

# Te-Yi “Dexter” Kan

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## Research Interests

Privacy-preserving ML Systems, Edge Computing, Task Scheduling, Resource Management, Vehicular Networking, Intelligent Reflecting Surfaces (IRSs), MIMO Detection.

## Education

### University of Southern California

Ph.D. - Electrical and Computer Engineering with **Dr. Konstantinos Psounis**, GPA: 3.91/4.00

Aug. 2022 - Expected May 2027

### University of California, Los Angeles

M.S. - Electrical and Computer Engineering, GPA: 3.74/4.00

Sep. 2019 - Dec. 2020

### National Taiwan University

B.S. - Electrical Engineering, GPA: 3.89/4.30

Sep. 2014 - Jan. 2019

## Publications

- [1] **Te-Yi Kan**, Konstantinos Psounis, “Low-Latency Private ML inference for Vision Tasks in Distributed Environments”, *Privacy Enhancing Technologies (PoPETs)*, 2024, submitted. (PET-24)
- [2] **Te-Yi Kan**, Konstantinos Psounis, “Online distributed offloading of time-sensitive vehicular tasks in edge-cloud systems”, *IEEE Transactions on Vehicular Technology*, 2024, submitted. (TVT-24)
- [3] **Te-Yi Kan**, Ronald Y. Chang, Feng-Tsun Chien, “Hybrid Intelligent Reflecting Surface and Classical Relay Assisted Multiuser MISO Systems”, *IEEE Transactions on Vehicular Technology*, 2023. (TVT-23) | 🌐
- [4] Tz-Wei Mo, Ronald Y. Chang, **Te-Yi Kan**, “DeepMCTS: Deep Reinforcement Learning Assisted Monte Carlo Tree Search for MIMO Detection”, *2022 IEEE 95th Vehicular Technology Conference: (VTC2022-Spring)*, 2022. (VTC-22) | 🌐
- [5] **Te-Yi Kan**, Ronald Y. Chang, Feng-Tsun Chien, “Intelligent Reflecting Surfaces and Classical Relays: Coexistence and Co-Design”, *2021 IEEE Globecom Workshops (GC Wkshps)*, 2021. (GC-21). | 🌐
- [6] **Te-Yi Kan**, Yao Chiang, Hung-Yu Wei, “QoS-aware Mobile Edge Computing System: Multi-server Multi-user Scenario”, *2018 IEEE Globecom Workshops (GC Wkshps)*, 2018. (GC-18) | 🌐
- [7] **Te-Yi Kan**, Yao Chiang, Hung-Yu Wei, “QoS-aware Fog Computing System: Load Distribution and Task Offloading”, *The 15th IEEE Vehicular Technology Society Asia Pacific Wireless Communications Symposium (IEEE VTS APWCS)*, 2018. (APWCS-2018) | 🌐
- [8] **Te-Yi Kan**, Yao Chiang, Hung-Yu Wei, “Task Offloading and Resource Allocation in Mobile-Edge Computing System”, *2018 27th Wireless and Optical Communication Conference (WOCC)*, 2018. (WOCC-18) | 🌐

## Skills

### Programming Software & APIs

Python, C/C++, Matlab, R, Java,  $\text{\LaTeX}$   
OpenStack, Docker, Kubernetes, TensorFlow, PyTorch, scikit-learn, Keras

## Research Experience

### Research Assistant - Dr. Konstantinos Psounis, USC

Feb. 2023 - Present

#### Privacy-Preserving ML Systems [PET-24]

- Developed a pipeline that includes a sensitive object detector, scheduler, and obfuscator to protect user privacy while maintaining task utility during ML inference for vision tasks.
- Leveraged distributed remote servers for privacy-preserved image processing, ensuring a seamless user experience while safeguarding private information.
- Experiment results show that our proposed system achieves approximately 30% utility boost without compromising user privacy and can operate at around 25 fps.

#### Online distributed offloading of time-sensitive vehicular tasks in edge-cloud systems [TVT-24]

- Investigated task offloading mechanism in edge-cloud computing systems for time-sensitive ML tasks to support future advanced driving assistance systems and automated driving systems.
- Developed a threshold-based online distributed offloading and resource allocation mechanism (TODORA) to reduce task duration by optimizing task offloading decisions and resource allocation.
- Verified by simulation, TODORA outperforms the state-of-the-art schemes.

