Chuyu Zhang

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EDUCATION

ShanghaiTech University — **Shanghai China**
School of Information Science and Technology, **final year PhD** in Computer Science.
Supervised by Prof. **Xuming He** — *Sep. 2020 - Present*

Wuhan University — **Wuhan China**
School of Electronic Information, B.S. in Electronic and information engineering. — *Sep. 2016 - Jun. 2020*

EXPERIENCE

Research Intern at Shanghai AI Lab — **Shanghai China**
OpenCompass Team. Working on evaluating and enhancing reasoning ability of LLMs. — *Jan. 2024 - Present*

RESEARCH INTERESTS

I previously focused on Open-World learning, particularly in the area of novel class discovery, with the goal of enabling models to learn new classes autonomously. Currently, my interests have shifted towards understanding 3D/4D world with Foundation Models.

PUBLICATIONS

- Songyang Zhang*, **Chuyu Zhang***, Yingfan Hu*, Haowen Shen, Kuikun Liu, Zerun Ma, Fengzhe Zhou, Wenwei Zhang, Xuming He, Dahua Lin, Kai Chen. CIBench: Evaluating Your LLMs with a Code Interpreter Plugin. Submitted to NeurIPS 2024 Dataset and Benchmark Track.
- Zheng Cai, Maosong Cao, ..., **Chuyu Zhang**, ..., Yicheng Zou, Xipeng Qiu, Yu Qiao, Dahua Lin. InternLM2 Technical Report, Arxiv, 2024.
- **Chuyu Zhang**, Hui Ren, Xuming He. SP^{2}OT: Semantic-Regularized Progressive Partial Optimal Transport for Imbalanced Clustering, in submission, 2024.
- **Chuyu Zhang***, Hui Ren*, Xuming He. P^{2}OT: Progressive Partial Optimal Transport for Deep Imbalanced Clustering, International Conference on Learning Representations (ICLR), 2024.
- **Chuyu Zhang***, Peiyan Gu*, Xuming He. Adaptive Knowledge Transfer for Generalized Category Discovery. Arxiv.
- Ruijie Xu*, **Chuyu Zhang***, Hui Ren, Xuming He. Dual-level Adaptive Self-Labeling for Novel Class Discovery in Point Cloud Segmentation. European Conference on Computer Vision (ECCV), 2024.
- Peiyan Gu*, **Chuyu Zhang***, Ruijie Xu, Xuming He. Class-relation Knowledge Distillation for Novel Class Discovery, International Conference on Computer Vision (ICCV), 2023.
- **Chuyu Zhang***, Ruijie Xu*, Xuming He. Novel Class Discovery for Long-tailed Recognition, Transactions on Machine Learning Research (TMLR), 2023.
- **Chuyu Zhang***, Chuanyang Hu*, Hui Ren, Yongfei Liu, Xuming He. Cascade Sparse Feature Propagation Network for Interactive Segmentation, British Machine Vision Conference (BMVC), 2023.
- Shuailin li*, **Chuyu Zhang***, Xuming He. Shape-aware semi-supervised 3D semantic segmentation for medical images, Medical Image Computing and Computer Assisted Intervention (MICCAI), 2020.
- Zhitong Gao, Yucong Chen, **Chuyu Zhang**, Xuming He. Modeling Multimodal Aleatoric Uncertainty in Segmentation with Mixture of Stochastic Expert, International Conference on Learning Representations (ICLR), 2023.

RESEARCH EXPERIENCES

CIBench: Evaluating Your LLMs with a Code Interpreter Plugin. Jul. 2024

- We build a new benchmark for agents with code interpreters using an LLM-human cooperative method.
- We devise unique assessment strategies involving both end-to-end and oracle modes. We also introduce several evaluation metrics to assess various outputs, offering a comprehensive gauge of LLMs' coding prowess within the benchmark.
- We conduct thorough experiments with 24 LLMs to analyze their performance on our benchmark.

