Xingjian Zhen

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[Homepage][1] [Github][2]

RESEARCH INTEREST

Computer Vision, Deep Learning, Statistics, and Medical Imaging

My research interest is about structured data or high-order features in Computer Vision. Since it's quite mature for Euclidean space deep learning, I would like to explore some different structured data or constrained data. The covariance matrices of the feature vectors can be viewed as the second-order features. Those high-order features are constrained by their own structure, i.e., Symmetric Positive Definite. Thus this will break the basic rules in Euclidean space. But those matrices are more robust to noise and contain more high-level information. I want to try some neural networks in Euclidean space, and extend them to those structured data.

EDUCATION

University of Wisconsin-Madison, WI, U.S. 2017 - 2022(Expected)
Ph.D. Student, Department of Computer Science GPA 3.83/ 4.0
Supervisor: Prof. Vikas Singh

Tsinghua University, Beijing, P.R. China. 2013 - 2017
B.E., Department of Electronic Engineering GPA 90.9/100

PUBLICATIONS

- [***In submission***] "ManifoldGLOW: Extending Flow-based Generative Models to Manifolds."
  Xingjian Zhen, Liu Yang, Rudrasis Chakraborty, Vikas Singh.
- [***CVPR (Oral), 2020***] "CPR-GCN: Conditional Partial-Residual Graph Convolutional Network in Automated Anatomical Labeling of Coronary Arteries."
  Xingjian Zhen, Han Yang, Ying Chi, Lei Zhang, Xian-Sheng Hua.
- [***ICCV, 2019***] "Dilated Convolutional Neural Networks for Sequential Manifold-valued Data."
  Xingjian Zhen, Rudrasis Chakraborty, Nicholas Vogt, Barbara B. Bendlin, Vikas Singh.
- [***AAIC, 2019***] "Sequential Deep Learning Algorithms Show Structural Connectivity Differences By Amyloid Status."
  Xingjian Zhen, Rudrasis Chakraborty, Nicholas Vogt, Seong Jae Hwang, Sterling C. Johnson, Barbara B. Bendlin, Vikas Singh.
- [***NeurIPS, 2018***] "A Statistical Recurrent Model on the Manifold of Symmetric Positive Definite Matrices."
  Rudrasis Chakraborty, **Xingjian Zhen**, Chun-Hao Yang, Monami Banerjee, Derek Archer, David Vaillancourt, Vikas Singh, Baba C. Vemuri.

INTERN EXPERIENCE

DAMO Academy, Alibaba 05/2019-09/2019
Mentor: Ying Chi
Title: Research Intern

- Developed automated anatomical labeling of coronary arteries via CPR-GCN
- Used 3D CNN with BiLSTM to extract the features from the CT images along branches
- Combined both image domain and position information with the partial-residual connection to achieve 95.8% mean recall

[1] https://zhenxingjian.github.io/homepage/
[2] https://github.com/zhenxingjian

RESEARCH EXPERIENCES

Certified Robustness Training via Gaussian Distribution 01/2020-current

- Applied the certifiable randomized smoothing robustness without sampling with 2× faster
- Proposed a tighter estimation of the channel wise Gaussian distribution
- Achieved 5% higher certified accuracy as well as a larger certified radius on Cifar-10 and SVHN

Flow-based Generative Model for Non-Euclidean Data 03/2019-12/2019

- Introduced three invertible layers whose determinant of Jacobian is simple
- Built the two-stream version of GLOW that can transfer information from one manifold to another
- Transferred DTI to corresponding ODF, and vice versa, with a small reconstruction error as well as maintaining verifiable group differences with $p-$value < 0.001
- Generated/ Mixed texture images based on the local covariance matrices

Point Cloud Completion 09/2019-11/2019

- Used the encoder-decoder based network to roughly complete the point cloud
- Utilized the nearest neighbor in the training dataset to extract local information

Dilated CNN in Group Analysis of Alzheimer's Disease 08/2018-03/2019

- Pre-processed the dMRI to extract the centerline/ average values along fiber bundles
- Applied SPD/ S^n manifold into the Dilated CNN model to extract information from DTI/ ODF
- Sped up the training and testing phases 5× with a competitive number of parameters with the state of the art model
- Got statistically significant differences on 5 fiber bundles, with PiB and APOE biomarkers

Statistical Recurrent Model on the Manifold 01/2018-05/2018

- Defined the "+/ ×" operators in the manifold space
- Modified the statistical recurrent model on the SPD manifold
- Reduced the number of parameters of the video classification model 100×
- Achieved the state of the art of accuracy in UCF11 dataset

Correlations for Image-Text Pair in Latent Space 09/2017-01/2018

- Applied the pre-trained CNN as the feature extractor from the image side
- Applied the word2vec method on the text as the representative of text
- Used t-SNE to minimize the KL divergence between latent space and the Image-Text pair
- Got meaningful results on the local dataset gathered from Reddit

Form Line Detection in the Picture 12/2016-06/2017

- Developed a system that detects and recognizes the form lines in pictures
- Used the bidirectional RNN method to achieve the state of the art, with MXNet as the core of the deep-learning system
- Tested in multiple dataset such as the NIST Special Database 2 and got 99.0% accuracy rate

COMPUTER SKILLS

Deep learning framework: PyTorch, TensorFlow, MXNet
Languages: Python, C++, Matlab, LaTeX
Softwares: Visual Studio, Matlab

REVIEWER SERVICES

MICCAI 2020, NeurIPS 2020