Zuoyu Yan

Ph.D. Student ·

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Research Interest

My research interest lies in the intersection of machine learning and topological data analysis. In particular, I am interested in:

- Combining geometry/topology with modern machine learning frameworks, e.g., graph neural networks
- Their applications in real-world scenarios, e.g., biomedicine, and recommendation systems.

Education

Peking University

Ph.D. Student, Computer Science *2019.09 till now*

Peking University

Undergraduate Degree, Data Science *2015.09 - 2019.06*

Intern Experience

Alibaba DAMO Academy

2021.05-2021.10

- Multimodal entity linking on Wikipedia and Wikinews data.

Publications

Zuoyu Yan, Tengfei Ma, Liangcai Gao, Zhi Tang, Yusu Wang, Chao Chen. Neural Approximation of Graph Topological Features. Advances in Neural Information Processing Systems (**NeurIPS**), 2022. (**Spotlight, acceptance rate 4%-5%**)

Zuoyu Yan, Tengfei Ma, Liangcai Gao, Zhi Tang, Chao Chen. Cycle Representation Learning for Inductive Relation Prediction. International Conference on Machine Learning (**ICML**), 2022.(**Short talk, acceptance rate 21.9%**)

Zuoyu Yan, Tengfei Ma, Liangcai Gao, Zhi Tang, Chao Chen. Link Prediction with Persistent Homology: An Interactive View. International Conference on Machine Learning (**ICML**), 2021.(**Short talk, acceptance rate 21.5%**)

Zuoyu Yan, Xinpeng Zhang, Liangcai Gao, Ke Yuan, Zhi Tang. ConvMath: A Convolutional Sequence Network for Mathematical Expression Recognition. International Conference on Pattern Recognition (**ICPR**), 2020.

Wenqi Zhao, Liangcai Gao, **Zuoyu Yan**, Shuai Peng, Lin Du, Ziyin Zhang. Handwritten mathematical expression recognition with bidirectionally trained transformer. International Conference on Document Analysis and Recognition (**ICDAR**), 2021. (**Best poster award, 2 out of 340 submissions**).

Liangcai Gao, Xiaohan Yi, Yuan Liao, Zhuoren Jiang, **Zuoyu Yan**, Zhi Tang. A deep learning-based formula detection method for PDF documents. International Conference on Document Analysis and Recognition (**ICDAR**) 2017.

Honors

- Won the 2021-2022th "Outstanding Research Award" of Peking University. (15% out of 27 PhD students of Wangxuan Institute of Computer Technology of Peking University (**WICT**))
- Won the 2021-2022th "Outstanding Student Award" of WICT. (7% out of 70 students of WICT)
- Won the 2018-2019th Excellent Project of Peking University President's Fund (10% out of 97 projects)

- Won the third prize in the ”Schlumberger Cup” programming competition held in Peking University.
- Ranked 8th(out of 836 teams) in the Plant Seedlings Classification competition held on Kaggle website

Skills

- Languages: C/C++, Matlab, Python
- Tools: Torch, Tensorflow, PyTorch, OpenCV

Past projects

My dream is to develop powerful machine learning methods to solve essential real-world problems, specifically, the problems related to graph-structured data. Previous works have made impressive progress and have been widely adapted to graph learning tasks. However, on one hand, classic graph learning methods are limited in their representation power, failing to detect simple but important structures such as cycles. On the other hand, powerful graph learning models are usually computationally costly, and can hardly be applied in large graphs which are common in real-world scenarios.

To address these limitations, I strive to develop novel frameworks with both concrete theoretical foundations and strong empirical results for graph-structured data under different contexts. Specifically, I design strong and powerful topological features, that contain important structural or contextual information, and combine them with graph learning models. Theoretical and empirical results on both simple graphs and knowledge graphs show the enhanced power of the proposed model. In addition, to accelerate the computation of these topological features, I develop machine learning models with strong algorithmic alignment to approximate these features. While achieving strong approximation results, the proposed model is nearly 100 times faster than conventional algorithms. With its observed transferability, the proposed model can be potentially applied to multiple real-world datasets.

Professional Service

Conference Reviewer at:

- Conference on Neural Information Processing Systems (NeurIPS)
- International Conference on Machine Learning (ICML)
- International Conference on Learning Representations (ICLR)
- Learning on Graphs Conference (LoG)

Reference

- **Zhi Tang**
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  https://www.wict.pku.edu.cn/cpdp/kydw/ggcy/1297369.htm
- **Chao Chen**
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  https://chaochen.github.io/
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