Algorithm 1: Scaling Algorithm for P^2OT

Input: Cost matrix $-\log \mathbf{P}$, ϵ, λ, ρ, N, K, a large value ι

$\mathbf{C} \leftarrow [-\log \mathbf{P}, \mathbf{0}_N]$, $\quad \boldsymbol{\lambda} \leftarrow [\lambda, ..., \lambda, \iota]^\top$

$\boldsymbol{\beta} \leftarrow [\frac{1}{K}\mathbf{1}_K, 1-\rho]^\top$, $\quad \boldsymbol{\alpha} \leftarrow \frac{1}{N}\mathbf{1}_N$

$\mathbf{b} \leftarrow \mathbf{1}_{K+1}$, $\quad \mathbf{M} \leftarrow \exp(-\mathbf{C}/\epsilon)$, $\quad \boldsymbol{f} \leftarrow \frac{\boldsymbol{\lambda}}{\boldsymbol{\lambda}+\epsilon}$

while *b not converge* **do**

  $\mathbf{a} \leftarrow \frac{\boldsymbol{\alpha}}{\mathbf{M}\mathbf{b}}$

  $\mathbf{b} \leftarrow (\frac{\boldsymbol{\beta}}{\mathbf{M}^\top \mathbf{a}})^{\circ \boldsymbol{f}}$

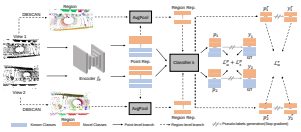
end

$\mathbf{Q} \leftarrow \text{diag}(\mathbf{a})\mathbf{M}\text{diag}(\mathbf{b})$

return $\mathbf{Q}[:, :K]$

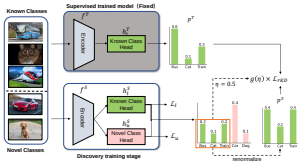
P^{2}OT: Progressive Partial Optimal Transport for Deep Imbalanced Clustering. Sep. 2023

- We generalize the deep clustering problem to more realistic and challenging imbalance scenarios, and establish a new benchmark.
- We propose a novel progressive PL-based learning framework for deep imbalance clustering, which formulates the pseudo label generation as a novel P^{2}OT problem, enabling us to consider class imbalance distribution and progressive learning concurrently.
- We reformulate the P^{2}OT problem as an unbalanced OT problem with a theoretical guarantee, and solve it with the efficient scaling algorithm.



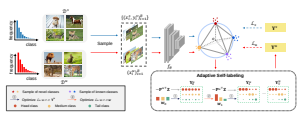
Dual-level Adaptive Self-Labeling for Novel Class Discovery in Point Cloud Segmentation. Sep. 2023

- We propose a novel adaptive pseudo-labeling algorithm that adaptively generates higher-quality imbalanced pseudo-labels, improving the clustering of novel classes.
- We develop a dual-level framework, which clusters novel classes at both the point-level and region-level, aiming to enhance the representation of novel classes.
- We achieve outstanding performance on both the SemanticPOSS and SemanticKITTI datasets on almost all experiments.



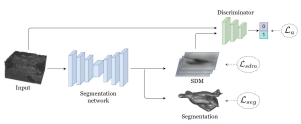
Class-relation Knowledge Distillation for Novel Class Discovery. Mar. 2023

- We propose a simple and effective learning framework to facilitate knowledge transfer from the known to novel classes, which provides a new perspective to solving novel class discovery problems.
- We propose a new regularization strategy to model class relation between known and novel classes in known classifier space, and develop a novel simple but effective gate function to adaptively transfer knowledge based on the strength of classes relation.
- Our method significantly outperform previous works on various public benchmarks, illustrating the efficacy of our design.



Novel Class Discovery for Long-tailed Recognition. Mar. 2023

- We present a more realistic novel class discovery setting, where the class distributions of known and novel categories are long-tailed.
- We introduce a novel adaptive self-labeling learning framework that generates pseudo labels of novel class in an adaptive manner and extends the equiangular prototype-based classifier to address the challenge in imbalanced novel-class clustering.
- We formulate imbalanced novel class discovery as a relaxed optimal transport problem and develop a bi-level optimization strategy for efficient class learning.



Shape-aware semi-supervised 3D semantic segmentation for medical images. Mar. 2020

- We propose a novel shape-aware semi-supervised segmentation approach by enforcing geometric constraints on labeled and unlabeled data.
- We develop a multi-task loss on segmentation and SDM predictions, and impose global consistency in object shapes through adversarial learning.
- Our method achieves strong performance on the Atrial Segmentation Challenge dataset with only a small number of labeled data.

RESEARCH SERVICE

- Reviewer of CVPR 2024, ECCV 2024, NeurIPS 2024.

AWARD

- First Place in SSB: Generalized Category Discovery Track (ImageNet-1k). A Challenge for Out-of-Distribution Generalization in Computer Vision (OOD-CV) in conjunction with ICCV 2023, Paris, Frances.