

Wenbin Zhai

PERSONAL DATA

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RESEARCH INTERESTS: Wireless Sensor Networks, Cybersecurity, Networking

HOMEPAGE: [Wenbin Zhai's Homepage](#)

GOOGLE SCHOLAR: [Wenbin Zhai's Google Scholar](#)



EDUCATION

Nanjing University of Aeronautics and Astronautics (NUA), China

Sep. 2020 – Apr. 2023

Master by Research of Computer Science and Technology, College of Computer Science and Technology

- **GPA:** 85.4/100, Ranking A (Top 15%)
- **Thesis Topic:** Research on Routing Protocol for Multi-hop Unmanned Aerial Vehicle Ad-hoc Networks (Outstanding Postgraduate Thesis of Jiangsu Province and Outstanding Postgraduate Thesis of Jiangsu Computer Society)

Nanjing University of Chinese Medicine (NJUCM), China

Sep. 2016 – Jun. 2020

Bachelor of Computer Science and Technology, School of Artificial Intelligence and Information Technology

- **GPA:** 86/100, Ranking 8/61 (Professional GPA: 90.8/100, Ranking 2/61)
- **Thesis Topic:** Design and Implementation of a Method for the Safe Storage of Chinese Medicine Data based on Homomorphic Encryption (Outstanding Undergraduate Thesis of Jiangsu Province)

SELECTED AWARDS AND HONOURS

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| • Outstanding Postgraduate Thesis of Jiangsu Province | <i>Dec. 2024</i> |
| • Outstanding Postgraduate Thesis of Jiangsu Computer Society | <i>Dec. 2024</i> |
| • Tuition Fee Scholarship of UNSW Sydney | <i>Dec. 2023</i> |
| • Provincial Merit Student of Jiangsu Province | <i>Apr. 2023</i> |
| • Outstanding Graduate of NUA | <i>Apr. 2023</i> |
| • Merit Student of NUA (2021-2022) | <i>Dec. 2022</i> |
| • Advanced Individual in Research and Innovation of NUA (2021-2022) | <i>Dec. 2022</i> |
| • Second Class Scholarship for Graduate Students of NUA (2020-2023) (CNY 8,000/year) | <i>Sep. 2020 – Sep. 2022</i> |
| • Outstanding Undergraduate Thesis of Jiangsu Province | <i>Oct. 2021</i> |
| • Outstanding Graduate of NJUCM | <i>Jun. 2020</i> |
| • Merit Student of NJUCM (2018-2019) | <i>Dec. 2019</i> |
| • Ruihua Soaring Scholarship | <i>Sep. 2019</i> |
| • National Encouragement Scholarship in China (2017-2019) (CNY 5,000/year) | <i>Dec. 2018 – Dec. 2019</i> |
| • First Class Scholarship for Undergraduates of NJUCM (2017-2019) (CNY 2,500/year) | <i>Dec. 2018 – Dec. 2019</i> |
| • Principal's Special Award of NJUCM (2017-2018) (CNY 10,000) | <i>Dec. 2018</i> |
| • Fei Xiaotong Virtue Scholarship (CNY 6,000) | <i>Dec. 2018</i> |

PUBLICATIONS

Journal Papers:

- **Wenbin Zhai**, Liang Liu, Youwei Ding, Shanshan Sun, and Ying Gu, "ETD: An Efficient Time Delay Attack Detection Framework for UAV Networks" in *IEEE Transactions on Information Forensics and Security (TIFS)*. [CORE A, CCF A, SCI-Q1, IF 7.231] [Publication]

