Chia-Hsiang Kao

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Research Interests

My goal is to develop robust and interpretable machine learning algorithms and systems that operate reliably even under challenging conditions. Along with my research goals, I am interested in model robustness, unbiased and generalized representation learning, explainable AI, and healthcare applications.

Education

National Yang Ming Chiao Tung University (NYCU) **Taipei, Taiwan**
Doctor of Medicine *Aug. 2015 - Jun. 2022*
- Overall GPA: 3.81/4.0, Major GPA: 3.82/4.0, CS-related GPA: 3.90/4.0

PS: National Yang Ming University (NYMU) and National Chiao Tung University merged in 2021. I originally studied in NYMU.
PS: In Taiwan, high school students can be directly admitted to medical schools without Bachelor's degree.

Publications

- **MAML is a Noisy Contrastive Learner** | Paper | Slides |
  Chia-Hsiang Kao, Wei-Chen Chiu, and Pin-Yu Chen
  [Submitted to ICLR'22] [NeurIPS'21 workshop, oral presentation]
  - Proved that MAML, a widely used meta-learning algorithm, belongs to supervised contrastive learning.
  - Identified two interference terms in MAML and proposed a zeroing trick that significantly improves MAML.
- **Demystifying T1-MRI to FDG^{18}-PET Image Translation via Representational Similarity** | Paper |
  Chia-Hsiang Kao, Yong-Sheng Chen, Li-Fen Chen, and Wei-Chen Chiu
  [MICCAI'21, oral presentation]
  - Hypothesized and validated that UNet-based medical image translation model comprises the brain tissue separation and brain region recognition stages.
  - Proposed simplified and explainable MRI-to-PET image translation model.
- **Unravelling the Spatio-Temporal Neurodynamics of Rhythm Encoding-Reproduction Networks by a Novel fMRI Autoencoder** | Paper |
  Chia-Hsiang Kao, Ching-Ju Yang, Li-Kai Cheng, Hsin-Yen Yu, Yong-Sheng Chen, Jen-Chuen Hsieh, and Li-Fen Chen
  [NER'19 (International IEEE/EMBS Conference on Neural Engineering)]
  - Proposed a novel autoencoder to untangle the spatial and temporal patterns of functional neurodynamics.
  - Identified the rhythm encoding-reproduction networks of the brain.

Research Experiences

Laboratory of Precision Psychiatry, National Yang Ming Chiao Tung University **Taipei, Taiwan**
Research Student *Sep. 2021 - Jun. 2022*
- Advisor: Professor Albert Chih-Chieh Yang.
- Estimated patients' cognitive function based on their drawings.

Enriched Vision Applications Lab, National Yang Ming Chiao Tung University **Hsinchu, Taiwan**
Research Student *Sep. 2020 - Sep. 2021*
- Advisor: Professor Wei-Chen Chiu and MIT-IBM Watson AI Lab Researcher Pin-Yu Chen.
- Proved that MAML is a supervised contrastive learning algorithm.
- Studied theories of self-supervised learning and adversarial learning.

Brain Mapping Laboratory, National Yang Ming Chiao Tung University **Taipei, Taiwan**
Research Student *Sep. 2017 - Sep. 2020*
- Advisor: Professor Li-Fen Chen.
- Utilized explainable AI tools to understand the inner behavior of image translation models.
- Analyzed fMRI, MRI, and CT data and built various predictive models.

Institute of Information Science, Academia Sinica **Taipei, Taiwan**

Research Intern *Jun. 2017 - Sep. 2017*

- Advisor: Professor Meng-Chang Chen.
- Analyzed air quality data and built air pollution predictive models.

Clinical Experiences

Taipei Veteran General Hospital **Taipei, Taiwan**
Medical Intern *Jan. 2022 - Jun. 2022*

- Served as a second-year intern doctor in Internal Medicine, Surgery, ICU, Emergency Medicine, OB/GYN, etc. I was responsible for the primary care of the inpatient in those departments.

Chi Mei Medical Center **Tainai, Taiwan**
Medical Intern *Nov. 2021 - Dec. 2021*

- Served as an intern doctor in Internal Medicine and Emergency Medicine.

Taipei Veteran General Hospital **Taipei, Taiwan**
Medical Intern *Oct. 2019 - Sep. 2020*

- Served as a first-year intern doctor in Internal Medicine, Surgery, Radiology, Pediatrics, OB/GYN, Family Medicine, etc. I was responsible for the primary care of the inpatient in those departments.

Scholarships, Honors, and Services

- **Junior Reviewer**, NeurIPS'21 Workshop *Oct. 2021*
- **Student Travel Award**, MICCAI'21: To first author student with the highest scoring. *Jun. 2021*
- **College Student Research Scholarships**, Ministry of Science and Technology, Taiwan *Jul. 2020*
- **College Student Research Scholarships**, Ministry of Science and Technology, Taiwan *Jul. 2018*
- **Summer Research Scholarships**, National Health Research Institutes, Taiwan *Jul. 2018*

Courses

Computer Science *	Introduction to Computer Science	A+
	Java Programming Language^G	B+
	Theory of Computability^G	A+
	Machine Learning^G	A+
	Reinforcement Learning^G	A+
Computer Science **	Data Structures and Algorithms	
	Operative Systems	
Mathematics *	Calculus (Honor)	B+
	Probability	A-
	Introduction to Analysis (Honor)	A-
	Advanced Probability^G	A
Mathematics **	Linear Algebra	
	Statistics	
	Differential Equation	

* courses; ** self-learn; ^{G} graduate-level course

Skills and Others

Languages	Mandarin (Native)
	English (Fluent, TOEFL: 106/120)
Programming	Python (PyTorch, TensorFlow, Keras, OpenCV, Scikit-learn)
	MATLAB
	JAVA
Interests	Jogging and Writing [Medium]