YU TIAN

◇ tian_yu@stumail.nwu.edu.cn

EDUCATION

Northwest University, China *September 2020 - June 2023(Expected)*
M.S. in Software Engineering. average: 84.8/100

Northwest University, China *September 2016 - June 2020*
B.S. in Software Engineering. average: 81.4/100

RESEARCH INTERESTS

∗ 3D Point Cloud Analysis[1–4]: point cloud feature extraction based on deep learning methods.

∗ Self-supervised Learning[1–3]: exploring unsupervised (self-supervised) representation learning methods for better transferability on ended downstream tasks.

∗ Point Cloud Reconstruction[1, 2]: recovering complete point cloud data from vectors.

RESEARCH EXPERIENCES

National and Local Joint Engineering Research Center for Cultural Heritage Digitization@North West University, China *September 2020 - Present*

Research on unsupervised dense similarity learning for 3D point cloud analysis

– Proposed a 3D Unsupervised Learning method by Dense Similarity Learning (ULD-Net), which could train backbone networks by modeling dense consistency between features from transformed views to extract representations that can be transferred to ended point cloud analysis tasks.

– Introduced a novel point mapping strategy named Equiv-Crop for correspondence across views with local and global scopes, to provide the foundation for point-level feature learning.

– Presented a feature separability constraint that maximizes the separability of feature vectors from different dimensions while boosting the representability of features.

– Improved the accuracy of unsupervised context-based methods for linear SVM validation and fine-tuned shape classification tasks by 2.8% and 0.3% on ModelNet40. On fine-tuned ShapeNet Part segmentation and S3DIS indoor scene segmentation tasks, our method achieves competitive results with existing methods of 85.7% and 59.2% mIoU.

Research on unsupervised representation learning for 3D cultural relics classification

– Designed an unsupervised representation learning network based on local-global bidirectional reasoning to extract the deep features of ceramic cultural relics.

– Proposed a multi-scale shell convolution-based hierarchical encoder to extract local features at different scales aggregated into global representation.

– Achieved 92.02% linear evaluation accuracy on ModelNet40, and improved classification accuracy by 4.4% on Terracotta Warriors relics dataset.

Research on unsupervised representation learning network for 3D point cloud classification

– Proposed an unsupervised representation learning network based on reconstruction and metric learning to extract the deep features for the downstream 3D object classification, which is the first attempt to apply the unsupervised representation learning for 3D Terracotta Warriors fragments.

– Presented an improved angular loss to measure the similarity between local features and global representations. Meanwhile, a cross-dim-based decoder is proposed to improve the quality of point cloud generation.

– Achieved comparable performance and narrows the gap between unsupervised and supervised learning approaches in downstream object classification tasks.

PROJECTS

3D mash clustering based on IDEC *December 2021 - March 2022*
– Proposed a clustering method using deep embeddings from latent space of the auto-encoder.
– Validated the K-means clustering results of extracted features from 3D meshed by the primal-dual graph network.

Deep learning for PET/CT images classification *November 2020 - May 2021*
– Proposed a deep learning method in predicting EGFR mutation status in patients with lung cancer based on PET/CT images.
– Resized CT and PET ROIs to 3-dimensional matrix by simpleItk and numpy packages, implemented a two-branch 3D CNN network to extract the deep learning features for prediction.

PUBLICATIONS

[1] J. Liu*, **Yu Tian***, G. Geng*, H. Wang, D. Song, K. Li, M. Zhou, and X. Cao, "Uma-net: an unsupervised representation learning network for 3d point cloud classification," *J. Opt. Soc. Am. A*, vol. 39, no. 6, pp. 1085–1094, Jun 2022, (*equal contribution). [Online]. Available: https://opg.optica.org/josaa/abstract.cfm?URI=josaa-39-6-1085

[2] J. Liu, G. Geng, **Yu Tian**, Y. Wang, Y. Liu, and M. Zhou, "Unsupervised representation learning for cultural relics based on local-global bidirectional reasoning," *Optics and Precision Engineering*, vol. 30, no. 18, p. 2241, September 2022, (in Chinese).

[3] **Yu Tian**, D. Song, M. Yang, J. Liu, G. Geng, M. Zhou, K. Li, and X. Cao, "Uld-net: 3d unsupervised learning by dense similarity learning with equivariant-crop," *J. Opt. Soc. Am. A*, vol. 39, no. 12, pp. 2343–2353, Dec 2022. [Online]. Available: https://opg.optica.org/josaa/abstract.cfm?URI=josaa-39-12-2343

[4] J. Liu, D. Song, G. Geng, **Yu Tian**, M. Yang, Y. Liu, M. Zhou, K. Li, and X. Cao, "Tgps: dynamic point cloud down-sampling of the dense point clouds for terracotta warrior fragments," *Opt. Express*, vol. 31, no. 6, pp. 9496–9514, Mar 2023. [Online]. Available: https://opg.optica.org/oe/abstract.cfm?URI=oe-31-6-9496

SKILLS

Programming Languages and Frameworks
Python, Pytorch, paddlepaddle, C#, Java, Andriod

Languages
IELTs: 6.5

AWARDS AND SCHOLARSHIPS

- The Second Prize Scholarship for Outstanding Students of Northwest University *October 2022*
- The Third Prize Scholarship for Outstanding Students of Northwest University *October 2021*
- The First Prize Scholarship for Freshmen of Northwest University *October 2020*
- The Third Prize Scholarship for Outstanding Students of Northwest University *October 2019*
- The First Prize of Northwest University Mathematical Contest in Modeling *September 2019*
- The Third Prize Scholarship for Outstanding Students of Northwest University *October 2018*
- Excellent research report of the practice *September 2016*