

Xiaoling Hu

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Current Position	<ul style="list-style-type: none">• Harvard Medical School, Athinoula A. Martinos Center for Biomedical Imaging, USA Aug. 2023 - Present <i>Postdoctoral Research Fellow</i> - Hosted by Prof. Juan Eugenio Iglesias and Prof. Bruce Fischl
Research Interests	<p>My research focuses on Machine Learning for Healthcare, with an emphasis on developing core AI/ML algorithms for healthcare applications. In particular, I am interested in:</p> <ul style="list-style-type: none">• Topology-Driven Deep Image Analysis• Trustworthy Machine Learning• Multimodal AI and Generative AI (GenAI)• Healthcare Applications
Education	<ul style="list-style-type: none">• Stony Brook University, Department of CS, USA Jan. 2018 - June 2023 <i>Doctor of Philosophy</i> - Advisor: Chao Chen - Thesis: Learning Topological Representations for Deep Image Understanding - Committee: Chao Chen, Dimitris Samaras, Haibin Ling, Li Fuxin• Tsinghua University, Department of EE, China Sep. 2014 - June 2017 <i>Master of Science</i>• Huazhong University of Science and Technology, Department of EE, China Sep. 2010 - June 2014 <i>Bachelor of Science</i>
Selected Publications	<p>(* indicates equal contribution, __ denotes students (co-)mentored by me, [‡] denotes (co)-senior supervision)</p> <ol style="list-style-type: none">[1] <i>Learn2Synth: Learning Optimal Data Synthesis Using Hypergradients for Brain Image Segmentation</i> Xiaoling Hu, Xiangrui Zeng, Oula Puonti, Juan Eugenio Iglesias, Bruce Fischl[‡], Yaël Balbastre[‡] <i>International Conference on Computer Vision (ICCV)</i>, 2025[2] <i>TopoCellGen: Generating Histopathology Cell Topology with a Diffusion Model</i> Meilong Xu, Saumya Gupta, Xiaoling Hu, Chen Li, Shahira Abousamra, Dimitris Samaras, Prateek Prasanna, Chao Chen <i>The IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)</i>, 2025 (Oral Presentation, acceptance rate < 1%) <i>Short version is also presented at CVPR 2025 Workshop GMCV</i>[3] <i>Hierarchical Uncertainty Estimation for Learning-based Registration in Neuroimaging</i> Xiaoling Hu, Karthik Gopinath, Peirong Liu, Malte Hoffmann, Koen Van Leemput, Oula Puonti[‡], Juan Eugenio Iglesias[‡]

International Conference on Learning Representations (ICLR), 2025

- [4] **Semi-supervised Segmentation of Histopathology Images with Noise-Aware Topological Consistency**
Meilong Xu, **Xiaoling Hu**, Saumya Gupta, Shahira Abousamra, Chao Chen
European Conference on Computer Vision (ECCV), 2024
- [5] **Brain-ID: Learning Contrast-agnostic Anatomical Representations for Brain Imaging**
Peirong Liu, Oula Puonti, **Xiaoling Hu**, Daniel C. Alexander, Juan Eugenio Iglesias
European Conference on Computer Vision (ECCV), 2024
- [6] **Registration by Regression (RbR): a framework for interpretable and flexible atlas registration**
Karthik Gopinath*, **Xiaoling Hu***, Malte Hoffmann, Oula Puonti[‡], Juan Eugenio Iglesias[‡]
Workshop on Biomedical Image Registration-MICCAI (WBIR), 2024
- [7] **P-Count: Persistence-based Counting of White Matter Hyperintensities in Brain MRI**
Xiaoling Hu, Annabel Sorby-Adams, Frederik Barkhof, William Kimberly, Oula Puonti, Juan Eugenio Iglesias
Workshop on Topology- and Graph-Informed Imaging Informatics-MICCAI (TGI3), 2024
- [8] **Semi-Supervised Contrastive VAE for Disentanglement of Digital Pathology Images**
Mahmudul Hasan, **Xiaoling Hu**, Shahira Abousamra, Prateek Prasanna, Joel Saltz, Chao Chen
International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2024
- [9] **Hard Negative Sample Mining for Whole Slide Image Classification**
Wentao Huang, **Xiaoling Hu**, Shahira Abousamra, Prateek Prasanna, Chao Chen
International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2024
- [10] **Spatial Diffusion for Cell Layout Generation**
Chen Li, **Xiaoling Hu**, Shahira Abousamra, Meilong Xu, Chao Chen
International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2024
- [11] **Anomaly-guided weakly supervised lesion segmentation on retinal OCT images**
Jiaqi Yang, Nitish Mehta, Gozde Merve Demirci, **Xiaoling Hu**, Meera Ramakrishnan, Mina Naguib, Chao Chen, Chialing Tsai
Medical Image Analysis (MedIA), 2024
- [12] **Topology-Aware Uncertainty for Image Segmentation**
Saumya Gupta, Yikai Zhang, **Xiaoling Hu**, Prateek Prasanna, Chao Chen
Thirty-seventh Conference on Neural Information Processing Systems (NeurIPS), 2023
- [13] **Calibrating Uncertainty for Semi-Supervised Crowd Counting**
Chen Li, **Xiaoling Hu**, Shahira Abousamra, Chao Chen
International Conference on Computer Vision (ICCV), 2023

