

Fan-Yun Sun

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Research Interests

Applied machine learning, machine perception, reasoning, and interaction, reinforcement learning, graph machine learning.

Education

Stanford University

PH.D IN COMPUTER SCIENCE

• GPA: 4.0 / 4.0

Palo Alto, U.S.A

09/2020 -

National Taiwan University (NTU)

B.S. IN COMPUTER SCIENCE AND INFORMATION ENGINEERING

• GPA: 4.20 / 4.30

Taipei, Taiwan

09/2015 - 06/2019

Publications

(google scholar page: <https://scholar.google.com/citations?user=TOW2RMMAAAAJ>)

1. **Fan-Yun Sun**, Hao Tang, Jonathan Kuck, Stefano Ermon “Equivariant Neural Network for Factor Graphs”, in submission of **Conference on Neural Information Processing Systems (NeurIPS 2021)**
2. Daniel M Bear, Elias Wang, Damian Mrowca, Felix J Binder, Hsiao-Yu Fish Tung, RT Pramod, Cameron Holdaway, Sirui Tao, Kevin Smith, **Fan-Yun Sun**, Li Fei-Fei, Nancy Kanwisher, Joshua B Tenenbaum, Daniel LK Yamins, Judith E Fan “Physion: Evaluating Physical Prediction from Vision in Humans and Machines”, accepted by **NeurIPS 2021 Track Datasets and Benchmarks**
3. Hsuan Su, Jiun-Hao Jhan, **Fan-Yun Sun**, Sauray Sahay, Hung-yi Lee “Put Chatbot into Its Interlocutor’s Shoes: New Framework to Learn Chatbot Responding with Intention”, in proceedings of **North American Chapter of the Association for Computational Linguistics (NAACL 2021)**
4. **Fan-Yun Sun**, Meng Qu, Jordan Hoffman, Chin-Wei Huang, Jian Tang “vGraph: A Generative Model for Joint Community Detection and Node Representation Learning”, in proceedings of **Conference on Neural Information Processing Systems (NeurIPS 2019)**
5. **Fan-Yun Sun**, Jordan Hoffman, Vikas Verma, Jian Tang, “InfoGraph: Unsupervised and Semi-supervised Graph-Level Representation Learning via Mutual Information Maximization”, **International Conference on Learning Representations (ICLR 2020) (Spotlight)**.
6. **Fan-Yun Sun**, Yen-Yu Chang, Yueh-Hua Wu, Shou-De Lin, “A Regulation Enforcement Solution for Multi-agent Reinforcement Learning”, in proceedings of **International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS 2019)**
7. **Fan-Yun Sun**, Yen-Yu Chang, Yueh-Hua Wu, Shou-De Lin, “Designing Non-greedy Reinforcement Learning Agents with Diminishing Reward Shaping”, in proceedings of **AAAI/ACM conference on AI, Ethics, Society 2018 (Oral)**
8. Yen-Yu Chang, **Fan-Yun Sun**, Yueh-Hua Wu, Shou-De Lin, “A Memory-Network Based Solution for Multivariate Time-Series Forecasting”, **Preprint Arxiv:1809.02105 2018**
9. Yueh-Hua Wu, **Fan-Yun Sun**, Yen-Yu Chang, Shou-De Lin, “ANS: Adaptive Network Scaling for Deep Rectifier Reinforcement Learning Models”, **Preprint Arxiv:1809.02112 2018**
10. Kuan-Lun Tseng, Winston Hsu, Chun-ting Wu, Ya-Fang Shih, **Fan-Yun Sun**, “Organ At Risk Segmentation with Multiple Modality”, **Preprint Arxiv:1910.07800 2018**

Research & Work Experience

Graudate Research Assistant (Rotation), Stanford University

Palo Alto, U.S.A

PHYSION: EVALUATING PHYSICAL PREDICTION FROM VISION IN HUMANS AND MACHINES PROF. DAN YAMINS [**NeurIPS-21**]

- We presented a visual and physical prediction benchmark that measures ML algorithms’ capabilities of predicting real world physics.
- We demonstrated how our benchmark can identify areas for improvement in physical understanding.

INTENT-AWARE MULTI-AGENT WORLD MODELING FOR SOCIAL NAVIGATION PROF. NICK HABER [**Ongoing**]

- We simulate environments with rich social behaviors.
- We develop a theory of mind neural network-based world model that infers agents’ intentions in relational environments in an unsupervised fashion.

DATA MINING AND ANOMALY DETECTION ON TEMPORAL NETWORKS PROF. JURE LESKOVEC

- Proposed an end-to-end self-supervised graph neural network to detect (high order) anomalies in temporal networks.
- Our method outperforms baseline methods by 8% on a dataset of financial transaction network.

EQUIVARIANT NEURAL NETWORK FOR FACTOR GRAPHS PROF. STEFANO ERMON [**In submission of NeurIPS**]

- We identified previously overlooked isomorphism properties between factor graphs.
- The proposed neural network-based models achieve state-of-the-art performance on marginal inference.

Research Intern, Montreal Institute for Learning Algorithms (MILA), PROF. JIAN TANG

Montreal, Canada

VGRAPH: A GENERATIVE MODEL FOR JOINT COMMUNITY DETECTION AND NODE REPRESENTATION LEARNING [**NeurIPS-19**]

01/2019 - 05/2019

- Proposed a generative model that models community assignment as discrete latent variable and is optimized using variational inference.
- Outperformed state-of-the-art baselines in both community detection tasks and node classification tasks.

