Bin Duan

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EDUCATION

Ph.D. Computer Science, Illinois Institute of Technology, Chicago, 2024

B.Eng. Electronic Engineering, Lanzhou University, China, 2017

APPOINTMENTS

2024– University of Michigan, Ann Arbor
Postdoc Research Fellow, Department of Cell and Developmental Biology

2022–24 University of Michigan, Ann Arbor
Visiting Scholar, Department of Cell and Developmental Biology

2019 Texas State University, San Marcos
Visiting Scholar, Department of Computer Science

RESEARCH AREAS

Computer Vision and Machine Learning: Multimodal representation learning, image registration, efficient AI models, generative modeling, optical flow estimation

Biomedical Image Analysis: Large-scale segmentation, compression, tracing, and registration for neuroscience and medical imaging

Software and Toolkit Development: Brain registration frameworks, compression tools, petabyte-scale image data management, visualization, and analysis platforms

PUBLICATIONS

Preprint Journal Articles

2025 **B. Duan**, L.A. Walker, B. Xie, W.J. Lee, A. Lin, Y. Yan, and D. Cai. "Artifact-Minimized High-Ratio Image Compression with Preserved Analysis Fidelity." *Nature Communications, Under Review*.

2025 L.A. Walker*, W.J. Lee*, **B. Duan***, M. Weatherspoon, Y. Li, F. Shen, M. Cheng, X. Niu, et al. "A browser-based platform for storage, visualization, and analysis of large-scale 3D images in HPC environments." *Nature Methods, Major Revision*.

2025 H. Jiang, L.A. Walker, Y. Li, **B. Duan**, X. Niu, J.C. Hsieh, M.C. Cheng, H. Su, et al. "A Parallelly Distributed Microscope and Software System for Scalable High-Throughput Multispectral 3D Imaging." *Nature Methods, Major Revision*.

Conference Proceedings

2025 F. Wang*, J. Tao*, J. Wu*, **B. Duan**, K. Wang, Z. Yang, and Y. Yan. "X-Field: A Physically Grounded Representation for 3D X-ray Reconstruction." *Annual Conference on Neural Information Processing Systems (NeurIPS)*.

2025 B. Xie, H. Tang, **B. Duan**, D. Cai, Y. Yan, G. Agam. "MaskSAM: Towards Auto-prompt SAM with Mask Classification for Volumetric Medical Image Segmentation." *IEEE/CVF International Conference on Computer Vision (ICCV)*.

2025 **B. Duan**, Y. Shang, D. Cai, and Y. Yan. "Online Multi-Spectral Neuron Tracing." *IEEE International Symposium on Biomedical Imaging (ISBI)*.

2025 J. Cao, **B. Duan**, and H. Yan. "Reconstruct Dense Live-Cell Microscopy Images via Learning Continuous Fluorescence Field." *IEEE International Symposium on Biomedical Imaging (ISBI)*.

2025 F. Wang, **B. Duan**, J. Tao, N. Sharma, D. Cai, and Y. Yan. "ZECO: ZeroFusion Guided 3D MRI Conditional Generation." *International Conference on Machine Vision and Applications (MVA)*.

2024 J. Wu, **B. Duan**, W. Kang, H. Tang, and Y. Yan. "Token Transformation Matters: Towards Faithful Post-Hoc Explanation for Vision Transformer." *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*.

2024 J. Ni, H. Tang, Y. Shang, **B. Duan**, and Y. Yan. "Adaptive Cross-Architecture Mutual Knowledge Distillation." *IEEE International Conference on Automatic Face and Gesture Recognition (FG)*.

2024 C. Sun, **B. Duan**, H. Latapie, G. Liu, and Y. Yan. "DCT: Divide-and-Conquer Transformer Network with Knowledge Transfer for Query-Driven HOI Detection." *ACM International Conference on Multimedia Retrieval (ICMR)*.

2024 **B. Duan**, H. Tang, C. Sun, Y. Zhu, and Y. Yan. "Mining and Unifying Heterogeneous Contrastive Relations for Weakly-Supervised Actor-Action Segmentation." *IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)*.

2023 **B. Duan**, M. Zhong, and Y. Yan. "Towards Saner Deep Image Registration." *IEEE/CVF International Conference on Computer Vision (ICCV)*.

2023 B. Xie, H. Tang, **B. Duan**, D. Cai, and Y. Yan. "MLP-GAN for Brain Vessel Image Segmentation." *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*.

2023 **B. Duan**, J. Cao, W. Wang, D. Cai, and Y. Yan. "Cell Instance Segmentation via Multi-Scale Non-Local Correlation." *IEEE International Symposium on Biomedical Imaging (ISBI)*.

2022 Y. Shang, D. Xu, **B. Duan**, Z. Zong, L. Nie, and Y. Yan. "Lipschitz Continuity Retained Binary Neural Network." *European Conference on Computer Vision (ECCV)*.

2022 K. Bhandari, **B. Duan**, G. Liu, H. Latapie, Z. Zong, and Y. Yan. "Learning Omnidirectional Flow in 360° Video via Siamese Representation." *European Conference on Computer Vision (ECCV)*.

2022 Y. Shang, **B. Duan**, Z. Zong, L. Nie, and Y. Yan. "Win the Lottery Ticket via Fourier Analysis: Frequencies Guided Network Pruning." *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*.

2021 **B. Duan**, H. Tang, W. Wang, Z. Zong, G. Yang, and Y. Yan. "Audio-Visual Event Localization via Recursive Fusion by Joint Co-Attention." *IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)*.

