Caleb J. Wang

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Dual citizen of the *United States of America* & *Taiwan*

Education

Northwestern University — Evanston, IL, USA

Ph.D. Candidate in Computer Science — *Sep. 2022 – Present*

Advised by Prof. Fabian E. Bustamante @ *AquaLab*

National Taiwan University — Taipei, Taiwan

Master of Science in Communication Engineering — *Feb. 2020 – Jun. 2021*

Thesis: *Discovering Twitch's Video Delivery Infrastructure Utilizing Cloud Services and VPNs*

Advised by Prof. Polly Huang

Bachelor of Science in Electrical Engineering — *Sep. 2015 – Jan. 2020*

Research Experience

AquaLab, Northwestern University — Evanston, IL, USA

Research Assistant, Advised by: Prof. Fabian E. Bustamante — *Sep. 2022 – Present*

∗ **Network Responses to Submarine Cable Disruptions:** Submarine cable failures routinely disrupt Internet connectivity, yet systematic methods to assess how networks respond remain lacking. In this project, we develop a measurement-driven approach using traceroute data to characterize failure response strategies. By analyzing link-level path changes, we infer whether traffic is rerouted locally or externally, and discover substantial variation in operator responses ranging from seamless circuit-level protection to complete disconnection.

∗ **Submarine Cable Network Criticality:** The submarine cable network is a critical infrastructure that underpins the global Internet. However, little is known about the importance of specific cables and landing stations within a given region. In this project, we leveraged submarine and terrestrial cable maps to develop a system that maps network-layer measurements to their underlying network infrastructure and derived metrics to evaluate the relative importance of submarine cables and landing stations in different regions.

∗ **Investigation of IP geolocation Techniques:** In an attempt to develop a local IP geolocation service, we implemented an active geolocation technique (`single-radius`), and evaluated the efficacy of its vantage point selection strategy. We integrated efforts from `Manycast2`, `sc_hoiho`, and `single-radius` to build a geolocation pipeline that focuses on core Internet infrastructure.

Cisco ThousandEyes — San Francisco, CA, USA

Ph.D. Research Intern, Reported to Dr. Arian Niaki & Dr. Abbas Razaghpanah — *Jun. 2025 – Sep. 2025*

∗ **Root Cause Identification of Network Events** (*research blog*)**:** Attributing the root cause of a network failure is challenging because each connection spans across multiple networks whose operations are opaque to outside observations. End-to-end monitoring can detect failure occurrences, but lacks the granularity required to localize the issue or identify the responsible entity. In this effort we analyze large-scale topology measurements and developed a system to attribute the root cause of network issues to specific entities at the interface, network, and country level.

Cisco ThousandEyes — San Francisco, CA, USA

Ph.D. Research Intern, Reported to Dr. Kyle Schomp & Dr. Arash Molavi — *May. 2024 – Aug. 2024*

∗ **Bringing State into IP geolocation** (*research blog*)**:** IP geolocation is the process of mapping a logical IP address to a geographical entity. Latency-based approaches typically rely on stateless evaluations of Round-Trip-Time (RTT) from known vantage points. In this study, we investigate the advantages of integrating state information into the geolocation process and assess the effects of reducing the confidence of vantage point locations.

Internet Initiative Japan — Tokyo, Japan

Research Intern, Reported to Dr. Romain Fontugne & Dr. Kenjiro Cho — *Aug. 2024 – Sep. 2024*

∗ **Mapping Critical Network Infrastructure:** The Internet is built upon layers of critical network infrastructure, including Internet Exchange Points (IXPs) and submarine cables. In this analysis, we examine how different regions across the world depend on IXPs and submarine cables to access popular content and Internet services. We also highlight the risks associated with network routes concentrating around a few critical pieces of infrastructure.

Network & Systems Lab, National Taiwan University — Taipei, Taiwan

Research Assistant, Advised by Prof. Polly Huang — *Jan. 2020 – Jun. 2021*

∗ **Exploring Twitch's Video Delivery Infrastructure:** Twitch is a global live streaming platform primarily focused on video gaming. In this project we built Jujuby to measure Twitch's video delivery mechanism at scale. We deployed Jujuby on over 20 vantage points across the globe and performed a longitudinal analysis of the scale and coverage of Twitch's Content Delivery Network (CDN).

