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Nai-Chieh Huang

Education

National Yang Ming Chiao Tung University (NYCU)

B.S. IN COMPUTER SCIENCE

- Cumulative GPA: 4.29 / 4.30; Ranking: 1 / 201 (0.49%); 5 Times Dean's List Awards
- Member of The Phi Tau Phi Scholastic Honor Society of the Republic of China (Top 1% in CS Department)
- Selected Courses († indicates graduate-level courses): Reinforcement Learning[†], Algorithmic Foundation of Machine Learning[†], Real Analysis[†], Optimization Algorithms[†], Introduction to Analysis, Probability, Linear Algebra (All A+)

Publications (* indicates equal contribution.) _

[1] Yen-Ju Chen^{*}, **Nai-Chieh Huang**^{*}, Ching-pei Lee, Ping-Chun Hsieh, "Accelerated Policy Gradient: On the Convergence Rates of the Nesterov Momentum for Reinforcement Learning." *The 41st International Conference on Machine Learning*, *ICML* 2024.

[2] **Nai-Chieh Huang**, Ping-Chun Hsieh, Kuo-Hao Ho, I-Chen Wu, "PPO-Clip Attains Global Optimality: Towards Deeper Understandings of Clipping." *The 38th Association for the Advancement of Artificial Intelligence*, **AAAI 2024**.

Research Experiences

Max Simchowitz's Research Group, PROF. MAX SIMCHOWITZ

Remote Undergraduate Researcher

• Researching improvements to the sample efficiency of **Diffusion Policy Policy Optimization**.

Reinforcement Learning and Bandits Lab, PROF. PING-CHUN HSIEH

Undergraduate Researcher

- Researching on the theoretical foundation of Model Predictive Control in Model-Based RL.
- Accelerated the **policy gradient convergence rate** from O(1/t) to $\tilde{O}(1/t^2)$ using **Nesterov's momentum**, providing the first convergence rate analysis of Nesterov's momentum in reinforcement learning and clarifying its role in RL. [ICML'24]
- Proved the first-ever **convergence rate** for **Neural PPO-Clip**, demonstrating a $O(1\sqrt{T})$ min-iterate convergence rate, and provided deeper insights into the clipping mechanism. [AAAI'24]

Department of Applied Mathematics NYCU, PROF. YE-KAI WANG

Research Assistant

- Studied **Differential Geometry** and **Schwarzschild Solutions** in the context of **General Relativity**, deepening the understanding of the mathematical formulation of spacetime curvature.
- Analyzed the Precession of the Mercury Perihelion rigorously, revisiting classical results in General Relativity. [Poster/Slides Link]

Cognitive Engineering and Computational Neuroscience Lab, PROF. CHUN-SHU WEI

UNDERGRADUATE RESEARCHER

• Designed a multi-input CNN model to improve signal classification in motor imagery-based brain-computer interfaces, resulting in a significant improvement in the success rate of signal classification.

Teaching & Professional Experiences

Optimization Algorithms, TEACHING ASSISTANT

• Hosting regular TA sessions to provide guidance and support on optimization topics.

Reinforcement Learning, TEACHING ASSISTANT

- Advised six student teams (each with 3-4 members) on research directions for their implementation and theory projects.
- Led weekly, hour-long sessions to answer student questions on theoretical coursework and clarify proofs from research papers.

Taiwan Sep. 2020 - Jun. 2024

Taiwan

Pittsburgh, PA Oct. 2024 - PRESENT

Oct. 2021 - Jun. 2024

Feb. 2023 - Jun. 2023

Jan. 2021 - Sep. 2021

Taiwan

Fall '24

Spring '23/'24

Taiwan

Probability, TEACHING ASSISTANT

- Conducted a weekly 1-hour TA session to address student questions on lectures and assignments.
- Provided supplementary instruction on advanced topics, including concentration inequalities and multivariate normal distributions, to deepen foundational knowledge and enhance students' analytical skills.
- Proposed challenging problems for probability coursework to enhance student understanding.

Competitive Programming (I), TEACHING ASSISTANT & PROBLEM SETTER

- Designed algorithmic programming problems for midterm and final exams, focusing on advanced concepts such as amortized complexity analysis in graph traversal and the fundamentals of discrete Fourier Transformation.
- Taught mathematical analysis to enhance students' comprehension of foundational algorithmic concepts.

Network Planning and Management Practices, Lecturer & Teaching Assistant

- Delivered a 3-hour lecture on Network Routing and Open Shortest Path First (OSPF).
- Provided weekly support by troubleshooting and assisting students with issues related to their managed networks.
- Structured problem scenarios for coursework projects and exams to enhance practical understanding and assessment.

NYCU CS Computer Center, Network Administrator

- Maintained monitoring systems and managed routing topology to ensure optimal network performance and reliability.
- Provided technical support for seamless system access and swiftly resolved IT issues.

Honors & Awards

Scholarships

2024 Google Conference Scholarships, Travel Grant for AAAI-24 Vancouver, Canada Foundation for the Advancement of Outstanding Scholarship, Travel Grant for ICML-24 2024 Vienna, Austria Shun-I Chu Academic Achievement Scholarship (top 2 CS students), ZYXEL 2023 Taiwan AWARDS 2023 Gold Medal (7th place), ICPC Asia Taoyuan Regional Programming Contest Taiwan 2023 1st Place, Competition of Computer Science and Engineering Projects Taiwan Best Project Award, Directed Individual Study at Department of Applied Mathematics NYCU 2023 Best Project Award, Reinforcement Learning Course Final Project 2022 2022 Silver Medal, ICPC Asia Taoyuan Regional Programming Contest Gold Medal, 2021 International Genetically Engineered Machine Synthetic Biology Competition 2021 Taiwan '20, '21 Silver Medal, ICPC Asia Taipei-Hsinchu Site Programming Contest Taiwan '20 - '22 Dean's List Award, 5x Recipient (for top 5% students in NYCU) Taiwan **Selected Side Project** A Note on Batch Value-Function Approximation with Only Realizability Jun. 2022 COURSE FINAL THEORY PROJECT OF REINFORCEMENT LEARNING • Reproduced the proofs and insights from the paper Batch Value-Function Approximation with Only Realizability. [Note Link] An Ablation Study of Sample Efficient Actor-Critic with Experience Replay Jun. 2022 COURSE FINAL IMPLEMENTATION PROJECT OF REINFORCEMENT LEARNING • Performed a comprehensive ablation study to analyze experimental outcomes presented in the paper. • Formulated hypotheses on retrace importance sampling weights and conducted experiments for validation. [Report Link]

Presentation & Other Professional Activities

- NTUxNYCU RL Paper Reading Group, Presenter
- Presented the paper Is Pessimism Provably Efficient for Offline RL? [Slides Link]
- Machine Learning Summer School 2021, General Program Student

Jul. 2022

Jun. 2021 - Aug. 2021

STANT

Spring '22

Spring '22

Jan. 2021 - Jul. 2022

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