

# MINGYU GUAN

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## EDUCATION

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### Georgia Institute of Technology

Ph.D in Computer Science

Aug. 2019 - Present

(GPA:4.0) Atlanta, GA

### The Chinese University of Hong Kong(CUHK)

B.S. in Computer Science with Honours, First Class

Aug. 2017 - May. 2019

(GPA:3.5) Hong Kong, China

### Sun Yat-Sen University(SYSU)

B.S. in Electronic Information Science (2+2\*)

Sep. 2015 - Jun. 2017

(GPA:4.0) Guangzhou, China

\*A joint program offered by SYSU and CUHK.

## RESEARCH EXPERIENCE

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### Graduate Research Assistant

*Advisors: Taesoo Kim and Anand Iyer*

May. 2020 - Present

*Georgia Institute of Technology, Atlanta*

- Built graph deep learning and graph processing systems for real-world graphs with billions of edges;
- Built general ML training and serving systems optimized for large-scale data and models;
- Leveraged machine learning techniques such as GNNs and Generative AI (LLMs) to cross-domain problems such as blockchain analytics and cloud security.

### Research Intern

*Advisor: Jay Stokes*

May. 2022 - Aug. 2022

*Microsoft Research, Redmond*

- Designed and implemented a novel heterogeneous Graph Neural Network (GNN) for compromised email detection, which encodes heterogeneity of graphs efficiently by considering both path and hop information;
- Outperformed state-of-the-art solutions in terms of accuracy and scalability;
- Cooperated with a research team and a product team to construct heterogeneous graphs from a large-scale noisy enterprise email data set and built an automatic system for detecting compromised email accounts.

### Undergraduate Research Assistant

*Advisor: James Cheng*

May. 2018 - Apr. 2019

*The Chinese University of Hong Kong, Hong Kong*

- Supported Distributed Online Analytical Processing (OLAP) on Husky, which is a general-purpose distributed computing system developed by the system laboratory at CUHK;
- Used the platform of Husky to implement the By-Layer cubing algorithm in Apache Kylin;
- Implemented SQL engine and customized query optimization rules on Husky using Apache Calcite.

## SELECTED PROJECTS

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### System for Dynamic Graph Neural Networks at Scale

May. 2021 - Present

- Supported efficient dynamic GNN training in large-scale distributed settings;
- Leveraged computational structure in the GNN-RNN approach to propose cross-layer optimizations;
- Accelerated DGNN training by reusing intermediate results and incrementally computing graph aggregations to eliminate redundant computations;
- Designed a two-level cache store to support the reusable optimizations and a new cache policy that is aware of the computation pattern of DGNNs;
- Enabled efficient distributed training that reserves both structure and time dependencies in dynamic graphs;
- Outperformed existing state-of-the-art GNN frameworks by up to 10.7x on a number of dynamic GNN architectures and workloads.

### Telemetry Analytics to Secure Cloud Computing

Jun. 2023 - Sep. 2023

- Built an analytic platform by leveraging GNNs and Large Language Models(LLMs) to analyze and monitor anomalies on cloud telemetry data, such as syscall logs and network data;

- Modeled network TCP data as graphs and utilized GNNs to be the graph encoders that are aligned with LLMs through iterative training;
- Conducted anomalous pattern detection based on the GNN-LLM prediction and achieved 92.3% accuracy on a real-world cloud dataset.

### Processing Billion-scale Dynamic Graphs on a Single Machine Jan. 2020 - Jul. 2021

- Introduced the design of cell abstraction, allowing a significant reduction in overall storage space as well as enabling a simple, yet effective load-balancing strategy;
- Proposed an API and execution model tailored for streaming graphs by incorporating a hybrid edge- and vertex-centric API coupled with the *edgeChanged* API to allow a timely reaction to graph changes;
- Designed a technique for concurrent analytics on streaming graphs, which fully exploits the similarities in data access among concurrent graph processing jobs.

### Automating Massively Parallel Heterogeneous Computing Jan. 2020 - May. 2021

- Modeled input program as a hierarchical data flow graph (HDFG) to perform a set of graph-based operations and transformations for automatic optimization and parallelization;
- Performed purity checking automatically by traversing abstract syntax tree(AST) module;
- Inferred types of variables and objects automatically with both static analysis and dynamic analysis.

### System for Serving ML Inference Pipelines Sep. 2019 - Dec. 2019

- Implemented serving models in docker containers across ML frameworks such as TensorFlow and PyTorch;
- Used *Ray Serve* as the base platform to communicate with containers via RPC;
- Supported pipeline and batched queries functionality.

## PUBLICATION

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Mingyu Guan, Anand Padmanabha Iyer, and Taesoo Kim. DynaGraph: Dynamic Graph Neural Networks at Scale. *In Proceedings of the 5th ACM SIGMOD Joint International Workshop on Graph Data Management Experiences & Systems and Network Data Analytics (GRADES-NDA)*, Philadelphia, PA, June 2022.

## HONORS AND GRANTS

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2023	<b>Student Travel Grant</b> , 17 <sup>th</sup> USENIX OSDI	Boston, MA
2019	<b>Deans List</b> , CUHK	Hong Kong, China
2019	<b>Rev Mak Shuet Kwong Memorial Scholarship</b> , CUHK	Hong Kong, China
2017	<b>First Prize Academic Scholarship</b> , SYSU	Guangzhou, China
2016	<b>Second Prize Academic Scholarship</b> , SYSU	Guangzhou, China
2016	<b>Jetta Scholarship for Outstanding Students</b> , SYSU	Guangzhou, China

## TEACHING EXPERIENCE

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**Graduate Teaching Assistant** Georgia Institute of Technology, Atlanta

- CS8803 Systems for AI: Large Language Models, Spring 2024
- CS3251 Computer Networking, Spring 2020

## SKILLS

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**Language** C++, C, Python, SQL  
**Frameworks** PyTorch, TensorFlow, JAX/Flax, DGL, PyG, gRPC, Hadoop  
**Tools** L<sup>A</sup>T<sub>E</sub>X, Docker, Git, OpenAI API