 2020

Tennessee Technological University, Cookeville, TN

- Taught sophomore-level introduction to theoretical computer science course during a full-term summer semester.
- Developed and administered an online, undergraduate algorithms course
- Course introduces sophomore undergraduates to algorithm analysis and algorithm design techniques.
- Recorded lectures, prepared and graded written and programming assignments and exams.

## Undergraduate Research Assistant

March 2016 - May 2018

Tennessee Technological University, Cookeville, TN

- Conducted research in machine learning and healthcare informatics.
- Co-authored scholarly works.
- Programmed solutions to various research problems.

## Research Intern

June 2017 - August 2017

Oak Ridge National Laboratory, Oak Ridge, TN

- Participant in the Higher Education Research Experience (HERE) Program within the Biomedical Computing Division.
- Developed a bioinformatics machine learning application with Python and Sci-Kit Learn

## Undergraduate Teaching Assistant

August 2015 - December 2016

Tennessee Technological University, Cookeville, TN

- Evaluated quizzes, exams, and assignments in various Computer Science courses.
- Tutored students.
- Assisted in designing and administering laboratories.

## PUBLICATIONS AND PRESENTATIONS

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### Conference Publications

1. **Brown KE**, Talbert S, Talbert DA. “A QUEST for Model Assessment: Identifying Difficult Subgroups via Epistemic Uncertainty Quantification.” *Proceedings of the American Medical Informatics Association Annual Symposium*, 2023.
2. Phillips KL, **Brown KE**, Talbert S, Talbert DA. “Group Bias and the Complexity/Accuracy Tradeoff in Machine Learning-Based Trauma Triage Models.” To appear in *Proceedings of the Florida Artificial Intelligence Research Society (FLAIRS-36)*, 2023.
3. Gannod M, Masto N, Owusu C, Highway C, **Brown KE**, Blake-Bradshaw A, Feddersen JC, Hagy HM, Talbert DA, Cohen B. “Semantic Segmentation with Multispectral Satellite Images of Waterfowl Habitat.” To appear in *Proceedings of the Florida Artificial Intelligence Research Society (FLAIRS-36)*, 2023.
4. **Brown KE**, Talbert DA. “A Simple, Direct Uncertainty Quantification Technique Based on Machine Learning Regression”. *Proceedings of the Florida Artificial Intelligence Research Society (FLAIRS-35)*, 2022.
5. **Brown KE**, Talbert DA. “Using Explainable AI to Measure Feature Contribution to Uncertainty”. *Proceedings of the Florida Artificial Intelligence Research Society (FLAIRS-35)*, 2022.
6. **Brown KE**, Talbert DA. “The Uncertainty of Counterfactuals”. *Proceedings of the Florida Artificial Intelligence Research Society (FLAIRS-34)*, 2021.
7. **Brown KE**, Bhuiyan F, Talbert DA. “Uncertainty Quantification in Multimodal Ensembles of Deep Learners”. *Proceedings of the Florida Artificial Intelligence Research Society (FLAIRS-33)*, 2020. (**Winner: Best Student Paper Award**)
8. Bhuiyan F, **Brown KE**, Sharif B, Johnson Q, Talbert DA. “Assessing Modality Selection Heuristics to Improve Multimodal Machine Learning for Malware Detection”. *Proceedings of the Florida Artificial Intelligence Research Society (FLAIRS-33)*, 2020.
9. **Brown KE**, Talbert DA. “Heuristically Reducing the Cost of Correlation-Based Feature Selection”. *Proceedings of the Association of Computing Machinery Southeast Conference*, 2019. (**Runner-Up: Best Paper Award**)

### Invited Talks

1. Talbert DA, **Brown KE**. “Explainability and Medical AI.” Vanderbilt University Department of Biomedical Informatics. January 13, 2022.

## Abstracts and Poster Demonstrations

1. **Brown KE**, Talbert S, Talbert DA. "Assessing the Quality of Uncertainty Calibration." *Proceedings of the American Medical Informatics Association Annual Symposium*, 2023.
2. **Brown KE**, Talbert DA. "Estimating Uncertainty in Deep Image Classification." *Proceedings of the American Medical Informatics Association Annual Symposium*, 2019.
3. **Brown KE**, Talbert DA. "Multi-Task Correlation-Based Feature Selection for Gene Expression Data." *Proceedings of the American Medical Informatics Association Annual Symposium*, 2018.

## AWARDS

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- **Best Student Paper Award**: Florida Artificial Intelligence Research Symposium, May 2020.
- **Runner-up Best Paper Award**: Association of Computing Machinery 2019 Southeast Conference, April 2019
- **Research and Creative Inquiry Award Winner (TIE)**: Tennessee Technological University, April 2019
- **Research and Creative Inquiry Award Winner**: Tennessee Technological University, April 2018
- **Engineering, Computing, and Technology Spectrum Award**: Tennessee Technological University College of Engineering, February 2018

## LEADERSHIP & SERVICE

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### **Florida Artificial Intelligence Research Society – Track Co-Chair (Artificial Intelligence in Health Informatics Special Track)** *August 2022 - May 2023*

*Tennessee Technological University, Cookeville, TN*

- Organize and perform peer review of papers submitted to the Artificial Intelligence in Health Informatics Special Track of the FLAIRS annual conference.

### **College of Engineering Graduate Studies Executive Committee – Graduate Student Representative** *August 2022 - May 2023*

*Tennessee Technological University, Cookeville, TN*

- Represented engineering graduate students college-level policy and catalog revisions and updates.

### **JAMIA Student Editorial Board – Member** *January 2022 - December 2023*

*Journal of the American Medical Informatics Association*

- Reviewed submitted articles for the *Journal of the American Medical Informatics Associates* under the mentorship of the associate editors of the journal.
- Will moderate two JAMIA Journal Club Seminars for calendary year 2023.

### **Data Science League — Co-founder and Student Officer** *September 2018 - May 2022*

*Tennessee Technological University, Cookeville, TN*

- President (January 2018 - August 2018; August 2020 - May 2022)
- Vice President (August 2018 - August 2020)
- Co-Founder and Charter Member

### **Computer Science Graduate Student Club — Officer** *September 2019 - September 2021*

*Tennessee Technological University, Cookeville, TN*

- Vice President (August 2020 - September 2021) Managed meeting logistics and served as acting president and moderator when necessary
- Treasurer (September 2019 - May 2020) Managed funds and procured university funding for the Computer Science Graduate Student Club

### **Department of Computer Science Student Advisory Council — Member** *September 2018 - September 2021*

*Tennessee Technological University, Cookeville, TN*

- Represented graduate and data science students in department-wide administrative meetings.

### **Tennessee Tech ACM-W Chapter — Student Officer** *August 2015 - May 2019*

*Tennessee Technological University, Cookeville, TN*

- Student Mentor (August 2018 - May 2019): Served as mentor to newly-elected officers.
- President (August 2016 - May 2018): Administered local chapter including organizing and conducting meetings
- Vice President (August 2015 - May 2016): Managed meeting logistics and served as acting president when necessary