





Hao-Lun Hsu

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Research Interests

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

Education

Duke University

Ph.D. Computer Science

Durham, NC, USA

Aug. 2022 – Present

- NSF Traineeship: Advancement of Surgical Technologies (TAST)

Georgia Institute of Technology

M.S. Biomedical Engineering

Atlanta, GA, USA

Aug. 2019 – May 2021

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

National Taiwan University

B.S. Mechanical Engineering

Taipei, Taiwan

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*, “Neuroweaver: 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

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 – Aug. 2022

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

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

Talks and Presentations

Georgia Tech Robotics Research Showcase	<i>Mar. 2022</i>
Poster	
<i>Improving Safety in Deep Reinforcement Learning Using Unsupervised Action Planning</i>	
Artificial Intelligence Medicine (AIM) Organization weekly webinar	<i>Mar. 2021</i>
Invited Talk	
<i>Applications of Reinforcement Learning in healthcare and power grid control</i>	
Prof. Constantine Dovrolis's research group	<i>Feb. 2021</i>
Invited Talk	
<i>Individual Difference in Humans' Brains from Functional Connectivity for Working Memory</i>	

Honors and Awards

Computer Science Fellowship @ Duke	<i>Aug. 2022 – May 2024</i>
<i>Awarded the fellowship by the department of Computer Science at Duke</i>	
"Thank a Teacher" @ Georgia Tech	<i>April. 2021</i>
<i>Recognition for excellence in teaching CS 7280 Network Science class</i>	
Silver Linings Global and Stanford Center on Longevity	<i>Dec. 2016</i>
<i>Finalist (8 out of 91) of Stanford Design Challenge Asia</i>	

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