

# Fan Nie

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## Education

### Shanghai Jiao Tong University

Sep 2020 – Jun 2024 (Expected)

B.Eng in Computer Science and Technology (IEEE Honor Class)

Shanghai, China

- GPA 93.41/100, Rank 2/122 (the last two years 1/122)
- A+ Courses: Computer Architecture, Computer Networks, Artificial Intelligence, NLP and 19 others
- Served as a reviewer for ICRA'24.

### École Polytechnique Fédérale de Lausanne (EPFL)

Feb 2023 – Jul 2023

Exchange Student of Computer Science

Lausanne, Switzerland

- Courses: Database System (6.0/6.0), Machine Learning (6.0/6.0), Data Visualization (6.0/6.0)

## Publication

(\* means equal contribution)

1. Z. Li\*, F. Nie\*, Q. Sun, F. Da, H. Zhao. **Uncertainty-Aware Decision Transformer for Stochastic Driving Environments**. *arXiv preprint arXiv:2309.16397, 2023. (Under Review at ICLR'24)*
2. Z. Li\*, F. Nie\*, Q. Sun, F. Da, H. Zhao. **Boosting Offline Reinforcement Learning for Autonomous Driving with Hierarchical Latent Skills**. *arXiv preprint arXiv:2309.13614. (Under Review at ICRA'24)*
3. Q. Wu, F. Nie, C. Yang, T. Bao, J. Yan. **GraphSHINE: Training Shift-Robust Graph Neural Networks with Environment Inference**. *(Under Review at WWW'24)*
4. Q. Wu, C. Yang, K. Zeng, F. Nie, M. Bronstein, J. Yan. **Advective diffusion transformers for topological generalization in graph learning**. *arXiv preprint arXiv:2310.06417. (Under Review at ICLR'24)*
5. Q. Wu, W. Zhao, C. Yang, H. Zhang, F. Nie, H. Jiang, Y. Bian, J. Yan. **Simplifying and Empowering Transformers for Large-graph Representations**. *In Advances in Neural Information Processing Systems (NeurIPS 2023)*.
6. Z. Li, Q. Wu, F. Nie, J. Yan. **Graphde: A Generative Framework for Debaised Learning and Out-of-distribution Detection on Graphs**. *In Advances in Neural Information Processing Systems (NeurIPS 2022)*.

## Research Experience

### Uncertainty-Aware Decision Transformer

Mar 2023 – Nov 2023

Submission to ICLR'24; the Co-First Author

MARSLab, THU

- Presented an uncertainty-aware decision transformer (DT) for a stochastic driving environment; estimated state uncertainties by the conditional mutual information and learned to perform aggressively or cautiously based on uncertainty levels.
- Designed, developed, and experimented with the models and training pipelines; conducted 15+ experiments (e.g. planning performance, uncertainty calibration) and visualized robust and exceptional performance of UNREST across diverse driving scenarios; drafted the paper.
- Outperformed state-of-the-art baseline (SPLT) significantly by 11.5% in terms of driving score.

### Skill-Based Offline Motion Planning

Dec 2022 – Sep 2023

Submission to ICRA'24; the Co-First Author

MARSLab, THU

- Introduced a novel skill-based framework enhancing offline RL to overcome the challenge of long-horizon planning in driving environments.
- Employed a two-branch VAE to extract driving skills and visualized them by T-SNE to prove the effectiveness; Conducted motion planning in the CARLA simulator; Drafted the paper and created the demo video to showcase the key ideas and model performance.
- Outperformed state-of-the-art baseline (OPAL) considerably by 11.4% in terms of driving score.

### Training Shift-Robust GNNs with Environment Inference

Oct 2022 – May 2023

Submission to NeurIPS'23 (Average rating: 5.6), WWW'24; the Second Author

Thinklab, SJTU

- Proposed a novel approach with an environment estimator and a mixture-of-expert GNN predictor to train robust GNNs under node-level distribution shifts.
- Designed and built GNN-based models and training pipelines; conducted 90+ experiments on six datasets to prove the efficacy of our model for OOD generalization.
- Outperformed state-of-the-art models by 12.9%, showing strong capabilities to generalize results on challenging tasks with significant dataset shift (e.g. node property prediction tasks).

## **Simplifying Transformers for Large-Graph Representations**

July 2022 – Apr 2023

Full paper accepted by NeurIPS'23; the Fifth Author

Thinklab, SJTU

- Introduced Simplified Graph Transformers (SGFormer) as a powerful and scalable encoder for large graphs; reduced the complexity of Graph Transformer to linear; innovative combined feature propagation and global attention in design.
- Built graph transformer baselines and conducted extensive experiments and visualizations to show the model performance over the SOTA model.
- Outperformed SOTA Transformers up to 25.9% with great efficiency improvement (141x inference acceleration).

## **Debiased Learning and Out-of-Distribution Detection on Graph Data.**

Mar 2022 – Sep 2022

Full paper accepted by NeurIPS'22; the Third Author

Thinklab, SJTU

- Addressed out-of-distribution challenges in graph data by integrating a unified probabilistic model. Automated outlier identifications during training, and concurrently induced a detector for out-of-distribution detection during testing.
- Preprocessed the datasets and employed different methods to introduce OOD samples. Conducted 15+ experiments and visualized results to show the performance (debiasing and OOD detection) and robustness against baselines.
- Outperformed SOTA results with a great edge. E.g. outperforms by 9.31% on MNIST-75sp in the OOD detection task.

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## Internship Experience

### **Shanghai Qizhi Institute.**

July 2023 – Dec 2023

Research Intern, Supervised by Prof. Hang Zhao

Shanghai, China

- Led advanced research on autonomous driving prediction and planning tasks. Designed model optimization strategies and adjustments and implemented codebase on Carla simulator and nuPlan dataset.
- Explored the reasoning ability of VLMs/LLMs to guide multi-agent interaction prediction in autonomous driving. Designed prompts and combined vectorized and rasterized inputs with texts for better encoding.

### **Biomap, Inc.**

July 2022 – Dec 2022

Algorithm R&D Intern

Beijing, China

- Set up the DeepCellState baseline and different types of Attention Free models to predict changes in gene expression levels after drug interference using PyTorch, and tested their performance on large-scale biological datasets.
- Implemented discretization techniques such as equal frequency binning and custom binning to minimize data loss. Finetuned the pretrained model and raised the F1 Score by 6.2%.

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## Project Experience

### **Graph Neural Networks for Scalable Combinatorial Optimization.**

Mar 2023 – June 2023

Research Project in LIONS, EPFL

- Speeded up the decoding process of solving CO problems with a GNN by directly sampling from the learned probabilities and employed a STE to guide the network in making accurate discrete decisions.
- Code; Experiment; Paper Writing; Presentation.

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## Extracurricular Activities

### **Youth Volunteer Team**

Mar 2021 – Dec 2022

Minister of Planning

SJTU, Shanghai

- Planned and organized various volunteer activities such as Shanghai Marathon volunteers, etc.; Wrote planning cases and coordinated with different departments.
- Interviewed over 50+ volunteer applicants; instructed volunteers and allocated tasks to teammates.

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## Skills

**Programming Languages:** Python, C + + , JavaScript, HTML, CSS

**Tech Skills:** MySQL, PyTorch, Data Visualization, Web Development, Web Crawler