

# Anni Zhou

Boise, Idaho, United States

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## Summary

Passionate researcher with 8+ years of experience in predictive and statistical modeling, machine learning, and data analysis. Enthusiastic about advancing AI methodologies for real-world applications. (*Ph.D thesis: "Trustworthy and Robust Early Sepsis Prediction for Intensive Care Unit Patients using Reinforcement Learning and Conformal Prediction"*)

## Skills

Tools and Languages	PyTorch, Tensorflow, SQL, PostgreSQL, Python, C/C++, R, JAX, Matlab
Data Analysis	numpy, pandas, matplotlib, seaborn, scikit-learn, keras
Research Interests	Machine Learning, Data Analysis, Reinforcement Learning, Deep Learning Statistical Modeling, Uncertainty Quantification, Large Language Models Personalized Recommendation System, Generative AI

## Education

### Georgia Institute of Technology

Atlanta, GA, United States

PH. D IN ELECTRICAL AND COMPUTER ENGINEERING

Aug. 2018 - Jan. 2025

- Minor in Industrial and Systems Engineering.
- Advised by Dr. Raheem Beyah and Dr. Rishikesan Kamaleswaran.

### Huazhong University of Science and Technology

Wuhan, China

B.S. IN ELECTRICAL AND COMPUTER ENGINEERING

Sept. 2014 - Jun. 2018

- Selected into the **Outstanding Engineer Education and Training Program** at Qiming College of Huazhong University of Science and Technology.

## Internship

### Multi-Task Spatio-Temporal Modeling for Plant Growth Prediction

Networking & IntelligenCE Lab

RESEARCH INTERN, MENTORED BY YUCHEN LIU AT NORTH CAROLINA STATE UNIVERSITY

Dec 2024 - present

- Developed a novel classification-assisted prediction model integrating physical information like irrigation data, achieving superior performance in image-based plant growth prediction.
- Introduced a new Pixel-of-Interest (POI) evaluation metric to assess model accuracy from a physical perspective, enhancing decision-making in agricultural research.
- Conducted experiments using large datasets, employing advanced machine learning frameworks (e.g., **ConvLSTM**, **PredRNN**) for robust plant growth analysis and prediction.

## Research Experience

### Deep Learning-based Contextual Multi-armed Bandit Algorithm with Uncertainty Quantification [Code]

Georgia Institute of Technology & Duke University

FUNDED BY NATIONAL INSTITUTE OF GENERAL MEDICAL SCIENCES

2023 - 2024

- Designed a novel reinforcement learning algorithm integrating conformal prediction and reinforcement learning, improving adaptive decision-making under uncertainty for early sepsis prediction.
- Proposed a linear contextual bandit extension offering faster convergence and enhanced interpretability for datasets with low variability.
- Conducted large-scale experiments on ICU datasets (27,000+ hours of electronic health records) **using JAX**, achieving high prediction accuracy and reliability in sepsis identification and demonstrating improved patient-specific reward approximation.
- **Collaborated with a multidisciplinary team** to translate research outcomes into actionable clinical insights.

## Online Learning-based Framework for Early Sepsis Prediction with Uncertainty Quantification using Conformal Prediction [Code]

Georgia Institute of Technology &

Duke University

FUNDED BY NATIONAL INSTITUTE OF GENERAL MEDICAL SCIENCES

2022 - 2023

- Developed an online learning framework with uncertainty quantification, achieving up to 98% coverage.
- **Optimized parallel computing** techniques, **enhancing computational efficiency and accelerating** processing 24 times.
- Integrated advanced imputation frameworks (e.g., HyperImpute) to address missing clinical data, ensuring scalability and robustness of the predictive models.
- Conducted extensive experiments on **large-scale training datasets** of up to 2,000 ICU patients, demonstrating improved patient-specific personalized model selection.
- Worked closely with clinicians to identify critical features and develop clinically relevant preprocessing workflows.

