Cai, Yifan

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EDUCATION

University of Pennsylvania — Philadelphia, PA
Master of Science in Computer & Information Science — 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 *46th 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 Xinping Guan.
In the *57th IEEE Conference on Decision and Control (CDC), 2018*

EXPERIENCES

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

Teaching Assistant, University of Pennsylvania

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

SERVICES

Reviewer, Journals

- IEEE Transactions on Information Forensics and Security (TIFS)
- IEEE Internet of Things Journal (IoT-J)
- ACM Transactions on Embedded Computing Systems (TECS)