

# Jia Lin Hau

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## EDUCATION

**University of New Hampshire**, Advisor: Marek Petrik

01/2019 - present

**M.S / Ph.D. in Computer Science**

GPA: 4.00

**Relevant Coursework:** Reinforcement Learning, Bandit Algorithms, Mathematical Optimization, Algorithms, Computer Graphics, Assembly Language, System Programming, Formal Specification, Database System.

**University of New Hampshire**, Advisor: Linyuan Li

09/2015 - 09/2018

**B.S. in Applied Mathematics: Economics**

GPA: 3.89

**Relevant Coursework:** Machine Learning, Forecasting Analysis, Numerical Methods, Linear Algebra, Differential Equation, Multi-Dimensional Calculus, Econometrics, Probability Theory, Statistical Inference, Financial Mathematics.

## REVIEWING

International Conference on Machine Learning 2022 (ICML)

NeurIPS 2021 Workshop on Safe and Robust Control of Uncertain Systems

## EXPERIENCE

**UNH Computer Science Department - *Research Assistant***

06/2020 - present

Research interest: Reinforcement learning, risk-averse optimization, machine learning, Bayesian method.

**UNH Computer Science Department - *Teaching Assistant***

01/2019 - 05/2020

Machine Learning (CS 750/850), Assembly Language and Machine Organization (CS 520), Scientific Programming in Python and C (CS 410P & C), Computer networks (CS 725)

**Boston Road Runner – *Data Analyst***

09/2018 - 12/2018

- Preprocessed (handle missing values, duplicates, and apply consistent formatting) data of participants and sponsors.
- Developed auto-regression time series models in R to predict future trends in the number of participants for upcoming races.
- Designed 3NF database schema using ERD and relation schema to reduce anomalies and improve data quality and integrity.
- Created data visualizations using Tableau, which allow peers and sponsors easily interpret and understand data insights.

**Idea Math - *Junior Instructor/ Summer Camp Resident Assistant***

06/2018 - 08/2019

**UNH International Student Organization (ISO) - *Vice President***

08/2017 - 06/2018

**UNH Mathematics Center - *Mathematics Center Tutor***

09/2017 - 06/2018

**UNH Residential Life - *Resident Assistant***

08/2016 - 08/2017

## RESEARCH PUBLICATIONS AND PREPRINTS

**On Dynamic Programming Decompositions of Static Risk Measures in Markov Decision**

ArXiv 2023

**Processes.** Jia Lin Hau, Erick Delage, Marek Petrik, Mohammad Ghavamzadeh

- Proved that the popular decomposition approach to solving MDPs with CVaR and EVaR objectives is suboptimal despite the claims to the contrary, which assumed it to be correct and optimal for a decade.
- Illustrated previous EVaR decomposition is incorrect and proposed a correct EVaR risk level decomposition for *policy evaluation*.
- Showed that unlike CVaR and EVaR for *policy optimization*, VaR decomposition does not suffer from saddle-point gap thus is optimal.

**Entropic Risk Optimization in Discounted MDPs.** Jia Lin Hau, Marek Petrik, Mohammad Ghavamzadeh

AISTATS 2023

- Contributed to advancing risk averse Markov decision processes (MDPs) by providing new theoretical results and practical algorithms.
- Proposed new polynomial time MDPs algorithms for Entropic Risk Measure (ERM) and Entropic Value at Risk (EVaR) objectives.
- Proved our algorithms return the optimal policy for finite horizon MDPs and delta-optimal policy for infinite horizon MDPs.
- Implemented these algorithms and conducted extensive experimentation to evaluate their accuracy and efficiency using Julia and R.

**RASR: Risk-Averse Soft-Robust MDPs.** Jia Lin Hau, Marek Petrik, Mohammad Ghavamzadeh, Reazul Russel

ArXiv 2022

- Proposed a novel framework to jointly model the epistemic and aleatory uncertainties in safe Reinforcement Learning (RL).
- Proved that entropic risk-aversion can be solved optimally and efficiently in RASR setting with time-dependent dynamic program.

**Robust pest management using RL.** Talha Siddique, Jia Lin Hau, Shadi Atallah, Marek Petrik

RLDM 2019

- Leveraged reinforcement learning techniques to develop a robust framework for risk-averse decision-making in pest management.
- Applied natural splines regression model to predict pest growth and STAN Bayesian inference language to generate posterior datasets, which were used to compute the optimal Robust MDP policy.
- Demonstrated the effectiveness of our framework by solving various domains including Cartpole (OpenAI) with limited data in Python

## OTHER ONGOING RESEARCH

## Risk Averse Distributional Deep Q Network

09/2023 - present

- Proposed a theoretically proven accurate framework to optimize risk averse objective for continuous domain include (Atari Gym).
- Customized distributional DQN to correctly handle risk averse objective with Pytorch.
- Utilized GPU to speed up the training for parameterizing Q value function.
- Our algorithm consistently outperforms Rainbow DQN across the domains throughout the whole 20 million training frames.

## Multi-Layered chemical diffusion 3D simulation

02/2023 - present

- Implemented a complex 3D chemical simulation in Julia with GLMakie to visualize and identify the success rate of the chemical reaction.
- Utilize the observable variables and broadcast function to speed up the continuous collision detection (CCD) by more than 10,000 times.

## PROJECTS

### EMOAI Emotion recognition application to avoid depression – *Developer and Use Case Finder*

02/2019 - 04/2019

- Spearheaded Deep Learning (CNN) emotion recognition project with pre-trained models to accurately classify users' facial expressions.
- Proposed groundbreaking application of the use of facial and emotion recognition technology to identify and prevent depression.
- Implemented active learning by allowing users to verify/update labels of their own emotion which enable personalized classification.

### CRACC A social application that connect people to play sports together – *Analyst / Android Developer*

01/2017 - 01/2018

- Collected data from various sources (API, Kaggle, BLS), analyzed and created data visualizations with Python.
- Communicated effectively with the IOS team to ensure consistent UI (XML) and functionality (Java) using Android Studio.
- Integrated with Firebase for users' data, and developed features that query weathers and navigation data based on users' location.

## OTHER ACHIEVEMENTS

Passed **Actuarial Science** Exam P: Probability

2018

*Bloomberg Market Concepts (BMC)* Completion

2018

Member of *Pi Mu Epsilon* of National Honorary **Mathematics** Society

2017

## SKILLS

**Language:** Python, R, Julia, C/C++, SQL, MATLAB, HTML, CSS, JavaScript, XML, Java

**Tools:** GLMakie, OpenGL, PyTorch, Numpy, Scikit-learn, Caret, Git, Excel, ERDPlus, Tableau, AWS