

Zengjie Song

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Career

School of Mathematics and Statistics, Xi'an Jiaotong University (XJTU)

Xi'an, China

Assistant Professor

May 2023 -

- Research interests include brain-inspired learning, multimodal learning, generative model, and computer vision

Institute of Automation, Chinese Academy of Sciences

Beijing, China

Postdoctoral Researcher

July 2020 - Apr. 2023

- Employed as the major researcher for the project *Biologically Inspired Visual Computing and Brain-Like Learning*

Education

XJTU

Xi'an, China

Ph.D. in Statistics

Mar. 2015 - Mar. 2020

- Supervisor: Prof. Jiangshe Zhang
- Dissertation: Brain-inspired Machine Learning Models and Algorithms with Applications in Image Processing
- External Examiner: Prof. Xiangchu Feng Internal Examiner: Prof. Jian Sun

XJTU

Xi'an, China

M.S. in Applied Mathematics

Sept. 2013 - Feb. 2015

- Supervisor: Prof. Jiangshe Zhang
- Finished three-year program in two years, enrolled as doctorate student one year ahead

XJTU

Xi'an, China

B.S. in Applied Mathematics (Mathematics Elite Program)

Sept. 2009 - July 2013

- Thesis: The Study of Image Distortion Metrics

Experience

Institute of Automation, Chinese Academy of Sciences

Beijing, China

Postdoctoral Researcher, Cooperator: Prof. Tieniu Tan and Prof. Zhaoxiang Zhang

July 2020 - Apr. 2023

- Developed predictive coding-inspired DNNs and self-supervised learning methods to perform audio-visual learning, achieving remarkable performance on visual sound separation (AVPC) and localization (SSPL), respectively

Department of Computer Science, University of Illinois at Urbana-Champaign

Urbana, U.S.A.

Visiting Ph.D. Student, Supervisor: Prof. Oluwasanmi Koyejo

Oct. 2017 - Oct. 2018

- Designed two deep neural networks (mddAE and CDNet) to learn controllable disentangled image representations, where the CDNet model leverages GANs to improve the output image quality

Department of Statistics, XJTU

Xi'an, China

Research Assistant, Supervisor: Prof. Jiangshe Zhang

Mar. 2015 - Sept. 2017

- Proposed the fast inference predictive coding (FIPC), based on the predictive coding in neuroscience, to efficiently address image feature extraction and image classification tasks

Department of Applied Mathematics, XJTU

Xi'an, China

Research Assistant, Supervisor: Prof. Jiangshe Zhang

Sept. 2013 - Feb. 2015

- Proposed a no-reference JPEG image quality assessment index (ISNIQI), which is inspired by the attention mechanism of human visual system and employs the image saliency map to weigh qualities of different image regions accordingly

Publications & Preprints

1. **Zengjie Song** and Zhaoxiang Zhang. Visually Guided Sound Source Separation with Audio-Visual Predictive Coding. *IEEE Transactions on Neural Networks and Learning Systems (T-NNLS)*, in press, 2023. [PDF] [arXiv] [Code]

