Xinyu **Yang**

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Education

Shanghai Jiao Tong University   *Shanghai, China*

Bachelor of Engineering, ACM Honors Class   *Sept. 2019 - Present*

- **ACM Honors Class** is an elite CS program for students ranked in the top 5% with aspirations in research.
- Overall GPA: **4.0 / 4.3**, Ranking: **1 / 30**
- TOEFL: 109 / 120. Reading: 30, Listening: 29, Speaking: 22, Writing: 28

Research Interests

Machine Learning, Robustness, Efficient Deep Learning, Out-of-Distribution Generalization, Structured Learning and Inference.

Publications

Variational Inference for Training Graph Neural Networks in Low-Data Regime through Joint Structure-Label Estimation   *SIGKDD 2022*

Danning Lao, **Xinyu Yang***, Qitian Wu and Junchi Yan*

FlatFormer: Flattened Window Attention for Efficient Point Cloud Transformer   *Under Review*

Zhijian Liu, **Xinyu Yang***, Haotian Tang, Shang Yang and Song Han*

Relational Out-of-Distribution Generalization   *Under Review*

Xinyu Yang, Huaxiu Yao*, Xinyi Pan, Shengchao Liu, Pang Wei Koh and Chelsea Finn*

Multi-domain Long-Tailed Learniing By Augmenting Disentangled Representations   *Under Review*

Huaxiu Yao, **Xinyu Yang***, Allan Zhou and Chelsea Finn*

BEVFusion: Multi-Task Multi-Sensor Fusion with Unified Bird's-Eye View Representation *Under Review*

Zhijian Liu, Haotian Tang*, Alexander Amini, **Xinyu Yang**, Huizi Mao, Daniela Rus and Song Han*

Honors & Awards

National Scholarship of P.R. China **(Top 0.2%, nationwide)**	*2021, 2022*
SenseTime Scholarship **(30 winners each year, nationwide)**	*2021*
Han-Ying-Ju-Hua Scholarship **(15 winners each year, Shanghai Jiao Tong University)**	*2021*
Fan Hsu-Chi Scholarship **(10 winners each year, Shanghai Jiao Tong University)**	*2020*
Academic Excellence Scholarship **(Top 5%, Shanghai Jiao Tong University)**	*2020, 2021*
Zhiyuan Honorary Scholarship	*2019, 2020, 2021*

Research Experience

Stanford University   *Stanford, CA, USA*

Research Intern at IRIS, advised by Prof. Chelsea Finn   *Mar. 2022 - Present*

- **Multi-Domain Long-Tailed Learning**
  Real-world scenarios often involve multiple domains with distinct imbalanced class distributions. We study this multi-domain long-tailed learning problem and aim to produce a model that generalizes well across all classes and domains. Towards that goal, we introduce **TALLY**, which produces invariant predictors by augmenting hidden representations for minority domains and classes. This work is submitted to **ICLR 2022**.

- **Relational Out-of-Distribution Generalization**
  Recent domain generalization approaches align all domains equally, which ignore the relationship between domains. To fill this gap, we formulate relational out-of-distribution: a domain shift setting incorporated with a domain relation graph and propose **ROOG** to solve it. A short version is accepted by **NeurIPS Workshop**, and the full version will be submitted to **ICML 2023**.

- **Out-of-Distribution Type Detection**
  Out-of-distribution (OOD) detection is critical to ensuring the reliability of machine learning systems. However, existing methods only focus on semantic shift. In this work, we extend OOD detection to a mixture of semantic shift, covariant shift and concept shift. We plan to propose an end-to-end framework to distinguish from different types of distribution shift and adapt to changing environments in an effiecient way.

Massachusettes Institute of Technology *Cambridge, MA, USA*
Research Intern at HanLab, advised by Prof. Song Han *Nov. 2021 - Present*

- **Efficient Point Cloud Transformer**

  For 3D point cloud transformers, their latency lags far behind sparse convolution-based models though achieving state-of-the-art performance. In this work, we present **FlatFormer** to close this latency gap by trading spatial proximity for better computational regularity. FlatFormer delivers **SOTA** accuracy on Waymo Open Dataset with **4.6**× speedup over (transformer-based) SST and **1.4**× speedup over (sparse convolution-based) CenterPoint. It is the **first** point cloud transformer that achieves real-time performance on edge GPUs. This work is submitted to **CVPR 2023**.

- **Multi-Sensor Fusion in Autonomous Driving System**

  Multi-sensor fusion is essential for an accurate and reliable autonomous driving system. In this work, we provide a fresh perspective to this field and propose **BEVFusion**, an efficient and generic multi-task multi-sensor fusion framework. It unifies multi-modal features in the shared BEV representation space, which nicely preserves both geometric and semantic information. This work is submitted to **ICRA 2023**.

- **3D BEV Segmentation Benchmark**

  Previous BEV map segmentation approaches suffer a lot from diversity in label generation and data leakage in official split that is originally for detection tasks (e.g. nuScenes), leading to a unfair comparison. Therefore, we resplit scenes for this task and propose a unified and easy-to-use BEV map segmentation benchmark on nuScenes. We will further extend it to more datasets like Argoverse 2.

- **3D Panoptic Segmentation**

  In this project, we extend SPVCNN to panoptic segmentation task with an instance branch predicting the offsets to object center. We use Mean-Shift clustering algorithm to get instance predictions. Our SPVCNN++-Panoptic wins **2nd** place in nuScenes panoptic challenge.

Shanghai Jiao Tong University *Shanghai, China*
Undergraduate Researcher at ThinkLab, advised by Prof. Junchi Yan *Jun. 2021 - Aug. 2022*

- **Weakly-Supervised Graph Learning through Structure-Label Joint Estimation**

  In real-world scenarios, complete input graph structure and sufficient node labels might not be achieved easily. To address this problem, we propose **W**eakly-**S**upervised **G**raph **N**eural **N**etwork(WSGNN), a flexible probabilistic generative framework which harnesses variational inference to solve semi-supervised graph learning in a label-structure joint estimation manner. This work is **accepted by KDD 2022**

Selected Projects

Mx* Compiler *Java*
Assembly Language, Code Generation and Optimization, LLVM IR, ANTLR *Jan. 2021 - Jun. 2021*
- Developed a compiler for C-and-Java-like language (Mx*) to NASM that overwhelmingly outperforms O1.
- Implemented optimizations like sparse conditional constant propagation, function inline and static single assignment

Low-latency Traffic Signal Controller *Python*
Reinforcement Learning, DQN, City-scale Road Network *Jan. 2021 - Jun. 2021*
- Coursework of "Machine Learning" (31st place in *KDD CUP 2021 - City Brain Challenge*)
- Designed an agent that coordinate the traffic signals to maximize number of vehicles served while maintaining an acceptable delay.

RISC-V CPU *Verilog*
Computer Architecture, Tomasulo, FPGA Programming *Nov. 2020 - Dec. 2020*
- Designed a RISC-V CPU that supports RV32I Base Integer Instruction Set V2.0 (2.1-2.7).
- Implemented a Tomasulo algorithm with load/store buffer that is efficient than five-stage pipelined CPU.

Teaching Experience

Teaching Assistant *Compiler Design and Implementation* *Fall 2021*
Teaching Assistant *Principle and Practice of Computer Algorithms* *Summer 2021*
Teaching Assistant *Data Structures* *Spring 2021*