




Hao-Lun Hsu

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Research Interests

Intersection of Reinforcement Learning and Robotics/ Neuromodulation, particularly interested in improving safety, interpretability, and robustness with real-world data.

Education

Duke University

Durham, NC, USA

Ph.D. Computer Science

Aug. 2022 – Present

- An incoming Ph.D. student interested in theoretical Reinforcement Learning with applications in healthcare, robotics, and recommendation systems

Georgia Institute of Technology

Atlanta, GA, USA

M.S. Biomedical Engineering

Aug. 2019 – May 2021

- Diversity Ambassador, Georgia Tech Student Diversity Program, 2020
- Graduate Teaching assistant of CS 7280 Network Science

National Taiwan University

Taipei, Taiwan

B.S. Mechanical Engineering

Sep. 2014 – Jun. 2018

- Teaching Assistant of EE 5040 Clinical Application of Medical Electronic Device
- Teaching Assistant of Biomed 7110 Clinical Observation & Demands Exploration

Publications

Conference Papers

- C1. P Sarikhani, **HL Hsu**, and B Mahmoudi*, “Automated Tuning of Closed-loop Neuromodulation Control Systems using Bayesian Optimization”, in *44rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, 2022
- C2. **HL Hsu**, Q Huang, and S Ha*, “Improving Safety in Deep Reinforcement Learning Using Unsupervised Action Planning”, in *IEEE International Conference on Robotics and Automation (ICRA)*, 2022
- C3. JH Chen, **HL Hsu**, WH Yang, YC Chen, and HM Hsiao*, “New Spherical Stent Concept for Occlusion”, in *Annual Scientific Meeting of Taiwanese Society of Biomechanics*, 2017

Workshop Papers

- W1. P Sarikhani, **HL Hsu**, JK Kim, S Kinzer, E Mascarenhas, H Esmailzadeh, and B Mahmoudi*, “Neuweaver: Towards a Platform for Designing Translatable Intelligent Closed-loop Neuromodulation Systems”, in *NeurIPS Research2Clinics Workshop*, 2021
- W2. **HL Hsu**, Q Huang, and S Ha*, “Safe Exploration for Reinforcement Learning Using Unsupervised Action Planning”, in *RSS Workshop on Integrating Planning and Learning*, 2021

Abstract

- A1. P Sarikhani, **HL Hsu**, M Zeydabadinezhad, Y Yao, M Kothare, and B Mahmoudi*, “Sparc: Adaptive Closed-loop Control of Vagal Nerve Stimulation for Regulating Cardiovascular Function Using Deep Reinforcement Learning: A Computational Study”, in *Neuroscience 2021, 50th Annual Meeting*, 2021

- A2. P Sarikhani, **HL Hsu**, O Kara, JK Kim, H Esmailzadeh, and B Mahmoudi*,
“Neuroweaver: A Platform for Designing Intelligent Closed-loop Neuromodulation
Systems”, in *4th International Brain Stimulation Conference*, 2021
- A3. **HL Hsu**, “Functional Connectivity Correlates to Individual Difference in Human Brains
during Working Memory Task and Resting State”, in *IEEE EMBS North American Virtual
International Student Conference*, 2021

Research Experience

Emory University

Graduate Research Assistant

Atlanta, GA, USA

Jan. 2021 – July 2022

Advisor: Prof. Babak Mahmoudi (Neuroinformatics & Intelligent System Lab)

- Used Bayesian Optimization automated tuning PI controllers for closed-loop neuromodulation
- Suppressed pathologically synchronous neurons for Parkinson's via RL approaches
- Regulated cardiovascular system via vagus nerve stimulation with set-point control based RL
- Few-shot adaption from healthy to hypertension cardiac model via transfer learning

Georgia Institute of Technology

Graduate Research Assistant

Atlanta, GA, USA

Jan. 2020 – Oct. 2021

Advisor: Prof. Sehoon Ha (Computer Animation & Robotics Lab)

