Naicheng He (Arnie)

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EDUCATION

Brown University, Providence, RI, USA Sep 2022 – Exp. 2026
Sc.B. in Applied Mathematics–Computer Science; A.B. in Mathematics
Relevant coursework: Advanced Topics in Deep Learning; Learning & Sequential Decision Making; Probabilistic Methods in Computer Science; Algorithmic Game Theory; Recent Applications of Probability & Statistics; Real Analysis I; Introduction to Robotics.

PUBLICATIONS

He, N., Prakash, A., Swamy, G., Greenwald, A., & Vinitsky, E. (2025).
Inverse Reinforcement Learning on GPUDrive. NYRL Workshop 2025 (in preparation).
Imitation learning and IRL for multi-agent driving in GPUDrive.

He, N.*, Guo, K.*, Prakash, A.*, Tiwari, S., Sapio-Kirk, T., Tao, R. Y., Greenwald, A., & Konidaris, G. (2025).
Spectral Collapse Drives Loss of Plasticity in Deep Continual Learning. NeurIPS ARLET Workshop 2025 (preprint under review).
Connects Hessian spectral collapse to loss of plasticity in deep continual learning and analyzes plasticity-preserving algorithms.

Prakash, A.*, **He, N.***, Goktas, D., & Greenwald, A. (2024–2025).
Bi-Level Policy Optimization with Nyström Hypergradients. NYRL Workshop 2025 (preprint under review).
Frames actor-critic RL as bilevel optimization with efficient Nyström-based hypergradient policy updates.

SELECTED PROJECTS

Diffusion Model Fine-Tuning With Constrained Optimization
***Naicheng He**, Nuo Wen Lei, Wanjia Fu, Yixiang Sun*
Developed a constrained-optimization pipeline to fine-tune unconditional diffusion models for task-specific behavior, including class removal in MNIST, safety-style constraints in trajectory planning, and steering polymer-generation models from coarse preference signals.

MatchingPennies (2nd-place one-shot negotiation agent at SCML 2024)
***Naicheng He**, Akash Singirikonda, Amy Greenwald*
Implemented a multi-agent negotiation agent in the `negmas` framework using concurrent negotiation and heuristic search over subsets of offers, balancing quantity requirements and profit margins; placed 2nd in the SCML 2024 one-shot track at AAMAS.

Pipelining Natural Language to Multi-Robot Task Allocation
*Yichen Wei, **Naicheng He***
Built a pipeline that maps natural language commands to linear temporal logic (LTL) specifications and then to multi-robot task allocations, improving execution success for complex and collaborative tasks by separating high-level language understanding from low-level control.

RESEARCH EXPERIENCE

Emerge Lab, NYU Tandon School of Engineering May 2025 – Present
Research Intern Supervisor: Dr. Eugene Vinitsky

- Build multi-agent IRL pipelines on GPUDrive to study recoverability of reward functions in autonomous driving domains.
- Implement training and evaluation infrastructure and design metrics (e.g., collision rates, off-road counts, goal-reaching rates) to assess learned rewards.

Brown Intelligent Robots Lab, Brown University Jan 2025 – Sep 2025
Undergraduate Research Assistant Supervisor: Dr. George Konidaris

- Compared Hessian eigenspectra at new-task initialization in deep continual learning setups, identifying spectral collapse as a precursor to loss of plasticity.
- Formalized τ-trainability framework to unify existing plasticity-preserving algorithms.
- Investigated Kronecker-factored Hessian approximations and regularizers that maintain effective feature rank and stabilize learning on continual supervised and RL benchmarks.

E-GLAMOR Group, Brown University Mar 2024 – Present
Undergraduate Research Assistant Supervisor: Dr. Amy Greenwald

- Co-developed BLPO, framing actor-critic RL as a Stackelberg game and implementing Nyström-based approximations to inverse Hessian-vector products for hypergradient updates.
- Ran large-scale experiments in JAX comparing BLPO with PPO on Gymnax and Brax tasks, analyzing convergence behavior and stability.
- Contributed to the MatchingPennies automated negotiation agent (see Selected Projects).

ACT Lab (Coordinated Mobile Robotics), Brown University Jan 2023 – May 2023
Undergraduate Research Assistant Supervisor: Dr. Nora Ayanian

- Conducted experiments on aerodynamic interactions between quadrotors, focusing on downwash effects in close-proximity flight.
- Collected and analyzed data from tethered and indoor free-flight experiments and integrated quadrotors with external localization systems for precise automated flight.

TEACHING EXPERIENCE

Undergraduate Teaching Assistant, CSCI 2951F: Sequential Decision Making Sep 2025 – Dec 2025
Brown University

Undergraduate Teaching Assistant, CSCI 1440/2440: Algorithmic Game Theory Feb 2025 – May 2025
Brown University

Undergraduate Teaching Assistant, CSCI 1470/2470: Deep Learning Feb 2024 – May 2024
Brown University

PROFESSIONAL EXPERIENCE

Part-time Full-Stack Engineer Sep 2023 – Jan 2024
Revvity

- Developed a mobile application with a React Native frontend, Ruby services, and an AWS backend to answer Revvity product customer queries.
- Fine-tuned LLaMA-2 on internal handouts and historical support emails to provide accurate automated responses.
- Reduced technical support emails by approximately 50% post-deployment, significantly lowering customer support workload.

VOLUNTEER EXPERIENCE

Cuzco Wild Animal Reserve, Cusco, Peru Jan 2024 (1 month)
Volunteer

- Assisted with daily care and feeding routines for rescued wildlife
- Supported staff in communicating conservation practices and responsible tourism to visitors.

AWARDS & HONORS

CRA Award Nominee Oct 2025
Brown University
Nominated as one of four undergraduate students to participate in the 2025 CRA Outstanding Undergraduate Researcher Award competition.

2nd Place, One-Shot Automated Negotiation May 2024
Supply Chain Management League, AAMAS 2024

Advanced Undergraduate Teaching and Research Award (UTRA) Sep 2023
Funded for drone downwash research at the ACT Lab.