INFOGRAPH: UNSUPERVISED AND SEMI-SUPERVISED GRAPH-LEVEL REPRESENTATION LEARNING VIA MUTUAL INFORMATION MAXIMIZATION [**ICLR-20**]

- Proposed to adopt mutual information maximization techniques for both unsupervised and semi-supervised whole graph learning.
- Outperformed baselines in both unsupervised graph classification and semi-supervised molecular property prediction tasks (QM9).

Research Assistant, Multimedia Indexing, Retrieval, and Analysis Lab, PROF. WINSTON HSU

Taipei, Taiwan

ORGAN AT RISK SEGMENTATION WITH MULTIPLE MODALITY

01/2018 - 12/2018

- Proposed to use GAN to improve segmentation performance on medical images with multiple modalities.
- Outperformed competitive baselines, including Faster-RCNN and Mask-RCNN.

NEURAL NETWORK AS NEURAL NETWORK INPUT

- Existing benchmark graph datasets are limited to social networks, citation networks, or bioinformatic datasets. In this paper, we extend the realm of graph benchmark datasets to computation graphs of neural networks.

Machine Learning Engineer Intern, Appier

Taipei, Taiwan

- Implemented RNN-based and graph-based recommendation algorithms using real world datasets.

03/2018 - 09/2018

Undergraduate Researcher, Machine Discovery & Network Mining Lab, PROF. SHOU-DE LIN

Taipei, Taiwan

A REGULATION ENFORCEMENT SOLUTION FOR MULTI-AGENT REINFORCEMENT LEARNING [AAMAS-19]

03/2017 - 09/2018

- Proposed a regulation enforcement solution for normative multi-agent systems.
- Utilized empirical game-theoretic analysis to show that our method makes mutual compliant the new Nash Equilibrium.

DESIGNING NON-GREEDY REINFORCEMENT LEARNING AGENTS WITH DIMINISHING REWARD SHAPING [AIES-18 (Oral)]

- Proposed a cost-effective method to train non-greedy reinforcement learning (RL) agents.
- Conducted multi-agent RL simulations to prove that our method achieved non-homogeneous equality.

A MEMORY-NETWORK BASED SOLUTION FOR MULTIVARIATE TIME-SERIES FORECASTING

- Proposed a memory network-based model for time series prediction with interpretable attention mechanism.
- Outperformed state-of-the-art baselines in both univariate and multivariate time series prediction.

ADAPTIVE NETWORK SCALING FOR DEEP RECTIFIER REINFORCEMENT LEARNING MODELS

- Provided a thorough study on how reward scaling can affect performance of deep reinforcement learning agents.
- Proposed an adaptive network scaling framework to find a suitable scale of rewards during learning for better performance.

Quantitative Research Intern, WorldQuant

Taipei, Taiwan

- Conducted quantitative research with financial data.

01/2018 - 02/2018

Microsoft Student Partner, Microsoft

Taipei, Taiwan & Seattle, Washington

- Workshop lecturer on machine learning and deep learning.
- Attended Microsoft Build Conference as the representative for Taiwan.

09/2017 - 06/2018

Software Engineering Intern, Google

Taipei, Taiwan

- Developed full stack applications for Android Team's project Treble.

07/2017 - 09/2017

Honors & Awards

(complete list at <https://fanyun-sun.github.io/#awards>)

- 2019 **Appier AI Scholarship**, for NeurIPS 2019
- 2018 **Ranked 19th / 4180 teams**, KDD CUP - Main Track
- 2018 **Ranked 4th / 4180 teams**, KDD CUP - Long Term Prediction Track
- 2018 **Research Project Grant**, Institute for Information Industry of Taiwan
- 2018 **Intern of the year Award**, Microsoft Student Partner
- 2017 **Finalist (Top 12)**, Formosa Response Selection Chatbot Competition
- 2017 **Top 1000**, Google Code Jam
- 2016 **1st Place**, ACM ICPC Regional Contest
- 2016 **2nd Place**, Newcomers for ACM-ICPC Taiwan Online Programming Contest
- 2016 **3rd Place**, NTU ACM ICPC Ranking
- 2017 **Best Project Award**, Probability - Final Project Contest
- 2016 **Ranked 3rd/280+ students**, Data Structure and Algorithm - Final Project Contest
- 15,16 **Presidential Awards**, National Taiwan University
- 2014 **Finalist (Top 30)**, International Physics Olympiad Domestic Final

Professional Activities

(slides available at <https://fanyun-sun.github.io/#teaching>)

Reviewer, International Conference on Learning Representations (ICLR),

2020

Presenter, Drug Discovery & Graph Neural Networks, MILA Graph Reading Group

04/2019

Workshop Lecturer, Intro to deep learning and frameworks compared, Microsoft Student Partner

10/2017

Teaching Assistant, Data Structures and Algorithms (Spring 2017), Prof. Jyh-Shing Roger Jang

02/2017 - 06/2017

Skills

Natural Languages

English, Chinese (Mandarin)

Programming Languages

Python, C/C++, Shell, Git, Java, Javascript, Matlab, Python

Deep Learning Libraries

Pytorch, Tensorflow, Keras