

# Tianyang ZHAO (Steven)

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## EDUCATION

### Yuanpei College, Peking University

Beijing, China

- Bachelor of Data Science and Big Data Technology, Aug 2015 - Present (expected in Jul 2019)
- GPA (Junior Year): **3.70/4.0**; TOEFL: **111/120**;
- Core Courses: Statistical Learning / Reinforcement Learning / Computer Vision & Deep Learning / Mathematical Statistics / Probability Theory & Statistics / Algebraic Structure & Combinatorial Mathematics / Numerical Methods / Mathematical Analysis / Intro to Data Science / Intro to Computation / C&C++ / Data Structure & Algorithm / Algorithm Design & Analysis / Intro to Computer Systems / Compiler Design / Computer Networks / Database Systems (Honor Tack)

### Department of Statistics, UCLA

Los Angeles, CA

- Research Assistant Jun 2018 – Nov 2018

## PUBLICATIONS

- **Tianyang Zhao**, Yifei Xu, Mathew Monfort, Wongun Choi, Chris Baker, Yibiao Zhao, Yizhou Wang, Ying Nian Wu. Convolutional Spatial Fusion for Multi-Agent Trajectory Prediction. Under review in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2019;
- **Tianyang Zhao**, Xiaoxuan Ma, Honglin Ma, Yizhou Wang. HAPPIER: Hierarchical Polyphonic Music Generative RNN. Under review in *International Conference on Learning Representations (ICLR)*, 2019;
- Yifei Xu, **Tianyang Zhao**, Chris Baker, Yibiao Zhao, Ying Nian Wu. Learning Trajectory Prediction with Continuous Inverse Optimal Control via Langevin Sampling. Under review in *AAMAS*, 2019.

## RESEARCH EXPERIENCE

### Multi-Agent Trajectory Prediction for Autonomous Driving with Deep Learning and Inverse Optimal Control

UCLA & ISEE (MIT startup for Autonomous Driving)

Los Angeles, CA & Cambridge, MA

Research Assistant, Advisor: **Ying Nian Wu**, Professor at Department of Statistics, UCLA Jun 2018 – Nov 2018

Co-advisors: **Wongun Choi**, **Chris Baker**, **Yibiao Zhao**, research scientists at ISEE led by **Prof. Josh Tenenbaum**

- Proposed, implemented, and trained a novel Convolutional Spatial Fusion model to reason about social interactions among varying numbers of agents & between agents and scene contexts, which retains the spatial structure of agents and the scene;
- Implemented a Conditional GAN to learn a joint distribution of multi-agent trajectories based on the proposed fusion model;
- Conducted ablative studies on Stanford Drone and NGSIM datasets, outperformed *Social GAN*;
- Paralleled the multi-agent code on GPU to accelerate training; completed and submitted a paper to *CVPR 2019*;
- Participated in proposing another Inverse Optimal Control (IOC) based prediction approach, which learns non-Markovian cost functions defined over entire trajectories; participated in extending weighted feature-based cost functions to neural network augmented ones; submitted a paper to *AAMAS 2019*.

### Music Generation with Hierarchical Deep Reinforcement Learning, EECS, Peking University

Beijing, China

Computer Vision and Digital Art (CVDA) research group

Jun 2017 - Jun 2018

Research Assistant, Advisor: **Yizhou Wang**, Professor at School of Electronics Engineering and Computer Science, PKU

- Proposed novel hierarchical LSTM architectures and corresponding RL algorithms to learn long-range consistency for sequence modeling, and to generate music by combining learned patterns from dataset with structured domain knowledge;
- Designed the architecture as follows: a higher level learns correlations across measures and patterns for chord progressions, and a lower level learns a distribution over the notes to generate within a measure; the two operate at different clock rates while communicating with each other;
- Generated samples via supervised learning: <https://github.com/HAPPIER-Music/>; submitted a paper to *ICLR 2019*.

## OPEN SOURCE PROJECTS

- **Homepage:** <https://programminglearner.github.io/>. Proficient in C++, C, python, TensorFlow, PyTorch.
- **Chinese Chess Program Developing and AI Designing with Novel Heuristic  $\alpha$ - $\beta$  Tree Search:** Developed a Chinese Chess game program from scratch; Proposed and implemented a novel approach of  $\alpha$ - $\beta$  tree search based on heuristic methods; Proved its superiority over conventional  $\alpha$ - $\beta$  tree search w.r.t. time complexity and winning rate; 3k+ lines in C++.
- **Automatic Back-Propagation:** Implemented automatic BP algorithm for any given DAG and Neural Nets from scratch, which calculated the backward path automatically, given any forward path.

## AWARDS AND HONORS

- Merit Student (top 10%), Peking University, Nov 2017;
- 5 of 318, Botzone AI contest (Reversi), Peking University;
- Meritorious Winner (top 15%), Mathematical Contest in Modeling (MCM), Feb 2018;
- 3rd Prize, ACM Programming Contest in Peking University, May 2017