Tung-Chun Chang

Irvine, CA, 92617 | Phone: +1 949-346-6149 | Email: tungchuc@uci.edu
https://www.linkedin.com/in/tung-chun-chang

SUMMARY

A researcher with over 5 years of experience in analysis and algorithmic optimization. More than ten years of experience in computer programming. Team-oriented, with experience in diverse collaborative projects across the globe and many specialties. Eager to learn new technologies and systems.

EDUCATION

University of California, Irvine, USA | **Ph.D. in Computer Science** Exp. Jun. 2024
National Tsing Hua University, Taiwan | **M.S. in Computer Science** Jan. 2016
National Chung Hsing University, Taiwan | **B.S. in Computer Science & Engineering** Jun. 2013

SKILLS & COURSE

Python, C/C++, Java, MATLAB, Linux, Shell script, Apache Spark, Hadoop, Amazon EMR, MongoDB, MySQL, Postgresql, NodeJS, Data Structures, Algorithms, API Design, System Design, Operating Systems, Object-Oriented Design, NS3 (network simulator), Computer Networks, Machine learning, Network analysis, Multithreaded-programming, Wireless Networking, Online Social Networks

EXPERIENCE

Department of Computer Science, University of California, Irvine Sep. 2019 – Present

Graduate Student Researcher

Implementation of a Data Pipeline for a Safety Monitoring System in Wildfire Prevention Operations

- Led a sub-project of an interdisciplinary and cross-campus project and collaborated with **forestry and fire model experts** from UC Berkeley and UC Irvine
- Implemented a **data pipeline** that collects data from sensors/cameras and transmits the data via an **MQTT broker** to a **PostgreSQL** database in a server
- Implemented a pipeline with **Python** to execute two C++-based open-source simulators (wind and fire) to **automatically** and **continuously** generate data for modeling abnormal fire behaviors
- Modeled the dangerous level with a probability of anomalies by analyzing simulation results with a **regression neural network** developed by **Keras** with **Python**

Algorithm Design for Deploying Sensing, Networking, and Computing Devices in Smart Communities

- Designed algorithms to determine devices' location and the data flows on devices to implement applications, such as wildfire detection and air quality monitoring, in smart communities
- Implemented a simulator with **Python** to evaluate the proposed algorithms, which enable a 2x - 7x improvement in cost/performance metrics
- Built a web **prototype** by **Vue** (front-end) and **Node.js** (back-end) with **MongoDB** (database) with a team of **3 members** from Paris, Taiwan, and the U.S. within **5 months**

Teaching Assistant

ICS 45C Programming in C++ as a Second Language (241 Students)

- Provided weekly one-on-one assistance (debugging, **unit testing**, data structure, concept clarification, object definition, etc.) to students for their projects and homework assignments
- Evaluated students' projects (total of four) in terms of correctness and quality of codes

CS230P Distributed Systems (Graduated Level)

- Lectured Hadoop framework, Map-Reduce schema, and the configuration of Amazon EMR on AWS in a 27-student class
- Advised students on the topic decision, tool selection (e.g., Hadoop, Spark, Kafka, etc.), system framework, and problem-solving for projects

CS132 Computer Networks

- Lectured three classes with around 20 students weekly to understand homework with topics of **TCP/IP**, MAC protocols, circuit/packet switching, routing, BGP, etc.

BANA 295 Big Data Management Systems

- Assisted students with implementation questions related to **SQL**, Apache Hadoop, Apache Spark, **AWS S3,** and AWS EMR setup
- Helped students clarify concepts in database systems, e.g., SQL, NoSQL, relational databases, big data processing, etc.