- **Wenbin Zhai**, Shanshan Sun, Liang Liu, Youwei Ding, and Wanying Lu, "HOTD: A Holistic Cross-Layer Time Delay Attack Detection Framework for UAV Networks" in *Journal of Parallel and Distributed Computing (JPDC)*. [CORE A, CCF B, SCI-Q1, IF 4.542] [Publication]
- **Wenbin Zhai**, Xin Li, Liang Liu, Youwei Ding, and Wanying Lu, "ESTA: An Efficient Spatial-Temporal Range Aggregation Query Processing Algorithm for UAV Networks" in *Future Generation Computer Systems (FGCS)*. [CORE A, CCF C, SCI-Q1, IF 7.307] [Under Review]
- **Wenbin Zhai**, Feng Wang, Liang Liu, Youwei Ding, and Wanying Lu, "Federated Semi-Supervised and Semi-Asynchronous Learning for Anomaly Detection in IoT Networks" in *IEEE Internet of Things Journal (IOTJ)*. [CCF C, SCI-Q1, IF 9.471] [Under Review]
- Weichen Ding, **Wenbin Zhai**, Liang Liu, Ying Gu, and Hang Gao, "Detection of packet dropping attack based on evidence fusion in IoT networks" in *Security and Communication Networks (SCN)*. [CCF C, SCI-Q3, IF 1.968] [Publication]
- Kaibin Zhang, Liang Liu, **Wenbin Zhai**, Youwei Ding, and Jun Hu, "OSIS: Obstacle-Sensitive and Initial-Solution-First Path Planning" in *Peer-to-Peer Networking and Applications (PPNA)*. [CCF C, SCI-Q2, IF 3.488] [Publication]
- Gongshun Min, Liang Liu, **Wenbin Zhai**, Zijie Wang, and Wanying Lu "An Efficient Data Collection Algorithm for Partitioned Wireless Sensor Networks" in *Future Generation Computer Systems (FGCS)*. [CORE A, CCF C, SCI-Q1, IF 7.307] [Publication]
- Wenjie Zhao, Yu Wang, **Wenbin Zhai**, Liang Liu, and Yulei Liu, "Efficient Time-Delay Attack Detection Based on Node Pruning and Model Fusion in IoT Networks" in *Peer-to-Peer Networking and Applications (PPNA)*. [CCF C, SCI-Q2, IF 3.488] [Publication]
- Yanlin Wang, Liang Liu, Mengqi Li, **Wenbin Zhai**, Weihua Ma, and Hang Gao, "Power Level Aware Charging Schedule in Wireless Rechargeable Sensor Network" in *Peer-to-Peer Networking and Applications (PPNA)*. [CCF C, SCI-Q2, IF 3.488] [Publication]
- Yu Fan, Liang Liu, Xingxing Zhang, Huibin Shi, and **Wenbin Zhai**, "MAPP: An efficient multi-location task allocation framework with personalized location privacy-protecting in spatial crowdsourcing" in *Information Sciences*, 2023, 619: 654-678. [CORE A, CCF B, SCI Q1, IF 8.233] [Publication]
- Jiancheng Song, Liang Liu, Yulei Liu, Jie Xi, and **Wenbin Zhai**, "Path Planning for Multi-Vehicle-Assisted Multi-UAVs in Mobile Crowdsensing" in *Wireless Communications and Mobile Computing (WCMC)*, vol. 2022, 21 pages, 2022. [CCF C, SCI-Q3, IF 2.146] [Publication]

Conference Papers:

- **Wenbin Zhai**, Liang Liu, Jianfei Peng, Youwei Ding, and Wanying Lu, "PAR: A Power-Aware Routing Algorithm for UAV Networks" in *17th International Conference on Wireless Algorithms, Systems, and Applications (WASA 2022)*, Dalian, China, November 24-26, 2022, Proceedings, Part III. Cham: Springer Nature Switzerland, 2022: 333-344. [CCF C] [Publication]
- Yunfeng Cui, **Wenbin Zhai**, Liang Liu, Youwei Ding, and Wanying Lu, "Link Aware Aggregation Query with Privacy-Preserving Capability in Wireless Sensor Networks" in *3rd International Conference on Emerging Information Security and Applications (EISA 2022)*, Wuhan, China, October 29-30, 2022, Proceedings. Cham: Springer Nature Switzerland, 2023: 209-224. [Publication]
- Wanying Lu, Liang Liu, **Wenbin Zhai**, Haoyuan Chen, and Yulei Liu, "HBC: Combining Lossy and Lossless Hybrid Bilayer Compression Framework on Time-Series Data" in *21th IEEE International Symposium on Parallel and Distributed Processing with Applications (ISPA 2023)*, Wuhan, China, December 21-24, 2023. [CCF C] [Publication]
- Kaibin Zhang, Liang Liu, **Wenbin Zhai**, Youwei Ding, and Jun Hu, "OSIS: Obstacle-Sensitive and Initial-Solution-First Path Planning" in *29th IEEE International Conference on Parallel and Distributed Systems (ICPADS 2023)*, Hainan, China, December 17-21, 2023. [CCF C] [Publication]
- Kun Guo, Liang Liu, **Wenbin Zhai**, and Youwei Ding, "EKR: An Efficient K-anycast Routing in UAV Networks" in *9th International Conference on Computer and Communications (ICCC 2023)*, Chengdu, China, December 8-11, 2023. [Publication]

- Zixiao Zhou, Liang Liu, **Wenbin Zhai**, Jiancheng Song, and Yulei Liu, "Power-Aware Path Planning for Vehicle-Assisted Heterogeneous UAVs in Mobile Crowd Sensing" in *2023 International Conference on Data, Information and Computing Science (CDICS 2023)*, Singapore, December 8-10, 2023. [Publication]
- Lingling Hu, Liang Liu, Yulei Liu, **Wenbin Zhai**, and Xinmeng Wang, "A robust fixed path-based routing scheme for protecting the source location privacy in wsns" in *17th International Conference on Mobility, Sensing and Networking (MSN 2021)*, Exeter, UK, December 13-15, 2021, IEEE, 2021: 48-55. [CCF C] [Publication]

