

## Ying Fan

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### ACADEMIC INTERESTS

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Machine learning, statistical reinforcement learning

### EDUCATION

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**Peking University, Yuanpei College**

Beijing, China

BSc. Data Science

Sep 2015 – Jul 2019(expected)

Overall GPA: 3.6/4.0; Major GPA: 3.8/4.0

Core courses:

Advanced Mathematics (4.0/4.0)

Data Structure and Algorithms (3.97/4.0)

Linear Algebra (3.91/4.0)

Statistical Learning (3.91/4.0)

Probability and Statistics (3.93/4.0)

Deep Learning: Algorithms and Applications (3.81/4.0)

Introduction to Data Analysis (3.86/4.0)

Introduction to Stochastic Processes (3.77/4.0)

### RESEARCH EXPERIENCES

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#### **Meta reinforcement learning**

May 2018-Present

*Independent Research, Advisor: Michael Littman, Brown Univ.*

- 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, echoing the way that organisms adapt to different environments in nature
- Made further improvements by treating the loss from a single tasks and that from whole range of tasks as different objective functions, and achieved the goal by truncated bi-level optimization

#### **Efficient exploration in reinforcement learning**

Apr 2018- Present

*Team Leader, Advisor: Yizhou Wang, Peking Univ.*

- Aimed at efficient exploration in a new environment of continuous spaces
- Proposed posterior sampling algorithms for both model-based and model-free reinforcement learning
- Did bayesian regret analysis of posterior sampling algorithms with gaussian process, which achieved the level of highest efficiency in theoretically guaranteed reinforcement learning algorithms for now
- Conducted experiments in OpenAI gym and UnrealCV environments and which outperformed existing methods

#### **Using failed demonstration in model-free reinforcement learning**

Jun 2017-Feb 2018

*Independent Research, Advisor: Yizhou Wang, Peking Univ.*

- Aimed to make use of unsuccessful demonstrations to improve the efficiency and robustness of reinforcement learning
- Made an 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

#### **Air pollution index approximation via real time photos**

May 2017

*Team Leader, Advisor: Yizhou Wang, Peking Univ.*

- Tried to make a meaningful approximation of current air pollution index, when given a picture of current environment an approximate air pollution index could be produced

- Used CNN to extract the features of photos which describe the degree of the pollution, while other feature extraction method based on image processing are tried to improve it
- Achieved accuracy of 90% in practice

### **Improvements on recommendation systems**

Jan 2017

*Independent Research, Advisor: Yunfeng Cai, Peking Univ.*

- Made appropriate recommendations on items for users by means of score-prediction in user-item matrix to give reasonable inference to complete user-item preference matrix
- Proposed revision of the regularizer to make a trade-off between fitting the original data and satisfying the improved similarity of the users and items respectively in matrix decomposition
- Achieved better generalization capability and improved the accuracy of score-prediction by 20% from existing algorithm

## **MANUSCRIPTS**

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1. **Ying Fan**, Letian Chen and Yizhou Wang. Efficient Exploration in Model-free and Model-based Methods Using Gaussian Process.
2. **Ying Fan** and Michael Littman. Modeling Meta Reinforcement Learning through Truncated Bi-level Optimization.

## **EXTRACURRICULAR ACTIVITIES**

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### **Freshman Seminar of Yuanpei College, Peking University**

*Teaching Assistant*

Sep 2016-Jun 2017

- Prepared course materials for Math and Computer Science Seminar
- Helped the fresh year students to adjust to the academic study in Data Science

### **Academic Department of Yuanpei Academic Societies of Students, Peking University**

*Member*

Sep 2015-Sep 2017

- The main work is to make interview and write posts with concern of the academic issues in college life
- Helped to hold the party for scholarly exchange of different academic societies

### **PKU Helper Team, Peking University**

*Back-end developer*

Oct 2017-Jun 2018

- Developed and maintained back-end of PKU Helper App for PKU campus life

## **AWARDS**

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

## **PROFESSIONAL QUALIFICATIONS & SKILLS**

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- Language: Mandarin(Native), English (TOEFL 106/120)
- Python(TensorFlow, Pytorch, etc.), C/C++, R, SQL, Matlab, Latex
- Chinese Lute, Amateur of 9th Level in Central Conservatory of Music of China (Highest)