2. Jingtao Wang, **Zengjie Song**, Yuxi Wang, Jun Xiao, Yuran Yang, Shuqi Mei, and Zhaoxiang Zhang. SSF: Accelerating Training of Spiking Neural Networks with Stabilized Spiking Flow. In *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV)*, 2023. [\[PDF\]](#)
3. **Zengjie Song**, Yuxi Wang, Junsong Fan, Tieniu Tan, and Zhaoxiang Zhang. Self-Supervised Predictive Learning: A Negative-Free Method for Sound Source Localization in Visual Scenes. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022. [\[PDF\]](#) [\[arXiv\]](#) [\[Code\]](#)
4. Kai Sun, Jiangshe Zhang, Junmin Liu, Ruixuan Yu, and **Zengjie Song**. DRCNN: Dynamic Routing Convolutional Neural Network for Multi-View 3D Object Recognition. *IEEE Transactions on Image Processing (T-IP)*, 30: 868–877, 2020. [\[PDF\]](#)
5. **Zengjie Song**, Oluwasanmi Koyejo, and Jiangshe Zhang. Toward a Controllable Disentanglement Network. *IEEE Transactions on Cybernetics (T-CYB)*, 52(4): 2491–2504, 2020. [\[PDF\]](#) [\[arXiv\]](#) [\[Code\]](#)
6. **Zengjie Song**, Oluwasanmi Koyejo, and Jiangshe Zhang. Learning Controllable Disentangled Representations with Decorrelation Regularization. *arXiv preprint arXiv:1912.11675*, 2019. [\[arXiv\]](#)
7. **Zengjie Song**, Jiangshe Zhang, Guang Shi, and Junmin Liu. Fast Inference Predictive Coding: A Novel Model for Constructing Deep Neural Networks. *IEEE Transactions on Neural Networks and Learning Systems (T-NNLS)*, 30(4): 1150–1165, 2018. [\[PDF\]](#) [\[Code\]](#)
8. Peiju Chang, Jiangshe Zhang, Junying Hu, and **Zengjie Song**. A Deep Neural Network Based on ELM for Semi-supervised Learning of Image Classification. *Neural Processing Letters (NPL)*, 48(1): 375–388, 2017. [\[PDF\]](#)
9. **Zengjie Song**, Jiangshe Zhang, and Junmin Liu. No-Reference Image Quality Assessment Using Image Saliency for JPEG Compressed Images. *Journal of Imaging Science and Technology*, 60(6): 60503-1–60503-8, 2016. [\[PDF\]](#)

Projects

1. **Research on Audio-Visual Sound Source Separation and Localization Methods for Complex Scene Video**
National Natural Science Foundation of China, Grant No. 12301656, 2024-2026 (host)
2. **Research on Computational Vision Modeling and Application Based on Predictive Coding**
Xi'an Jiaotong University, Grant No. xzy012023047, 2023-2025 (host)
3. **Audio-Visual Multimodal Video Representation Learning Inspired by Brain Cognitive Mechanisms**
China Postdoctoral Science Foundation, Grant No. 2021M703489, 2021-2022 (host)
4. **Research on Deep Neural Networks and Fast Inference Methods Based on Predictive Coding**
National Natural Science Foundation of China, Grant No. 61976174, 2020-2023 (participant)
5. **Research on Deep Generative Models and Transfer Learning for Pansharpening of Remote Sensing Images**
National Natural Science Foundation of China, Grant No. 61877049, 2019-2022 (participant)
6. **Variable Selection of High-Dimensional Data Based on Probabilistic Generative Models**
National Natural Science Foundation of China, Grant No. 11671317, 2017-2020 (participant)
7. **Research on Learning Deep Architecture with Asymmetry Forward and Backward Connections**
National Natural Science Foundation of China, Grant No. 61572393, 2016-2019 (participant)

Teaching

XJTU

Teaching Assistant, *Higher Algebra and Analytic Geometry*

Xi'an, China

Fall 2023

XJTU

Teaching Assistant, *Undergraduate Thesis Design*

Xi'an, China

Spring 2015, Spring 2016, Spring 2017

XJTU

Teaching Assistant, *Advanced Mathematics*

Xi'an, China

Fall 2014

Awards & Honors

2022	Excellent Doctoral Dissertation Award of Shaanxi Province , Education Department of Shaanxi Provincial Government	<i>China</i>
2022	Excellent Doctoral Dissertation Award of Xi'an Jiaotong University , XJTU	<i>China</i>
2018	"Hao Jianxue" Principal Class Scholarship , XJTU	<i>China</i>
2018	Overseas Visiting Scholarship for Graduate Students , XJTU	<i>China</i>
2017	Scholarship for Visiting Ph.D. Student , China Scholarship Council (CSC)	<i>China</i>
2014	"Huang Qianheng" First Grade Scholarship , XJTU	<i>China</i>
2014	Outstanding Graduate Student , XJTU	<i>China</i>
2012	Siyuan Scholarship , XJTU	<i>China</i>

Skills

Programming	Python, Matlab, \LaTeX
Languages	Chinese and English