Kai-Chieh Hsu

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Research Interests

Machine Learning Reinforcement Learning (RL) and Neural Networks for robotics and healthcare applications

Signal Processing Compressed Sensing and VLSI implementation

Education

Princeton University (PU)

Princeton, NJ

Ph.D. in Electrical Engineering — Sept. 2019 - PRESENT

- Achieved 4.0/4.0 GPA

National Taiwan University (NTU)

Taipei, Taiwan

B.S. in Electrical Engineering — Sept. 2014 - Jan. 2019

- Achieved 4.19/4.30 overall GPA and 4.19/4.30 major GPA
- Ranked in top 5% by cumulative GPA
- Research Advisors: Prof. An-Yeu (Andy) Wu and Prof. Jean-Fu Kiang

Research Projects

Safety-Critical Robotic Systems

PU, NJ, USA

Prof. Jaime Fernández Fisac — July 2020 - PRESENT

- **Inverse System Design**
- **RL for Reach-Avoid Problems**

ECG Real-Time Telemonitoring

NTU, Taiwan

Access IC Lab (Prof. An-Yeu (Andy) Wu, IEEE Fellow) — Aug. 2017 - Mar. 2019

- **Edge Classification**: Incorporated compressed sensing (CS), task-driven dictionary learning (predictive sparse coding) and PCA to render light-weighted classifier and overcome limited labeled data challenge
- **On-Demand Recovery**: Designed a two-stage algorithm that classifies and reconstructs only problematic signals. This algorithm utilizes the information from classification stage to speed up the reconstruction algorithm
- **Hardware Design and Chip Implementation**: Proposed a hardware architecture for on-demand recovery to allow hardware sharing between classification and reconstruction algorithms

Direction-of-Arrival (DOA) Estimation

NTU, Taiwan

Group of Electromagnetic Applications (Prof. Jean-Fu Kiang) — Feb. 2017 - Mar. 2019

- **Antenna Uncertainty**: Utilized special matrix structure with Khatri-Rao subspace-based MUltiple SIgnal Classification (MUSIC) to improve immunity to uncertainties and detect DOAs with sensors half the number of sources
- **More Sources Than Sensors**: Proposed a new antenna array structure to increase the number of detectable sources based on fourth-order statistics and compressive sensing approach
- **Mixed Carrier Frequency (CF) Known and Unknown Sources**: Proposed a two-step algorithm to first estimate DOA of CF-known sources and then joint estimate the DOA and CF of CF-unknown sources

Publications

[6] C.-Y. Chou, **K.-C. Hsu**, B.-H. Cho, K.-C. Chen and A.-Y. (Andy) Wu, "Low-Complexity On-demand Reconstruction for Compressively Sensed Problematic Signals," in *IEEE Trans. Signal Process.*, vol. 68, pp. 4094-4107, July 2020. |

[5] **K.-C. Hsu** and J.-F. Kiang, "Joint Estimation of DOA and Frequency From A Mixture of Frequency Known and Unknown Sources with Orthogonal Coprime Arrays," in *Sensors, 19(2), 335*, Jan. 2019. |

[4] **K.-C. Hsu**, B.-H. Cho, C.-Y. Chou and A.-Y. (Andy) Wu, "Low-Complexity Compressed Analysis in Eigenspace with Limited Labeled Data for Real-Time Electrocardiography Telemonitoring," in *IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, Anaheim, USA, Nov. 2018. |

[3] **K.-C. Hsu** and J.-F. Kiang, "DOA Estimation With Triply Primed Arrays Based on Fourth-Order Statistics," in *IEEE AP-S Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting*, Boston, USA, July 2018. |

[2] **K.-C. Hsu** and J.-F. Kiang, "DOA Estimation Using Triply Primed Arrays Based on Fourth-Order Statistics," in *Progress In Electromagnetics Research M*, Vol. 67, pp. 55-64, Mar. 2018. |

[1] **K.-C. Hsu** and J.-F. Kiang, "DOA Estimation of Quasi-Stationary Signals Using a Partly-Calibrated Uniform Linear Array with Fewer Sensors Than Sources," in *Progress In Electromagnetics Research M*, Vol. 63, pp. 185-193, Jan. 2018. |

Honors & Awards

3rd Prize in Integrated Circuit Design Contest — Ministry of Education, Taiwan
- Out of about 300 teams — July 2018

2nd Prize in Taiwan Creative Electromagnetic Implementation Competition — High-speed RF and mm-Wave Tech. Center, Taiwan
- Under the supervision of Prof. Tzong-Lin Wu, IEEE Fellow | — Aug. 2017

8th place in Data Structure and Programming Contest — Cadence, Taiwan
- Out of about 250 students — Mar. 2017

Digital IC Design Certificate — National Chip Implementation Center, Taiwan
- Familiar with Verilog, logic synthesis, simulation and STA — Nov. 2018

Graduate Representative in NTUEE graduate ceremony — Dept. of EE, NTU, Taiwan
- Given to top ten students of four years — June 2018

Professor Chun-Hsiung Chen Scholarship — Electromagnetic Industry-Academia Consortium, Taiwan
- Rewarded outstanding performances in electromagnetic fields — Jan. 2018

Presidential Awards — Dept. of EE, NTU, Taiwan
- Given to top ten students of that semester — second semester of 2014 and 2016

Research & Teaching Experiences

Research Assistant — PU, NJ, USA
Prof. Jaime Fernández Fisac — Aug. 2020 - PRESENT

Teaching Assistant — PU, NJ, USA
ELE364: Machine Learning for Predictive Data Analytics — Sept. 2020 - PRESENT

Research Assistant — NTU, Taiwan
Access IC Lab (Prof. An-Yeu (Andy) Wu, IEEE Fellow) — Feb. 2018 - Mar. 2019

Undergraduate Researcher — NTU, Taiwan
Group of Electromagnetic Applications (Prof. Jean-Fu Kiang) — Feb. 2017 - Mar. 2019

Teaching Assistant — NTU, Taiwan
Digital System Design — Feb. 2018 - June 2018

Professional Activities

Reviewer IEEE Transactions on Vehicular Technology, IETE Technical Review

Skills

- **Program Languages** Python, MATLAB, Verilog, C++
- **Others** LaTeX, Chinese, Korean