YANCHENG HUANG

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EDUCATION

Michigan State University
Incoming Ph.D. Student, Computer Science — Aug 2025 - Present
Tongji University
Master of Computer Science — Sep 2021 - Mar 2024
Hohai University
Bachelor of Computer Science — Sep 2017 - June 2021

RESEARCH INTERESTS

During my master's studies, my research focused on the intersection of sequential data analysis and optimization. In particular, I worked on developing change point detection algorithms with theoretical guarantees for engineering problems arising from real-world applications. Currently, I am conducting research in the area of machine unlearning.

PUBLICATION

1. **Huang, Y.**, Yang, K., Zhu, Z., & Chen, L. Triadic-OCD: Asynchronous Online Change Detection with Provable Robustness, Optimality, and Convergence. In Forty-first International Conference on Machine Learning.
2. **Huang, Y.**, Yang, K., Qiu, C., Zhang, J., & Wang, X. Uncertainty-Aware Quickest Change Detection. IJCAI Workshop on AI4TS. [Best Paper Honors Mention].

MANUSCRIPTS UNDER REVIEW

1. **Huang, Y.**, Yang, K., Qiu, C., Zhang, J., & Wang, X. EarlyShield: Optimal Robust Online Change Detection with Provable Detection Delay.
2. Zhu, Z., Yang, K., & **Huang, Y.** Synergistic Fusion of Wireless Localization and Sensing via Bi-level Machine Learning.
3. Zheng, M., Yang, K., & **Huang, Y.** Causal Graph-Aware Joint Anomaly Detection and Analysis for Microservice Systems.

RESEARCH PROJECTS

Uncertainty-Aware Quickest Change Detection

- Formulate the statistical evidence for change at a time in dynamic and uncertain systems as a Mixed-Integer Quadratic Programming (MIQP) problem.
- Develop two novel detection methods based on the formulated MIQP problem, leveraging SDP relaxation and branch-and-bound, respectively.
- Conduct extensive experiments to demonstrate the effectiveness of the proposed methods.

Triadic-OCD: Asynchronous Online Change Detection with Provable Robustness, Optimality, and Convergence

- Examine a highly versatile uncertain set of system parameters, offering flexibility to customize the uncertainty set in practical applications based on specific requirements.
- Propose a novel asynchronous distributed algorithm with certifiable robustness for the considered uncertainty set, mitigating the straggler issue commonly encountered in large-scale distributed systems.
- Prove that the proposed method is guaranteed to converge, and perform a non-asymptotic convergence analysis to establish an upper bound on the iteration complexity for attaining an ϵ-optimal solution.

EarlyShield: Optimal Robust Online Change Detection with Provable Detection Delay

- Propose a robust, computationally efficient, and high-performance detector based on the generalized log-likelihood ratio (GLLR) to address the change point detection problem in dynamic and uncertain systems.
- Provide a relaxation problem, proven to be tighter than the commonly used SDP relaxation, and use its optimal objective value to approximate the GLLR in the proposed algorithm.
- Establish a lower bound on the threshold employed in the proposed algorithm for any given constraint on the expected false alarm period.
- Provide an upper bound on the expected detection delay for any given threshold employed in the proposed algorithm.

Synergistic Fusion of Wireless Localization and Sensing via Bi-level Machine Learning

- Model the localization and sensing within a wireless system in a fusion approach with shared subcarrier selection. Based on the hierarchical structure of these tasks, the training process is formulated as a Mixed-Integer Bi-Level Optimization (MIBO) problem.
- Design a stochastic proximal gradient descent algorithm to solve the MIBO problem, where the integer constraint and non-convex lower-level constraint are relaxed.
- Analyze the convergence rate of the proposed algorithm.

Causal Graph-Aware Joint Anomaly Detection and Analysis for Microservice Systems

- Propose a causal graph-aware, multi-scale, unsupervised anomaly detection method for microservice systems based on graph attention networks.
- Further augment the performance of the proposed method by formulating the invocation trace anomaly detection as a bilevel optimization problem, leveraging the insights provided by causal knowledge.
- Extensive experiments have been carried out to demonstrate the superiority of the proposed methods.

AWARDS

- National Scholarship, China's highest honor for undergraduate students
- Outstanding graduate Dissertation Award of Tongji University
- Arts and Sports Scholarship