Course Project

Distributed Data Stream of Internet of Things Data Simulation in Hadoop/Spark Framework

- Implemented data I/O of the generated data with **Map-Reduce** by using **Java** in the **Hadoop** framework, e.g., storing data in the Hadoop file system and accessing data based on user queries
- Distributed the data generator to different machines by **Apache Spark** on **AWS EMR**

Academia Sinica, Taipei, Taiwan Mar. 2016 – Aug. 2019

Research Assistant (Substitute Military Service)

Design and Implementation of a Traffic-Aware Sensor Grouping Algorithm in IEEE 802.11ah Networks

- Designed and implemented a sensor grouping algorithm (with **C++**) that considers network traffics and successful transmission probability in IEEE 802.11ah networks
- Modeled the successful transmission probability of sensors by a **log regression** on the results of a network simulator, **NS-3**
- Implemented the regression model with **Matlab**, which derives a maximum error of 5.82%
- Evaluated the algorithm in NS-3, which improves the channel with the worst network utilization by up to 24.6%

Research in Redemption Maximization of Social Coupon (Referral Links) in Online Social Networks

- Proposed a novel research problem in online social networks, which allocates coupons to users for distribution to maximize the redemption rate of social coupons
- Modeled the online social network as a graph and applied a **graph-theoretical method** to design an algorithm with an **approximation ratio** (mathematical guaranteed performance)
- Directed an intern to develop the algorithm with C++, evaluated the algorithm in real social network data set with **5.5M nodes** and **86M edges**
- Improved the redemption rate of social coupons by 30 times as compared to real company policies, such as Airbnb and Dropbox

Research in Mathematical Optimization in Edge Pool Mining Management for Self-Sustainable IoT

- Proposed a blockchain-based edge pool mining scheme for IoT devices to self-sustain by exchanging resources and mining cryptocurrency (with rented and own computing power)
- Modeled the problem by the Stackelberg game model, proved the existence of an equilibrium (IoT devices would not rent from other companies) by **linear programming optimization**
- Evaluated the proposed algorithm, which improved 1.62 times of profit for the computation-renting company, and the IoT devices can sustain (enough income to cover the expense) themselves

Design of a Supervised Learning Method for Gait Analysis based on Time-Series Sensor Data

- Implemented an iPhone application with **Objective-C** to collect data from a 6-axis inertial sensor (accelerometer and gyroscope) attached to shoes via Bluetooth
- Processed the **time-series data/signal** from the 6-axis inertial sensor to extract a chunk of data that represents a step
- Designed and implemented an analysis model of **Support Vector Machine** for unusual gait from the 6-axis inertial sensor data collected while humans were walking

Design and Implementation of an Analysis Tool for Pattern Recognition in Fly Brains

- Collaborated with **neuroscientists** at National Tsing Hua University to design a pattern recognition tool in fly brains
- Modified and Implemented a Map-Reduced algorithm that enumerates all subgraphs (possible patterns) in a fly brain modeled as a graph by **C++** with the **multi-threaded** scheme

Linux Server Management

- Managed three lab servers with **Ubuntu** system including system updating, user management, package installation, etc.

Participation of a Study Group of Research Problem in Networking

- Discussed research papers related to problems in **Software Defined Networks**, **Network Function Virtualization**, **Multicasting**, **Network Flow Control**, etc.

Knock Knock, Hsinchu, Taiwan Feb. 2014 – Jun. 2014

Co-founder, Knock Knock - a dating app providing only texting within a limited time

- Designed and implemented an online dating application, which was **first place** in the top new free (social) in **Google play** in Taiwan
- Implemented a **server** to exchange messages between users through Google Cloud Messaging

PUBLICATIONS (Google Scholar)

- **T.-C. Chang**, et al., *"SmartParcels: Cross-Layer IoT Planning for Smart Communities,"* ACM/IEEE IoTDI, May 2021 (**acceptance rate: 25%**, **Oral Presentation**)
- **T.-C. Chang**, et al., *"SmartParcels: A What-If Analysis and Planning Tool for IoT-Enabled Smart Communities: Demo Abstract*," ACM/IEEE IoTDI, May 2021 (**Oral Presentation**)
- **T.-C. Chang**, et al., "*Seed Selection and Social Coupon Allocation for Redemption Maximization in Online Social Networks*," IEEE International Conference on Data Engineering, April 2019
- **T.-C. Chang**, et al., "*Traffic-Aware Sensor Grouping for IEEE 802.11ah Networks: Regression Based Analysis and Design*," IEEE Transactions on Mobile Computing, May 2018 (**47 citations**)
- **T.-C. Chang**, et al., "*Load-Balanced Sensor Grouping for IEEE 802.11ah Networks*," IEEE Global Communications Conference (GLOBECOM), December 2015 (**49 citations**, **Oral Presentation**)