## Early Sepsis Prediction for ICU patients with Big Data Support [Code]

Georgia Institute of Technology &

Emory University

FUNDED BY NATIONAL INSTITUTE OF GENERAL MEDICAL SCIENCES

2020 - 2021

- Achieved 90.82% accuracy using a novel online learning-based prediction framework combining various machine learning algorithms such as XGBoost, Random Forest, and Logistic Regression.
- Processed and analyzed large-scale electronic health records for 40,336 patients using PostgreSQL, ensuring data integrity and completeness.
- Provided explainable results through AI tools such as LIME, facilitating clinician acceptance and trust in predictive outcomes.

## Privacy-preserving Distributed Online Learning Recommendation System

Huazhong University of Science and

Technology

FUNDED BY WUHAN NATIONAL LABORATORY FOR OPTOELECTRONICS (WNLO)

2016 - 2018

- Designed a privacy-preserving collaborative recommendation system, achieving 98.06% accuracy using online learning methodologies.
- Addressed privacy challenges through Differential Privacy techniques, ensuring user data confidentiality.
- Conducted rigorous theoretical analysis of regret bounds, achieving sublinear regret convergence to the optimal policy.
- Authored three peer-reviewed publications detailing the methodologies and findings.

## Publication

**Zhou, A.**, Liu, Y. *Multi-Task Spatio-Temporal Modeling: Towards Accurate and Robust Plant Growth Prediction in the Real World (Under Review)*.

**Zhou, A.**, Beyah, R., Kamaleswaran, R. *NeuroSep-CP-LCB: A Deep Learning-based Contextual Multi-armed Bandit Algorithm with Uncertainty Quantification for Early Sepsis Prediction (Under Review)*. [Code]

**Zhou, A.**, Beyah, R., Kamaleswaran, R. *Sepsyn-OLCP: An Online Learning-based Framework for Early Sepsis Prediction with Uncertainty Quantification using Conformal Prediction (Under Review)*. [Code]

**Zhou, A.**, Beyah, R., Kamaleswaran, R. *OnAI-comp: An Online AI Experts Competing Framework for Early Sepsis Detection*. IEEE/ACM Transactions on Computational Biology and Bioinformatics, 2021, 19(6): 3595-3603. [Paper]

Chen, W., **Zhou, A.**, Zhou, P., et al. *A Privacy-Preserving Online Learning Approach for Incentive-Based Demand Response in Smart Grid*. IEEE Systems Journal, 2019, 13(4): 4208-4218. [Paper]

**Zhou, A.**, Zhou, P., Wu, D., et al. *T-PriDO: A Tree-based Privacy-Preserving and Contextual Collaborative Online Big Data Processing System*. 2018 IEEE Conference on Communications and Network Security (CNS), IEEE, 2018: 1-9. [Paper]

**Zhou, A.**, Feng, Y., Zhou, P., et al. *Social Intimacy-based IoT Services Mining of Massive Data*. 2017 IEEE International Conference on Data Mining Workshops (ICDMW), IEEE, 2017: 641-648. [Paper]

Fang, L., Li, M., Liu, Z., Lin, C., Ji, S., **Zhou, A.**, Susilo, W., Ge, C. *A Secure and Authenticated Mobile Payment Protocol Against Off-Site Attack Strategy*. IEEE Transactions on Dependable and Secure Computing, 2021, 19(5): 3564-3578. [Paper]

# Teaching

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## **CS/ECE 6263 Introduction to Cyber-Physical System Security**

*Georgia Institute of Technology*

GRADUATE TEACHING ASSISTANT

*2019 - 2022*

- Worked with the TA team to provide an introduction to security issues relating to various cyber-physical systems including industrial control systems and those considered critical infrastructure systems.
- Guided the students to work with various tools and techniques used by hackers to compromise computer systems or otherwise interfere with normal operations.
- Instructed the students to use tools that are unique to interacting with cyber-physical systems.

# Professional Activities & Services

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Peer Reviewer of *IEEE Global Communications Conference*, and *Expert Systems With Applications*