Publications

Refereed Conferences

[C1] *Threading the Ocean: Mapping Digital Routes Across Submarine Cables using Calypso.* **Caleb J. Wang**, Ying Zhang, Qianli Dong, Esteban Carisimo, Ramakrishnan Durairajan, Fabián E. Bustamante. *In proceedings of the ACM SIGCOMM 2025 (shorts) Conference, Coimbra, Portugal.*

[C2] *Ten years of the Venezuelan crisis - An Internet perspective.* Esteban Carisimo, Rashna Kumar, **Caleb J. Wang**, Santiago Klein, Fabian E. Bustamante. *In proceedings of the ACM SIGCOMM 2024 Conference, Sydney, Australia*

[C3] *A Hop Away from Everywhere: A View of the Intercontinental Long-haul Infrastructure.* Esteban Carisimo, **Caleb J. Wang**, Mia Weaver, Fabian E. Bustamante, Paul Barford. *In the proceedings of the ACM on Measurement and Analysis of Computing Systems (SIGMETRICS'24), Venice, Italy*

[C4] *Jujuby: Design and Deployment of a Crawler for Twitch CDN Mapping.* **Caleb Wang**,Yuan-Tai Lui,Polly Huang. *In proceedings of the 17th Asian Internet Engineering Conference (AINTEC'22), Hiroshima, Japan*

Posters & Workshops

[P1] *Towards Cost Effective Server Population Estimation: A Case Study of Twitch.* **Caleb Wang**, Hsi Chen, Polly Huang. *In the proceedings of the Web Conference 2020 (WWW'20), Taiwan, Taipei*

[P2] *Twitch's CDN as an Open Population Ecosystem.* Wei-Shiang Wung, **Caleb Wang**, Hsi Chen, Yuan-Tai Lui, Cheng Hsu, Guan-Ting Ting, Polly Huang. *2020. ACM SIGCOMM 2020 Conference*

Work Experience

Microsoft Taiwan Taipei, Taiwan

Customer Engineer *Aug. 2021 – Jun. 2022*

∗ **GCR - Customer Success:** As an engineer under the Customer Success Unit, I was responsible for proactively engaging with customers to ensure the effective adoption of Microsoft services and solutions. I provided technical consultation on SQL Server and PowerBI for Taiwanese SMC & government agencies and developed custom IPs (intellectual properties) for Microsoft Synapse and Databricks.

AI R&D Center, Microsoft Taiwan Taipei, Taiwan

Software Engineer Intern *Sep. 2019 – Jun. 2021*

∗ **Document Intelligence:** As a software engineer intern, I implemented a CI pipeline to ensure synchronization of containerized environments across development teams and reduced 50% testing overhead by automating the testing CI/CD pipeline for production containers.

∗ **Partner Technology, Hong Kong:** As part of the Partner Technology team, I worked with Microsoft partners in Hong Kong on developing custom AI solutions, leading to case wins in financial, insurance, legal, and government sectors. I reduced service evaluation overhead from days to minutes by implementing a demonstration platform for partners to quickly evaluate Azure services.

Yoctol.AI Taipei, Taiwan

Data Scientist Intern *Jul. 2018 – Aug. 2018*

∗ **Speaker Identification:** As a data scientist intern, I trained a speaker identification model based on a Siamese architecture with Tensorflow, and hosted the model as a backend for a web-based speaker identification service using Flask, Redis and Tensorflow serving.

Skills

Languages: Python, SQL, JavaScript, C/C++, Bash
Data & ML: Spark, PySpark, Django, PyTorch
Datastores: ClickHouse, MongoDB, PostgreSQL, Redis
DevOps & Tools: Azure DevOps, Git, Docker, Jira

Teaching Experience

CS 345: Distributed Systems, Northwestern University

Teaching Assistant *Spring 2024 & Spring 2025*

Computer Networks, National Taiwan University

Teaching Assistant *Fall 2020*

Machine Learning, National Taiwan University

Head Teaching Assistant *Fall 2018 & Fall 2019*