

Research Interests

My research focuses on developing **reinforcement learning (RL) frameworks that are robust, efficient, and aligned with human values**. I am particularly interested in explainable machine learning, reinforcement learning, and model robustness. My work includes influence-based training techniques to improve data efficiency and robustness, Bayesian ensemble methods for planning, and leveraging large language models to enhance world modeling in sequential decision-making. **My long-term goal is to integrate reasoning and interpretability into RL systems to enable adaptive, value-aligned decision-making in complex environments.**

Educational Background

Shanghai University of Finance and Economics

Sep 2022 – Jun 2024

M.S. in Applied Statistics

GPA: 3.58/4 (86.78/100)

China University of Geosciences

Sep 2018 – Jun 2022

B.S. in Statistics

GPA: 4.04/5 (ranking: 1/26)

Awards

The 13th Li Siguang Talent Program

National Scholarship

Academician Scholarship

Outstanding Undergraduate Thesis

Outstanding Graduate

Second-class academic scholarship

China University of Geosciences

2019

Ministry of Education of the People's Republic of China

2019

China University of Geosciences

2021

China University of Geosciences

2022

China University of Geosciences

2022

Shanghai University of Finance and Economics

2022, 2023

Publications

(* authors contributed equally)

1. Yu, S.*, **Xu, W.***, et al (2024). Enhancing Prediction Performance through Influence Measure. *The Thirteenth International Conference on Learning Representations (ICLR2025)*. Accepted.
2. **Xu, W.**, Peng, R., et al. (2024). Improvement Research on Reinforcement Learning Algorithms Based on Bayesian Dynamic Ensemble
3. Yan W., Feng X., Lin T., et al., including **Xu, W.** (2022). Diverse Subclade Differentiation Attributed to the Ubiquity of *Prochlorococcus* High-Light-Adapted Clade II. *mBio*, 13(1):e03027-21.

Research Experience

InfluenceDriven Training: Enhancing Training Robustness [Webpage]

Mar 2024 – Nov 2024

- Developed a novel metric based on the influence measure to assess the impact of individual data points on machine learning model performance, enhancing the robustness and accuracy of models.
- Designed and validated a dynamic active learning algorithm and a data selection method, demonstrating their effectiveness through extensive simulations and real-world datasets.
- This work has been accepted by **ICLR 2025** (see 1).

Bayesian Dynamic Ensemble Framework for MBRL [Webpage]

Jul 2023 – Jan 2024

- Collaborated with Zhejiang Lab to create a Bayesian Dynamic Ensemble (BDE) model, focusing on enhancing the robustness and convergence speed of Model-Based Reinforcement Learning (MBRL) algorithms.
- Implemented the BDE model using the mbrl library within the Mujoco simulation environment, which led to significant improvements in long-term strategic planning and faster convergence of algorithms.

- We have submitted this work (see [2](#)).

LLMs for Enhanced World Modeling in POMDPs [[Github](#)]

Jul 2024 – Dec 2024

- Led research on utilizing Large Language Models (LLMs) as world models in POMDPs, enhancing predictive capabilities of world model and agent decision-making.
- Developed an auxiliary loss function to preserve semantic information, enhancing the model's generalization across varied scenarios. Implemented Low-Rank Adaptation to efficiently fine-tune the models.

Reinforcement Learning with Psychometric Models for Trait Evaluation [[Webpage](#)]

Nov 2024 – Present

- Developed a framework combining reinforcement learning techniques with psychometric models using Partially Observable Markov Decision Processes (POMDPs) to estimate personal traits from noisy observations and evaluate individual-specific abilities.
- Designed a latent dynamics model with variational inference to infer hidden states and integrate complex datasets, enabling detailed assessments of individual traits and decision-making patterns.

Competition Experience

The 2nd Meituan Business Analysis Competition

Apr 2022

- Explored factors influencing the sales of expired food from the perspective of product design.
- Developed an *Expired Food Decision Optimization System* to provide better decision support for merchants to optimize product descriptions and forecast sales.
- Achieved **Top 50/1296** ranking in the preliminary round and **Top 30** ranking in the final round.

KDD Cup 2022 Wind Power Forecasting

Jun 2022

- Developed a hybrid time series prediction strategy based on tree models (such as LightGBM), incorporating recursive-direct hybrid forecasting techniques.
- Achieved a ranking of **11th (top 10%)** in the final stage of the competition.

Additional Information

Technical Skills

Proficient in Python, including object-oriented programming and scientific computing libraries such as NumPy and PyTorch. Familiar with R, C++. Experienced in working with Linux systems and familiar with Git workflow.