Chih-Fan Rich Pai

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Education

University of California, San Diego (UCSD) GPA: 4.0/4.0 — La Jolla, CA

Ph.D. in Electrical and Computer Engineering (Machine Learning and Data Science Track) — *Sept. 2021 -*

- **Course:** Machine Learning, Statistical Learning, Probabilistic Reasoning & Learning, Stochastic Approximation, Continuous Optimization, Semidefinite & Sum-of-Squares Optimization, Information Theory, Probability Theory, Stochastic Processes

National Taiwan University (NTU) GPA: 3.99/4.3 — Taipei, Taiwan

M.S. in Communication Engineering (EECS Collage, Signal Processing for Communication Group) — *Feb. 2018 - June 2020*

- Won Youth Thesis 1st Award and Best Master Thesis Award
- **Course:** Machine Learning, Deep Learning for Computer Vision, Matrix Computations, Convex Optimization, Design and Analysis of Algorithms, Adaptive/Multirate Signal Processing, Digital Communication

National Chiao Tung University (NCTU) GPA: 4.14/4.3 (Rank: 2/46) — Hsinchu, Taiwan

B.S. in Electrical and Computer Engineering (Graduated early for academic excellence) — *Sept. 2014 - Jan. 2018*

Research Experience

Nonconvex Nonsmooth Policy Optimization for Optimal and Robust Control — Apr. 2023 -

Research Assistant, supervised by Prof. Yang Zheng

- Investigated optimization landscape properties of LQG and $\mathcal{H}_\infty$ optimal control problems
- Developed model-free policy optimization algorithms for LQG and $\mathcal{H}_\infty$ problems with provably convergent guarantees

Reinforcement Learning (RL) and General Sequential Decision-Making — June 2022 - March 2023

Research Assistant, supervised by Prof. Tara Javidi and Prof. Yian Ma

- Designed algorithms for reward-free exploration in RL, including active model estimation for Markov decision processes using a single trajectory, approximating the empirical state distribution to a target coverage distribution, and adaptive resource allocation for learning several Markov chains

Signal Processing for Communication — June 2018 - Oct. 2020

Research Assistant, supervised by Prof. See-May Phoong

- Proposed a novel time-varying channel estimation algorithm for OFDM systems with uniformly spaced pilots
- Proposed a new class of filters: *"depth-L" Nyquist filters and biorthogonal partners*, which find practical applications in fractionally spaced equalizers and filter bank multicarrier systems
- Publication: **C. Pai**, T. Hung, and S. Phoong, "Depth-L Nyquist (M) Filters and Biorthogonal Partners," IEEE Access, vol. 8, pp. 75512–75522, Apr. 2020.

Honors

- **J. Yang Scholarship** from UCSD — Sep. 2021
- **NTU Best Master Thesis Award** and **Youth Thesis 1st Award** from Chinese Institute of Electrical Engineering — Jan. 2021
- **NCTU Academic Excellence Award**: 3 times (top 3%) — Sept. 2014 - Jan. 2018

Teaching Experience

NTU Teaching Assistant for the following courses:
Linear Algebra, Calculus, Digital Signal Processing, and Multirate Signal Processing — June 2018 - June 2020

Selected Project

Algorithmic game theory reading group — Feb. 2022 -

- Explored mechanism design, mean-field game, equilibrium computation, convergence behavior of learning dynamics, multi-objective optimization, multi-agent and multi-objective reinforcement learning

Theory and Practice of Machine Learning — June 2019 - Apr. 2020

- Explored **why gradient descent almost always avoid saddle points** in minimizing non-convex functions; also explored **surrogate risk minimization** algorithms for SVM, AdaBoost, logistic regression.
- Implemented **regression** for PM2.5 prediction, **probabilistic generative model**, **CNN** for human sentiment classification, and **RNN** for malicious comments identification
- **Ranked 2** in Kaggle among 120 NTU students by applying BERT to **dialogue modeling transfer learning** task

Visualization and Implementation of Deep Learning for Computer Vision — Sept. 2019 - Apr. 2020

- Visualized **what deep CNN learn** with saliency map, deconvolutional network, and deep generator network
- Implemented image reconstruction, clustering and classification using **dimensionality reduction**, e.g., autoencoder, PCA, K-Means, t-SNE; implemented **semantic segmentation** with ResNet50, **GAN** for producing human faces, **DANN** for **transfer learning**, and **LSTM**, **Seq2seq** for video action recognition and segmentation

Programming languages

C, C++, Python, MATLAB, PyTorch, Tensorflow, Scikit-learn, NumPy, Pandas