RESEARCH EXPERIENCE

Topic: Cybersecurity in Wireless Sensor Networks

Sep. 2021 – Date

- Proposed a **Holistic Cross-Layer Time Delay Attack Detection Framework (HOTD)** for UAV networks, designed to effectively identify time delay attacks that are both challenging to detect and straightforward to implement. The framework begins with a comprehensive selection of delay-related features across each layer of UAV networks. Using supervised learning, a consistency model is constructed to map the relationship between these features and their corresponding forwarding delays. Based on this model, the consistency degree of each node is calculated. Finally, the K-Means clustering algorithm is employed to classify nodes as either malicious or benign based on their consistency degrees. (2021–2022, published in the *Journal of Parallel and Distributed Computing (JPDC)* [CORE A, CCF B, SCI-Q1]).
- Proposed an **Efficient Time Delay Attack Detection Scheme (ETD)** for UAV networks, addressing a relatively underexplored attack surface. The scheme begins with a comprehensive selection of delay-related features across four dimensions: delay, node, message, and connection. Using **one-class classification**, a model is trained based on these features to evaluate the forwarding behaviors of all nodes and compute their trust values. Malicious nodes are then distinguished from benign ones based on these trust values. (2022, published in the *IEEE Transactions on Information Forensics and Security (TIFS)* [CORE A, CCF A, SCI-Q1]).
- Working on the design of **Federated Semi-Supervised and Semi-Asynchronous Learning (FedS³A)** for anomaly detection in IoT networks, addressing a more realistic **semi-supervised scenario**. The framework introduces a semi-asynchronous model update and staleness-tolerant distribution scheme to balance round efficiency and detection performance. It accounts for the staleness of local models and the participation frequency of clients to ensure fair contributions to the global model. Additionally, a group-based aggregation function is employed to handle non-IID data, while difference transmission using sparse matrices is adopted to reduce communication overhead. (2022–present, submitted to the *IEEE Internet of Things Journal (IOTJ)* [CCF C, SCI-Q1]).

Topic: Routing Optimization for UAV Ad-hoc Networks

Sep. 2020 – Sep. 2021

- Proposed a **Power-Aware Routing (PAR) Algorithm** to optimize energy consumption in delay-constrained UAV networks. The algorithm incorporates the **adjustable power levels** of UAVs and leverages pre-planned trajectory information to calculate encounters at different power levels. Using this data, a power-aware encounter tree is constructed to identify the transmission path with minimal energy consumption from the source to the destination, while adhering to delay constraints. (2020–2021, published in *WASA 2022* [CCF C]).
- Designed an **Efficient Spatial-Temporal Range Aggregation Query Processing (ESTA) Algorithm** for UAV networks. Leveraging a constructed Topology Change Graph (TCG), the algorithm employs an efficient shortest path method to determine user query delay. ESTA then transforms the aggregation of query results into a recursive set cover problem, constructing a Spatial-Temporal Aggregation Tree (STAT) to identify an optimal in-network aggregation routing path for query results while maintaining user query delay requirements. (2022, submitted to *Future Generation Computer Systems (FGCS)* [CORE A, CCF C, SCI-Q1]).

PROJECT EXPERIENCE

Topic: Multi-CDN Integration Platform

Jan. 2020 – Sep. 2020

- Built a **CDN Scheduling Platform** that aggregates resources from multiple CDN service providers, addressing the limitations of resource availability and scheduling capabilities inherent to single-provider solutions.

- Unified and streamlined the interfaces of various CDN service providers (e.g., Google, Cloudflare). Through a centralized control panel, users can configure all integrated CDN providers with a single, simplified setup, significantly reducing operational and maintenance overhead.
- Implemented a mechanism to regularly pull and back up distributed data from all CDN providers into a local time-series database. This enables users to perform fast historical and real-time queries efficiently.

Topic: Detection of Software Behaviour Baseline

Jan. 2020 – Aug. 2020

- Developed a Software Behaviour Baseline Library to monitor and detect software runtime behaviour. The library comprises both **static and dynamic behaviour baseline** components. The static baseline is constructed by analysing source code, configuration files, executable programs, and other artifacts using the LLVM code analysis tool and a function granularity control flow graph generator. The dynamic baseline is generated by capturing function sequences and system calls during software execution using the capture tool strace and the Var-grams algorithm.
- Software behaviour is evaluated against the baseline library. If deviations are detected, the system enforces control strategies such as stopping execution, limiting execution, or allowing continued execution after issuing an alarm.

PROFESSIONAL ACTIVITIES

Journal Reviewer:

- IEEE Transactions on Information Forensics and Security (TIFS) [CORE A, CCF A, SCI-Q1] *Apr. 2024 – Date*
- The Journal of Supercomputing (TJSC) [CCF C, SCI-Q2] *Apr. 2024 – Date*