

Caleb Wang

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Research Interests

Network Topology, Submarine Cable Network, Active IP Geolocation, Network Measurements, Internet Centralization

Education

Northwestern University

PH.D. IN COMPUTER SCIENCE

- Joined AquaLab & advised by Prof. Fabián Bustamante

Evanston, Illinois, USA

Sep. 2022 - Present

National Taiwan University

M.S. IN COMMUNICATION ENGINEERING

- Network and Systems Lab advised by Prof. Polly Huang
- Thesis: *Discovering Twitch's Video Delivery Infrastructure Utilizing Cloud Services and VPNs*

Taipei, Taiwan

Feb. 2020 - Jun. 2021

B.S. IN ELECTRICAL ENGINEERING

Sep. 2015 - Jan. 2020

Research Experience

AquaLab, Northwestern University, Advisor: Prof. Fabián Bustamante

Evanston, Illinois, USA

RESEARCH ASSISTANT

Sep. 2022 - Present

- Topic: *Criticality of the Submarine Cable Network*
 - Researched on **strategies to bridge network layer measurements to underlying physical network infrastructure** including submarine and terrestrial cables
 - Developed a system that infers the **physical network infrastructure being traversed** given an end-to-end network layer measurement
 - Proposed **three empirically derived metrics** to understand the relative importance of submarine cables, capture an entity's reliance on a set of cables, and measure the relative importance of a landing point
 - Conducted case studies of submarine cable and landing point characteristics for different countries across major regions over the world
- Topic: *IP geolocation techniques*
 - Implemented and evaluated the performance of an active IP geolocation engine (**single-radius**) on a global measurement platform
 - Investigated the effectiveness and efficiency of the vantage point selection strategy of **single-radius**
 - Leveraged previous IP geolocation efforts (**Manycast²**, **sc_hoiho**, **IPMap**) to develop a *server IP* geolocation pipeline

Network and Systems Lab, National Taiwan University, Advisor: Prof. Polly Huang

Taipei, Taiwan

MASTER STUDENT

Jan. 2020 - Jun. 2021

- Designed and implemented a crawler (*Jujuby*) leveraging public and private APIs to collect IP-based user redirection information from a global live streaming platform (Twitch)
- Conducted a global-scale data collection of Twitch's client redirection scheme by scheduling *Jujuby* on 20+ vantage points
- Performed a longitudinal analysis of the size and geolocation of Twitch's Content Delivery Network (CDN)

Speech Processing Lab, National Taiwan University, Advisor: Prof. Lin-shan Lee

Taipei, Taiwan

UNDERGRADUATE RESEARCHER

Sep. 2017 - Jul. 2018

- Built a generative VAE model using a sequence-to-sequence architecture with GRUs and attention layers to transform the speaker identity of uttered speech
- Analyzed latent variable interpretability in VAEs for prosody conversion

Publications

CONFERENCE PAPERS

SIGMETRICS 2024

Esteban Carisimo, **Caleb Wang**, Mia Weaver, Fabián Bustamante, Paul Barford, "*A hop away from everywhere: A view of the intercontinental long-haul infrastructure*"

AINTEC 2022

Caleb Wang, Yuan-Tai Liu, Polly Huang, "*Jujuby: Design and Deployment of a Crawler for Twitch CDN Mapping*"

CONFERENCE POSTERS

WWW 2020

Caleb Wang, Hsi Chen, Polly Huang, "*Towards Cost Effective Server Population Estimation: A Case Study of Twitch*"

SIGCOMM 2020

Wei-Shiang Wung, **Caleb Wang**, Hsi Chen, Yuan-Tai Lui, Cheng Hsu, Guan-Ting Ting, Polly Huang, "*Twitch's CDN as an Open-Population Ecosystem*"

Teaching Experience

National Taiwan University

Taipei, Taiwan

COMPUTER NETWORKS, TEACHING ASSISTANT

Fall 2020

MACHINE LEARNING, HEAD TEACHING ASSISTANT

Fall 2019

- Established an online grading system to grade assignments and rank scores automatically
- Designed a system consisting of an inferencing backend (*Flask, PyTorch*), API and OAuth login servers (*Node.js*), database (*MongoDB*) and a web server/load balancer (*Nginx*)
- Isolated services by docker and container orchestration by docker-compose

MACHINE LEARNING, TEACHING ASSISTANT

Fall 2018

Work Experience

Microsoft, Taiwan

Taipei, Taiwan

CUSTOMER ENGINEER

Aug. 2021 - Jun. 2022

- Developed and managed custom IPs for Microsoft Synapse & Databricks
- Provided technical consultancy on SQL server and PowerBI for corporations & government agencies

SOFTWARE ENGINEERING INTERN

Sep. 2019 - Jun. 2021

- Worked with engineers on the containerization of development environments and constructed a CI pipeline to ensure strict synchronization of environments across multiple teams
- Engineered a release pipeline to automate the testing of production containers, resulting in a 50% testing time reduction
- Collaborated with sales team on developing AI solutions, which directly influenced case wins in various industries including manufacturing, finance, insurance, legal, and government services
- Sped up service evaluation from days to minutes for partners by establishing a website on Azure App Service to demonstrate cloud services on Azure, minimizing the impact of technical difficulties on business agreements

RESEARCH & DEVELOPMENT INTERN, AIoT

Sep. 2018 - Sep. 2019

- Engineered a data collection pipeline using Azure Databricks and CosmosDB to collect, transform and store real-time rainfall information for model training
- Implemented 7+ APIs of an audio command recognition service to support building a voice-controlled robot for a local vendor

Yoctol.AI

Taipei, Taiwan

DATA SCIENTIST INTERN

Jul. 2018 - Aug. 2018

- Trained a speaker identification model based on a Siamese architecture with Tensorflow
- Designed and built a web-based speaker identification service using Flask, Redis and Tensorflow serving

Leadership

Graduate Institute of Communication Engineering, National Taiwan University

Taipei, Taiwan

VICE PRESIDENT OF STUDENT ASSOCIATION

Jun. 2020 - Jun. 2021

- Assisted GICE with recruiting new graduate students
- Hosted team building activities to reinforce relationships between students and GICE

Department of Electrical Engineering, National Taiwan University

Taipei, Taiwan

DIRECTOR OF DEPARTMENT MUSIC FESTIVAL

Dec. 2017

- Organizer of a cross-department music festival with over 500 students and participants
- Managed the event advertisement by owning a Facebook fan page and engaging in audience interaction activities
- Negotiated with sponsors to provide beverage and venue support

Skills

Programming

Python, JavaScript(Node.js, React), C/C++, Bash script

Frameworks

Nginx, Flask, Django, MongoDB, Redis, MySQL, PyTorch

DevOps

Azure DevOps, git, docker, docker-compose

Selected Courses

Northwestern University

Advanced Networking, Internet-Scale Experiments, Scalable Software Architectures, Law and Digital Technology, Visualization for scientific communication

National Taiwan University

Virtual Machines, High Performance Computing, Machine and Deep Learning, Advanced Computer Networks, Operating Systems