Zhiheng Li– Curriculum Vitae

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(last update: Aug. 2021)

Education

2018 - now **PhD Student**, Department of Computer Science, University of Rochester, NY, USA
Advisor Prof. Chenliang Xu

2014 - 2018 **Bachelor of Engineering**, Department of Computer Science, Wuhan University, Hubei, China
Advisor Prof. Zhenzhong Chen

Research Interests

AI Fairness, Image/Video Segmentation, Graph Clustering/Partitioning, Graph Neural Networks, Video Synthesis

Publications

Discovering the Unknown Biased Attribute from a Biased Classifier
Zhiheng Li, Chenliang Xu
The IEEE International Conference on Computer Vision (ICCV), 2021

Graph Neural Network Based Coarse-Grained Mapping Prediction
Zhiheng Li, Geemi P. Wellawatte, Maghesree Chakraborty, Heta A Gandhi, Chenliang Xu, Andrew D. White
Chemical Science, 2020

Deep Grouping Model for Unified Perceptual Parsing
Zhiheng Li, Wenxuan Bao, Jiayang Zheng, Chenliang Xu
The IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2020

Learning a Weakly-Supervised Video Actor-Action Segmentation Model with a Wise Selection
Jie Chen, **Zhiheng Li**, Jiebo Luo, Chenliang Xu
The IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2020

Lip Movements Generation at a Glance
Lele Chen*, **Zhiheng Li***, Ross K Maddox, Zhiyao Duan, Chenliang Xu (* **equal contribution**)
The European Conference on Computer Vision (ECCV), 2018

Research Experience

Sep. 2020 - Nov. 2020 University of Rochester
Discovering the Unknown Biased Attribute from a Biased Classifier

- In the domain of AI fairness, previous studies use protected attributes to mitigate biases of an AI algorithm. However, the protected attributes are *pre-defined* by humans in previous works, which not only may leave some biases neglected, but also is labor-consuming when defining protected attributes for a new domain of data.
- We study a new problem on discovering the *unknown* biased attribute from a biased classifier, without any pre-definition of labels of the biased attribute. The discovered biased attribute can be used as candidates for protected attributes.
- We propose a novel *total variation loss* and *orthogonalization penalty* to tackle this challenging problem.
- The comprehensive experiments on both disentanglement datasets and the CelebA dataset show that our method can successfully discover the biased attribute from the classifiers.
- Furthermore, our method can discover unnoticeable biases from various object classifiers (trained on ImageNet) and scene classifiers (trained on Places365), proving the generalizability of our method.

Feb. 2020 - Aug. 2020 University of Rochester
Graph Neural Network Based Coarse-Grained Mapping Prediction

The selection of coarse-grained (CG) mapping operators is a critical step for CG molecular dynamics (MD) simulation. It is still an open question about what is optimal for this choice and there is a need for theory. The current state-of-the-art method is mapping operators manually selected by experts. In this work, we demonstrate an automated approach by viewing this problem as supervised learning where we seek to reproduce the mapping operators produced by experts. We present a graph neural network based CG mapping predictor called Deep Supervised Graph Partitioning Model (DSGPM) that treats mapping operators as a graph segmentation problem. DSGPM is trained on a novel dataset, Human-annotated Mappings (HAM), consisting of 1180 molecules with expert annotated mapping operators. HAM can be used to facilitate further research in this area. Our model uses a novel metric learning objective to produce high-quality atomic features that are used in spectral clustering. The results show that the DSGPM outperforms state-of-the-art methods in the field of graph segmentation. Finally, we find that predicted CG mapping operators indeed result in good CG MD models when used in simulation.

Jul. 2019 - Feb. 2020 University of Rochester
Deep Grouping Model for Unified Perceptual Parsing

The perceptual-based grouping process produces a hierarchical and compositional image representation that helps both human and machine vision systems recognize heterogeneous visual concepts. Examples can be found in the classical hierarchical superpixel segmentation or image parsing works. However, the grouping process is largely overlooked in modern CNN-based image segmentation networks due to many challenges, including the inherent incompatibility between the grid-shaped CNN feature map and the irregular-shaped perceptual grouping hierarchy. Overcoming these challenges, we propose a deep grouping model (DGM) that tightly marries the two types of representations and defines a bottom-up and a top-down process for feature exchanging. When evaluating the model on the recent Broden+ dataset for the unified perceptual parsing task, it achieves state-of-the-art results while having a small computational overhead compared to other contextual-based segmentation models. Furthermore, the DGM has better interpretability compared with modern CNN methods.

Aug. 2018 - University of Rochester

Jun. 2019 *Learning the Interplay between Actor and Action via Metric Learning*

- Propose a metric learning-based method on joint learning of actor and action, enabling the model to learn the interplay between actor and action.
- Along with metric learning method, using an data sampling method to strengthen metric learning's performance by feeding the model pair (or triplet) of data with such property: "same actor, different actions" or "same action, different actors".
- The metric learning-based method is incorporated into both multi-task learning model and hierarchical based learning model. A2D dataset is used as the training and testing set.

Sep. 2017 - Oct. 2017 University of Rochester
Lip Movements Generation

- Worked on generating video clip of lip movements based on audio speech.
- Proposed a method that strengthens correspondence between audio information and visual information.
- The project is written in Python and is based on PyTorch.

Sep. 2017 - Oct. 2017 University of Rochester
Deformable Convolution 3D

- Refactored CUDA C++ code for extending deformable convolution to 3D model.
- Applied deformable convolution 3D in action recognition task and tested on different action recognition datasets, such as UCF101, Kinetics, etc.

Apr. 2016 - Jun. 2017 Wuhan University
Abnormal Event Detection in Surveillance Video

- Focused on the Surveillance Event Detection (SED) task of TRECVID to detect abnormal events from surveillance camera video.
- Incorporated Faster R-CNN, an advanced object detection algorithm, as a pedestrian detector into our model.
- Developed a visual tool for the purpose of showing the detection results using Qt and OpenCV.

Experience

Jun. 2021 - Present NEC Labs America
Research Intern

Professional Services

Reviewer: NeurIPS'20, CVPR'21, ICML'21, ICCV'21, NeurIPS'21, ICLR'22, AAAI'22
Volunteer: ACM FAccT'21, ICLR'21

Technical Skills

Programming Languages: Python, Java, C, C++, Ruby, Swift, Objective-C, Common Lisp
Frameworks: PyTorch, Caffe, MxNet, OpenCV