

# FANGCHEN (CATHERINE) LIU

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Homepage: <https://fangchenliu.github.io/>

## EDUCATION

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**University of California San Diego**

Sep. 2018 – Present

*M.S. in Computer Science* – thesis track, GPA: 3.87/4.0

**Peking University, Beijing, China,**

Sep. 2014 – Jul. 2018

*B.S. in Computer Science with Honor* – summa cum laude, GPA: 3.67/4.0 (top 10%)

## CORE COURSES

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UCSD: Convex Optimization (A+), Machine Learning on Geometric Data (A+), Stochastic Process (A+), Statistical Learning (A)

PKU: Advanced Mathematics I (98), Advanced Mathematics II (96), Advanced Algebra (90), Honored Operation System Programming (92), Honored Computer Networks Programming (96), Embedded System Programming (90)

## RESEARCH INTEREST

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I am interested in understanding the environments for interactions and through interactions. I have research experience in reinforcement learning (a NeurIPS paper), imitation learning (an ICLR submission), and 3D perception (a CVPR submission). I also worked on 2D image adversarial defense (a CVPR paper) and autonomous driving dataset construction (an arXiv with 169 Google Scholar citations as of Nov 3, 2019).

## PUBLICATIONS

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\* *indicates equal contribution*

- SAPIEN: a SimulATED Part-based Interactive ENvironment. Fanbo Xiang, Yuzhe Qin, Kaichun Mo, Yikuan Xia, Hao Zhu, **Fangchen Liu**, Minghua Liu, Li Yi, He Wang, Angel Chang, Leonidas Guibas, Hao Su. *In Submission to CVPR*, 2020
- State Alignment-based Imitation Learning. **Fangchen Liu**, Zhan Ling, Tongzhou Mu, Hao Su. *In Submission to ICLR*, 2020
- Mapping State Space using Landmarks for Universal Goal Reaching. **Fangchen Liu**\*, Zhiao Huang\*, Hao Su. *NeurIPS*, 2019
- Adversarial Defense by Stratified Convolutional Sparse Coding. Bo Sun, Nian-hsuan Tsai, **Fangchen Liu**, Ronald Yu, Hao Su. *CVPR*, 2019
- Effective Master-Slave Communication On a Multi-Agent Deep Reinforcement Learning System. Xiangyu Kong, **Fangchen Liu**\*, Bo Xin\*, Yizhou Wang. *NIPS Hierarchical Reinforcement Learning Workshop*, 2017
- BDD100K: A Diverse Driving Video Database with Scalable Annotation Tooling. Fisher Yu, Wenqi Xian, Yingying Chen, **Fangchen Liu**, Mike Liao, Vashisht Madhavan, Trevor Darrell. *arXiv:1805.04687*

## RESEARCH EXPERIENCE

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### **Reinforcement/Imitation Learning for Robot Manipulation in 3D Simulated Environments** Oct. 2019 – Present

*Research Assistant at University of California San Diego, advised by Prof. Hao Su*

- Help build 3D environments for robot manipulation in a PhysX-based simulator developed in SU Lab
- Use goal-conditioned reinforcement learning and imitation learning methods to solve robot manipulation tasks (e.g., door opening)
- Use PointNet++ to generate grasping proposal and predict object mobility
- Submitted to CVPR 2020

### **Imitation Learning between Heterogeneous Actors** Jul. 2018 – Oct. 2019

*Research Assistant at University of California San Diego, advised by Prof. Hao Su*

- Attack the imitation learning problem when experts and imitators have different dynamics
- Use state-based Variational Auto-Encoder to robustify behavior cloning and Wasserstein distance to measure imitation progress
- Combine local and global constraints by reformulating the objective of Proximal Policy Optimization (PPO) algorithm
- Submitted to ICLR 2020

### **Model-based Reinforcement Learning and Planning** Dec. 2018 – May. 2019

*Research Assistant at University of California San Diego, advised by Prof. Hao Su*

- Combine reinforcement learning with search algorithms to solve long-horizon planning and exploration problems on a graph-based hierarchical environment model
- Use farthest point sampling to find landmarks in the replay buffer
- Achieve SOTA on learning-based goal-conditioned robot control, manipulation, and navigation benchmarks (AntMaze, PointMaze, FetchReach, FetchPush, etc)
- Accepted by NeurIPS 2019

### **Adversarial Defense by Convolutional Sparse Coding** Oct. 2018 – Nov. 2018

*Research Assistant at University of California San Diego, advised by Prof. Hao Su*

- Implement a patch-based dictionary learning baseline for adversarial defense
- Accepted by CVPR 2019

### **Hierarchical Multi-Agent System in Video Game Playing** Oct. 2017 – Mar. 2018

*Intern at Microsoft Research Asia, advised by Prof. Yizhou Wang & Dr. Bo Xin*

- Propose a hierarchical multi-agent framework for video game playing, outperformed DeepMind's baseline on StarCraft II at the time
- The global agent uses an SSD-like detection algorithm to get object proposals and generate an schedule plan for local agents

- Use an LSTM to aggregate every low-level agent's observations, and use A3C to train the local policy
- Part of the results can be found in the arXiv report: [arXiv:1712.07305](https://arxiv.org/abs/1712.07305)

### Face Set Recognition

*Intern at SenseTime AI, advised by Dr. Yi Sun*

Sep. 2016 – Mar. 2017

- Work on face set recognition using memory networks
- Implement a memory module acting like Neural Turing Machine to aggregate a set of features belonging to the same ID, which was integrated in their internal deep learning framework (CAFFE-based)

### TEACHING EXPERIENCE

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TA for Introduction to Computer Vision, UCSD	Sep. 2019 – Dec. 2019
Seminar on Advanced Optimization, UCSD	Sep. 2019 – Dec. 2019
Seminar on Convex Optimization, UCSD	Feb. 2019 – May. 2019
Seminar on Spectral Graph Theory, UCSD	Sep. 2018 – Dec. 2018
TA for Algorithm Design and Analysis, Peking University	Feb. 2017 – Jun. 2017

### HONORS AND AWARDS

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Honored Bachelor of Science in Peking University	Jul. 2018 (30 in 350)
Member of Top-Notch Program in PKU (renamed as Turing Class now)	Jul. 2016 - Jul. 2018
Guanghua Scholarship	Mar. 2015 & Mar. 2017 (Twice)
Merit Student in Academic Study	Mar. 2016 & Mar. 2017 (Twice)
First-prize in Chinese Mathematical Olympiad in Senior, Shandong Province	Dec. 2013