**Intelligent Reflecting Surface (IRS) [TVT-23, GC-21]**

- Proposed a coexistence system that a multiuser downlink MISO communication is assisted by a coexisting full-duplex IRS and half-duplex decode-and-forward relay.
- Designed an alternating optimization based algorithm to maximize the sum-rate of all the users by jointly optimizing the active beamforming at the base station, the active beamforming at the relay, and the passive beamforming at the IRS.
- Validated the superiority of the proposed coexistence system by simulations and provided insightful discussion about the tradeoffs in the design of joint beamforming.

**Multiple-input multiple-output (MIMO) Detection [VTC-22]**

- Devised a novel deep reinforcement learning (DRL)-enhanced method, which incorporates DRL into Monte Carlo tree search (MCTS), to improve MIMO detection.
- Verified by simulations that our DRL-based scheme achieves significant performance and complexity advantages over the original MCTS detection algorithm under varying channel conditions.

**Undergraduate Researcher - Dr. Hung-Yu Wei, NTU**

Sep. 2016 - Aug. 2018

**Multi-access Edge Computing (MEC) Systems [GC-18, APWCS-18, WOCC-18]**

- Investigated task offloading in MEC system and developed Quality of Service (QoS)-aware MEC systems for both single-server and multi-server scenarios to reduce execution latency of mobile applications.
- Introduced a two-stage algorithm for QoS maximization by optimizing task offloading, resource allocation, and load distribution.
- Numerically examined the superior performance of the proposed algorithm over several benchmarks.

## Work Experience

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**Member, Academia Sinica-MediaTek Collaborative Project**

Oct. 2021 - May 2022

- Proposed and collaborated with MediaTek research team on the project, "AI-Enabled Hybrid Reconfigurable Intelligent Surface (RIS) and Relay Systems for 6G Communications."
- Designed a hybrid RIS/relay system where RISs and traditional relays coexist to enhance system performance in terms of energy efficiency and sum-rate.
- Analyzed the characteristics of hybrid RIS/relay systems at mmWave and THz hands.

**Summer Intern, Foxconn Technology Group**

Jun. 2017 - Aug. 2017

Foxconn's Advanced Communication Academy (FACA), 5G team

- Implemented a commercial MEC infrastructure within a 15-person team to enable lifecycle management of MEC services.
- Design a hybrid fog/cloud platform for facial detection and video streaming.
- Contributed to building a face-based access control and attendance system powered by MEC via OpenStack.

## Selective Projects

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**Operating System Implementation**

Spring 2024

- Completed Brown University's kernel assignment project to build a simple operating system called Weenix.
- Implemented essential elements for an operating systems, including but not limited to process, thread, scheduler, virtual file system, and virtual memory.

**Reinforcement Learning (RL)-Based Mechanism for Loss Reduction during the COVID-19 Outbreak**

Spring 2020

- Developed RL-based algorithms to provide appropriate business strategies for the food and beverage industry.
- Simulated the proposed RL-based algorithms to verify the superiority of our proposed methods in comparison to baselines.

**Generative Adversarial Imitation Learning (GAIL)**

Spring 2020

- Implemented an imitation learning algorithm that can be scaled up to large and high-dimensional environments with Python.
- Evaluated the imitation algorithm in the OpenAI environment such as Pendulum and Cartpole and showed that the proposed GAIL algorithm outperforms the common baseline, Behavior Cloning.

**Image Generation Methods for Cataract Surgery**

Winter 2020

- Applied two deep learning-based frameworks, U-Net and U-Net+WGAN, to segment the images of eye structures.
- Evaluated the two frameworks with respect to three metrics, pixel accuracy, mean IoU, and F1 score, and also compared the results with our self-labeled data.

**Functionally Reduced And-Inverter Graph (FRAIG)**

Fall 2016

- Implemented a special circuit representation, FRAIG (Functionally Reduced And-Inverter Graph), with C from a circuit description file and designed a data structure to identify functionally equivalent candidate pairs in the circuit.
- Performed hash, Boolean logic simulations, and Boolean Satisfiability (SAT) solver to detect equivalence in a circuit.