2021 Y. Shang*, **B. Duan***, Z. Zong, L. Nie, and Y. Yan. "Lipschitz Continuity Guided Knowledge Distillation." *IEEE/CVF International Conference on Computer Vision (ICCV)*.

2021 **B. Duan**, L.A. Walker, D.H. Roossien, F.Y. Shen, D. Cai, and Y. Yan. "Unsupervised Neural Tracing in Densely Labeled Multi-Spectral Brainbow Images." *IEEE International Symposium on Biomedical Imaging (ISBI)*.

2021 **B. Duan**, W. Wang, H. Tang, H. Latapie, and Y. Yan. "Cascade Attention Guided Residue Learning GAN for Cross-Modal Translation." *International Conference on Pattern Recognition (ICPR)*.

Other Publications

2024 **B. Duan**. "Developing Practical Tools and Algorithms for Biomedical Image Compression and Analysis." *Ph.D. thesis*.

2024 K. Wen, B. Xie, **B. Duan**, and Y. Yan. "MambaReg: Mamba-Based Disentangled Convolutional Sparse Coding for Unsupervised Deformable Multi-Modal Image Registration." *Arxiv*.

2023 **B. Duan**, K. Bhandari, G. Liu, Y. Yan. "Optical flow estimation in 360 videos: dataset, model and application." *Arxiv*.

GRANTS

Key Personnel

2025–27 NIH 4UC2AR082197-02: "Neural Architecture of the Murine and Human Temporomandibular Joint." Role: Core Software architect, Key Computational specialist.

2025–26 NIH 1P41EB035084-01A1: "Microsystems-Based Imaging Systems." Role: Key Computational specialist.

2024–25 NSF 1RF1MH124611-01: "A Unified Framework for Unsupervised Sparse-to-dense Brain Image Generation and Neural Circuit Reconstruction." Role: Lead Algorithm developer.

2023–26 NIH 1RF1MH133764-01: "Continuous development of nTracer2 and its deployment at NIH image repositories." Role: Core Software architect.

2020–24 NIH 1RF1MH124611-01: "Development of a scalable strategy for reconstructing cell-type determined connectome of the mammalian brain." Role: Lead Algorithm developer.

TEACHING AND MENTORSHIP

Teaching Experience

2025 Lecture. "Biomedical Image Registration." Illinois Institute of Technology CS 577 – 2023 and Math 569 – 2024, Texas State University CS4347 – 2025.

2020 Teaching Assistant for CS4347 Machine Learning, Texas State University

2020 Teaching Assistant for CS7312 Advanced Data Mining, Texas State University

Collaborative Mentorship

Yuzhang Shang, Ph.D., IIT, Efficient AI, 4 publications

Bin Xie, Ph.D. candidate, IIT, Medical Image Segmentation, 3 publications

Feiran Wang, Ph.D. student, IIT, Biomedical Image Learning, 2 publications

Junyi Wu, Ph.D. student, UIC, Machine Learning, 2 publications

Yilin Chen, Undergrad researcher, Umich, Software Development

Samuel Dibelardino, UROP student, Umich, 3D Image Segmentation

Meklit Sitotaw, REU student, Vanderbilt, Neuron Matching

CONFERENCE ACTIVITY

2025 **B. Duan**, L.A. Walker, and D. Cai. "RE-JOIN Portal - a centralized platform for interactive large-scale joint image visualization and annotation." 3rd Annual RE-JOIN Meeting. Houston, Texas. Oct 2–3.

2025 **B. Duan**, Y. Shang, D. Cai, and Y. Yan. "Online Multi-Spectral Neuron Tracing." IEEE International Symposium on Biomedical Imaging. Houston, Texas. Apr 14–17.

2024 **B. Duan**, H. Tang, C. Sun, Y. Zhu, and Y. Yan. "Mining and Unifying Heterogeneous Contrastive Relations for Weakly-Supervised Actor-Action Segmentation." IEEE/CVF Winter Conference on Applications of Computer Vision. Waikoloa, Hawaii. Jan 4–8.

2022 **B. Duan**, H. Ding, L.A. Walker, Y. Yan, and D. Cai. "An Automated Pipeline for Mouse Whole-Brain CCF Registration." Society For Neuroscience Annual Meeting. San Diego, California. Nov 12–16.

2022 **B. Duan**, H. Latapie, G. Liu, Y. Yan. "Audio-Visual Event Localization via Recursive Joint Co-Attention." IEEE/CVF Conference on Computer Vision and Pattern Recognition. New Orleans, Louisiana. Jun 19–24.

2021 **B. Duan**, H. Tang, W. Wang, Z. Zong, G. Yang, and Y. Yan. "Audio-Visual Event Localization via Recursive Fusion by Joint Co-Attention." *IEEE/CVF Winter Conference on Applications of Computer Vision*. Virtual, Jan 5–9.

SERVICE

Outreach and Academic Service

2023– Neurons Can Fly research program at University of Michigan, Ann Arbor, Michigan

Professional Reviewer Service

IEEE Transactions on Image Processing

IEEE Transactions on Multimedia

Computer Vision and Image Understanding

Machine Vision and Applications

Image and Vision Computing

Visual Intelligence

Neurocomputing

IEEE/CVF Conference on Computer Vision and Pattern Recognition

IEEE/CVF International Conference on Computer Vision

European Conference on Computer Vision

International Conference on Learning Representations

Neural Information Processing Systems

International Conference on Machine Learning

Medical Image Computing and Computer Assisted Intervention

IEEE/CVF Winter Conference on Applications of Computer Vision

International Conference on Acoustics, Speech, and Signal Processing

International Conference on Pattern Recognition

IEEE International Symposium on Biomedical Imaging

REFERENCES

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