

# Cai, Yifan

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## EDUCATION

### University of Pennsylvania

*Master of Science in Computer & Information Science*

Philadelphia, PA

Aug 2024

Advisor: Dr. Linh Thi Xuan Phan

*Ph.D. Student in Computer & Information Science*

Aug 2021 – Present

Advisor: Dr. Linh Thi Xuan Phan

Research Interest: Distributed systems, real-time cyber-physical systems, and security

### Shanghai Jiao Tong University

Shanghai, China

*Bachelor of Engineering, Software Engineering, System Software Track*

Jun 2020

Honors/Awards: SJTU Scholarships (2016-2017, 2017-2018 & 2018-2019)

## PUBLICATIONS

### Exploiting Timing Side-Channels in Multi-Mode Real-Time Systems

Yifan Cai and Linh Thi Xuan Phan

*In submission.*

### GeoShield: Byzantine Fault Detection and Recovery for Geo-Distributed Real-Time Cyber-Physical Systems

Yifan Cai and Linh Thi Xuan Phan

*arXiv:2511.15031 [cs.CR]*

### Rasco: Resource Allocation and Scheduling Co-design for DAG Applications on Multicore

Abigail Eisenklam, Robert Gifford, Georgiy A. Bondar, Yifan Cai, Tushar Sial, Linh Thi Xuan Phan, and Abhishek Halder.

*In ACM Transactions on Embedded Computing Systems (TECS),*

*Special issue of ACM SIGBED International Conference on Embedded Software (EMSOFT), 2025.*

### RoboRebound: Multi-Robot System Defense with Bounded-Time Interaction

Neeraj Gandhi, Yifan Cai, Andreas Haeberlen, and Linh Thi Xuan Phan

*In the 20th European Conference on Computer Systems (EuroSys), 2025*

### Analysis of Long-term Average Behaviors of Probabilistic Task Systems

Yifan Cai, Linh Thi Xuan Phan, and P.S. Thiagarajan.

*In International Conference on Real-Time Networks and Systems (RTNS), 2024*

### Object-oriented Unified Encrypted Memory Management for Heterogeneous Memory Architectures

Mo Sha\*, Yifan Cai\*, Sheng Wang, Linh Thi Xuan Phan, Feifei Li, and Kian-Lee Tan (\* Equal contribution)

*In International Conference on Management of Data (SIGMOD), 2024*

### VeriDB: An SGX-based Verifiable Database.

Wenchao Zhou, Yifan Cai, Yanqing Peng, Sheng Wang, Ke Ma, and Feifei Li

*In International Conference on Management of Data (SIGMOD), 2021*

### Understanding the Effect of Data Center Resource Disaggregation on Production DBMSs.

Qizhen Zhang, Yifan Cai, Xinyi Chen, Sebastian Angel, Ang Chen, Vincent Liu, and Boon Thau Loo.

*In 46<sup>th</sup> International Conference on Very Large Data Bases (VLDB), 2020.*

### Intra-day Forecast of Ground Horizontal Irradiance Using Long Short-Term Memory Network (LSTM)

Xiuhong Chen, Xianglei Huang, Yifan Cai, Haomin Shen, and Jiayue Lu.

*In Journal of the Meteorological Society of Japan. Ser. II, 2020, 98(5): 945-957.*

## Rethinking Data Management Systems for Disaggregated Data Centers.

Qizhen Zhang, **Yifan Cai**, Sebastian Angel, Ang Chen, Vincent Liu, and Boon Thau Loo.

In *Conference on Innovative Data Systems Research (CIDR)*, 2020.

## Consensus-based Data Statistics in Distributed Network Systems.

**Yifan Cai**, Jianping He, Wenbin Yu, and Xinpeng Guan.

In the 57<sup>th</sup> *IEEE Conference on Decision and Control (CDC)*, 2018

## EXPERIENCES

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### Roblox

San Mateo, CA

*Research Intern, supervised by Dr. Andreas Haeberlen and Dr. Linh Thi Xuan Phan*

May 2024 – Aug 2024

- Designed a partitioning system for large-scale multiplayer gaming environments, optimizing server resource allocation while maintaining seamless player experience.
- Provided an efficient solution for cross-partition border management, minimizing data replication and inter-server communication overhead.

### Alibaba Cloud

Sunnyvale, CA

*Research Intern, supervised by Dr. Mo Sha and Dr. Sheng Wang*

May 2023 – Aug 2023

- Proposed a solution to ensure confidentiality, integrity, and freshness of data in a system with heterogeneous memory architectures, while providing a unified interface to the applications.
- Used centralized data structures to ensure data security, achieving up to 6.3x speedup compared to traditional security techniques (e.g., AEAD).

### Alibaba Cloud

Hangzhou, China

*Research Intern, supervised by Dr. Sheng Wang and Dr. Wenchao Zhou*

Sept 2020 – May 2021

- Worked on designing and implementing a cloud database providing data and execution integrity that can be verified by the users.
- Improved the performance of the verification process by introducing multiple verifiers and a mechanism to assign workloads to different verifiers. The improvement therefore allowed multiple transactions to be executed concurrently.
- Implemented database operators such as joins and scans with the additional steps needed for verifications, with which the database supported relational queries rather than only key-value lookup.

### University of Pennsylvania

Philadelphia, PA

*Research Intern, Advisor: Dr. Vincent Liu*

Jul 2019 – Dec 2019

- Conducted research on the impact of disaggregated data centers on the design of relational databases.
- Developed microbenchmarks of nested loop join, hash join, and grace hash join operators and investigated the relationship between local memory size, the number of remote memory access and the performance degradation of each operation.
- Added features such as relative paths to LegoOS (a disaggregated operating system) by adding more system calls in order to deploy complex systems such as PostgreSQL and MonetDB on it.
- Analyzed the performance drawbacks of existing disaggregated operating systems for query executions and outlined potential solutions.

## TEACHING

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*Teaching Assistant, University of Pennsylvania*

- CIS 505 Software Systems, Fall 2021
- CIS 505 Software Systems, Fall 2022

## SERVICES

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*Reviewer, Journals*

- IEEE Transactions on Information Forensics and Security (TIFS)
- IEEE Internet of Things Journal (IoTJ)