

# Ying Fan

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## EDUCATION

### Computer Sciences Department, UW-Madison

PhD Student, Overall GPA: 3.9/4.0

Madison, WI, USA

Sep 2019 – Present

### Yuanpei College, Data Science Major, Peking University

Beijing, China

Bachelor of Science, Overall GPA: 3.6/4.0; Major GPA: 3.8/4.0

Sep 2015 – Jul 2019

## RESEARCH EXPERIENCES

### Unknown-aware Deep Q Learning

2021

Advisor: Sharon Li, UW-Madison

- Aimed at making Deep Q learning framework aware of out-of-distribution (OOD) input and mitigate the issue of incorrect high estimation of Q values without hurting the cumulative reward
- Designed to regularize the training from a probabilistic view to facilitate higher OOD uncertainty for OOD states and vice versa
- Provided the proof that the regularization does not hurt the convergence solution of Q learning, and conducted experiments on Atari game to show state-of-the-art OOD detection performance

### Informative Outlier Mining via Bandits

2021

Advisor: Sharon Li, UW-Madison

- Aimed at informative outlier mining for classifiers to reject out-of-distribution inputs and avoid overconfidence
- Defined boundary score as an OOD indicator, and reformulate the problem of informative mining as a bandit problem
- Derived the sample efficiency on the final FNR and FPR by combining the theoretical results of bandit regrets and PAC-bound in classification

### Model-based Reinforcement Learning for Continuous Control with Posterior Sampling

2020

Independent Research, Paper Accepted to ICML 2021 (long talk)

- Aimed at efficient exploration in continuous state-action spaces using model-based posterior sampling algorithm
- Derived the Bayesian regret, which is the first regret of continuous PSRL that is polynomial in episode length with function approximation in continuous state-action spaces
- Achieved more efficient exploration compared with state-of-the-art model-based algorithms in control benchmark tasks

### Meta Reinforcement Learning

2018

Advisor: Michael Littman, Brown University

- Aimed at fast adaptation to a series of tasks, where some basic laws are shared, as a potential solution to achieve learning to learn and improve sample efficiency
- Proposed meta reward designer, with evolutionary strategy to obtain task-level information and adjust the policy dynamically when the recognition of the task changed
- Made further improvements by treating the loss from a single task and that from whole range of tasks as different objective functions, and achieved the goal by truncated bi-level optimization

### Using Failed Demonstration in Model-free Reinforcement Learning

2017

Advisor: Yizhou Wang, Peking University

- Aimed to make use of unsuccessful demonstrations to improve the efficiency and robustness of reinforcement learning
- Developed a theoretical analysis on how state distribution in the demonstrations decides the expectation of posterior variance of predicted value function in gaussian process
- Conducted the experiments in practice and verified the theorem

## PAPERS

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1. **Ying Fan**, Yifei Ming. Model-based Reinforcement Learning for Continuous Control with Posterior Sampling (ICML 2021 with long talk, rate: 3%, paper: <http://proceedings.mlr.press/v139/fan21b.html>, code: <https://github.com/yingfan-bot/mbpsrl>)
2. **Ying Fan**, Sharon Li. Towards Unknown-aware Deep Q Learning (Under Review)
3. Yifei Ming\*, **Ying Fan**\* and Sharon Li. Bandit-based Learning for Out-of-distribution Detection (Under Review, \* indicates equal contribution)
4. **Ying Fan**, Letian Chen and Yizhou Wang. Efficient Model-Free Reinforcement Learning Using Gaussian Process. (<https://arxiv.org/abs/1812.04359>)

## HONORS & AWARDS

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- Founder Scholarship, Peking University (top 5%)
- Award for Academic Excellence, Peking University (top 5%)
- Third Prize of the 25th “Challenge Cup”, Youth Science Competition of Peking University

## EXTRACURRICULAR ACTIVITIES

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Teaching Assistant Experiences:

CS 300 Programming II, UW-Madison

Aug 2020-Dec 2020

CS 760 Machine Learning, UW-Madison

Jan 2020-May 2020

Freshman Seminar of Yuanpei College, Peking University

Sep 2016-Jun 2017

## SKILLS & QUALIFICATIONS

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- Language: Mandarin(Native), English (TOEFL 108/120)
- Python (Pytorch, TensorFlow, etc), C/C++, R, MATLAB, Latex, SQL
- Chinese Lute (Level 9, Central Conservatory of Music)