- Integrated on-policy reinforcement learning (RL) agent with unsupervised action planning for safe exploration
- Deployed Augmented Random Search for training the power grid policy to adapt to less controllable renewables
- Sim-to-sim transfer for different power load with dynamic randomization

National Taiwan University

Undergraduate Research Assistant

Taipei, Taiwan

Sep. 2015 – Sep. 2018

Advisor: Hao-Ming Hsiao (Advanced Medical Device Laboratory)

- Designed a double spherical stent to reduce the blood flow volume by 44% for cerebral aneurysm treatment
- Invented a novel dural defect occluder to prevent bacterial meningitis and cerebrospinal fluid rhinorrhea after Expanded Endonasal Approach

Work Experience

Curai Health

Machine Learning Research Intern

Palo Alto, CA, USA (Remote)

May 2022 – Present

Mentors: Dr. Anitha Kannan and Dr. Ilya Valmianski

- Building a Reinforcement Learning model for text response from patients to make diagnoses automatically via chatbots

Reazon Holdings, inc.

Machine Learning Research Intern

Tokyo, Japan (Remote)

Oct. 2021 – Dec. 2021

Mentors: MD. Shubham Gupta and Dr. Daijro Mori

- Built ShuffleNet and GhostNet for gaze estimation and eye moving tracking on mobile devices improving upon published accuracy
- Adapted a Capsule Network to gaze estimation problem including eyes, face, and gray frame models and incorporated reconstruction loss to the original objective function
- Abstracted original PyTorch implementation via PyTorch Lightning

Abbott Vascular Taiwan

Data Analyst/ Software Engineering Intern

Taipei, Taiwan

Jun. 2018 – July 2019

- Built an administrative system to share information among marketing, sales, and finance departments, and improved 75% of operation time in the sales database of vascular products, facilitating fast targeting
- Forecasted vascular product marketing trend by digitizing routine documents and incorporated the original database with Power BI to provide interactive visualizations and business intelligence capabilities to create reports and dashboards

Entrepreneurship & Innovation Experience

OpenEnded

Philadelphia, PA, USA

Founding Member

Aug. 2020 – Mar. 2021

- Democratized career information to help east Asian college students painlessly and effortlessly imagine and plan for their future
- Conducted user interviews to investigate the difficulty why college students are not willing to actively make their career plans
- Designed the user interface for collecting user data via Adalo

Cross-strait Youth Entrepreneurship Competition

Shanghai, China

Leadership Growth Award

Jul. 2017

Stanford Design Challenge Asia

Taipei Taiwan

Finalist (8 out of 91)

Dec. 2016

- Established a social platform for the elderly, including a pair of smart shoes as a medium, to inspire them to go outside and exercise

H. Spectrum

Taipei, Taiwan

Trainee in leading health startup incubator/accelerator in Asia

Feb. 2016 – Jun. 2016

- Developed a non-Newtonian fluid formulation to design wearable devices preventing hip fractures in the elderly
- Received training including clinical requirement, trial field, prototype, patent, regulation, and business models

Graduate Institute of Biomedical Electronics & Bioinformatics, NTU

Taipei, Taiwan

Trainee in summer research bootcamp

Jul. 2015 – Aug. 2015

- Designed an endotracheal tube to address blind insertion and airway difficulties

Talks and Presentations

Georgia Tech Robotics Research Showcase

Mar. 2022

Poster

Improving Safety in Deep Reinforcement Learning Using Unsupervised Action Planning

Artificial Intelligence Medicine (AIM) Organization weekly webinar

Mar. 2021

Invited Talk

Applications of Reinforcement Learning in healthcare and power grid control

Prof. Constantine Dovrolis's research group

Feb. 2021

Invited Talk

Individual Difference in Humans' Brains from Functional Connectivity for Working Memory

Technical Skills

Programming: Python, MATLAB, C++, C#, Julia, VBA

OS: Linux (Ubuntu), Microsoft Windows, iOS

ML: Tensorflow, PyTorch, Keras, Scikit-learn, PyTorch Lightning

Simulation Environment: OpenAI Gym, Mujoco