Xingjian Zhen

5770B Medical Science Center
1300 University Ave.
Madison, WI, USA 53706-1510

xzhen3@wisc.edu

[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 3.85/ 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

- [***CVPR, 2021***] "Simpler Certified Radius Maximization by Propagating Covariances."
  Xingjian Zhen, Rudrasis Chakraborty, Vikas Singh.
- [***AAAI, 2021***] "Flow-based Generative Models for Learning Manifold to Manifold Mappings."
  Xingjian Zhen, Rudrasis Chakraborty, Liu Yang, 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.

UNDER REVIEWING

- [***In submission***] "Altered Structural Connectivity Detected with Dilated Convolutional Neural Network Analysis in the DIAN study and the Wisconsin Registry for Alzheimer's Prevention."
  Xingjian Zhen, Rudrasis Chakraborty, Nicholas Vogt, Ruochen Wang, Kao Lee Yang, Nagesh Adluru, Brian Gordon, Tammie Benzinger, Nicole Mckay, Tobey Betthauser, Sterling C, Johnson, Vikas Singh, Barbara B. Bendlin

INTERN EXPERIENCE

Amazon 05/2020-09/2019
Mentor: Karen Hovsepian, and Mingwei Shen
Title: Applied Scientist Intern

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

- Built an end-to-end three-modes model to generate answer, textual explanation, and visual saliency explanation with graph neural network and the noise augmentation to improve the robustness
- Got 1% better accuracy, 7% better textual explanation CIDEr, 2% better visual explanation IoU
- Collected a novel TextVQA-X dataset from public available TextVQA with extra textual and visual explanation

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, 9% improvement from baseline

RESEARCH EXPERIENCES

Certified Robustness Training via Gaussian Distribution 01/2020-current

- Applied the certifiable randomized smoothing robustness without sampling with 2× to 5× faster
- Proposed a tight estimation of the channel-wise Gaussian distribution to reduce the cost from exponential to linear
- Achieved 5% better certified accuracy as well as a larger certified radius on ImageNet and Places365

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

- Introduced three invertible layers on manifold-valued data whose determinant of Jacobian is simple
- Built the two-stream GLOW that can transfer information from one manifold to another
- Transferred DTI to corresponding ODF with a small reconstruction error and maintaining verifiable group differences with $p-$value < 0.001
  In reality, this can save scanning time from 35 mins to $7-9$ mins

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 5× with a competitive number of parameters with SoTA
- Got statistically significant differences on 5 (out of 18) fiber bundles, by 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

COMPUTER SKILLS

Deep learning framework: PyTorch, TensorFlow, MXNet

Languages: Python, LaTeX, Matlab, C++

REVIEWER SERVICES

2020: ECCV, MICCAI, NeurIPS,

2021: AAAI, ICLR, CVPR, IJCAI, ICML, ICCV