- [14] **Enhancing Modality-Agnostic Representations via Meta-Learning for Brain Tumor Segmentation**
Aishik Konwer, **Xiaoling Hu**, Xuan Xu, Joseph Bae, Chao Chen, Prateek Prasanna
International Conference on Computer Vision (ICCV), 2023
- [15] **Learning Probabilistic Topological Representations Using Discrete Morse Theory**
Xiaoling Hu, Dimitris Samaras, Chao Chen
International Conference on Learning Representations (ICLR), 2023 (**Spotlight Presentation, notable-top-25% of accepted papers**)
*Short version is selected as **Oral Presentation** at Medical Imaging meets NeurIPS Workshop, 2023*
- [16] **Confidence Estimation Using Unlabeled Data**
Chen Li, **Xiaoling Hu**, Chao Chen
International Conference on Learning Representations (ICLR), 2023
- [17] **Structure-Aware Image Segmentation with Homotopy Warping**
Xiaoling Hu
Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS), 2022
- [18] **Learning Topological Interactions for Multi-Class Medical Image Segmentation**
Saumya Gupta*, **Xiaoling Hu***, James Kaan, Michael Jin, Mutshipay Mpoy, Katherine Chung, Gagandeep Singh, Mary Saltz, Tahsin Kurc, Joel Saltz, Apostolos Tsiaopoulos, Prateek Prasanna, Chao Chen
European Conference on Computer Vision (ECCV), 2022 (**Oral Presentation, acceptance rate 2.7%**)
- [19] **Trigger Hunting with a Topological Prior for Trojan Detection**
Xiaoling Hu, Xiao Lin, Michael Cogswell, Yi Yao, Susmit Jha, Chao Chen
International Conference on Learning Representations (ICLR), 2022
- [20] **A Manifold View of Adversarial Risk**
Wenjia Zhang, Yikai Zhang, **Xiaoling Hu**, Mayank Goswami, Chao Chen, Dimitris Metaxas
International Conference on Artificial Intelligence and Statistics (AISTATS), 2022
- [21] **Topology-Attention ConvLSTM Network for 3D Image Segmentation**
Jiaqi Yang*, **Xiaoling Hu***, Chao Chen, Chialing Tsai
International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2021
- [22] **Topology-Aware Segmentation Using Discrete Morse Theory**
Xiaoling Hu, Yusu Wang, Li Fuxin, Dimitris Samaras, Chao Chen
International Conference on Learning Representations (ICLR), 2021 (**Spotlight Presentation, acceptance rate 5.6%**)
- [23] **3D Topology-Preserving Segmentation with Compound Multi-Slice Representation**
Jiaqi Yang*, **Xiaoling Hu***, Chao Chen, Chialing Tsai
IEEE International Symposium on Biomedical Imaging (ISBI), 2021
- [24] **Topology-Preserving Deep Image Segmentation**
Xiaoling Hu, Li Fuxin, Dimitris Samaras, Chao Chen
Thirty-third Conference on Neural Information Processing Systems (NeurIPS), 2019

Preprints

- [1] **Scalable Segmentation for Ultra-High-Resolution Brain MR Images**
Xiaoling Hu, Peirong Liu, Dina Zemlyanker, Jonathan Williams Ramirez, Oula Puonti, Juan Eugenio Iglesias
Tech Report, 2025
- [2] **MATCH: Multi-faceted Adaptive Topo-Consistency for Semi-Supervised Histopathology Segmentation**
Meilong Xu*, **Xiaoling Hu***, Shahira Abousamra, Chen Li, Chao Chen
Tech Report, 2025
- [3] **PseudoDiffUDA: Diffusion-Augmented Unsupervised Domain Adaptation for Medical Image Segmentation**
Chen Li, Meilong Xu, **Xiaoling Hu**, Weimin Lyu, Chao Chen
Tech Report, 2025
- [4] **RankByGene: Gene-Guided Histopathology Representation Learning Through Cross-Modal Ranking Consistency**
Wentao Huang, Meilong Xu, **Xiaoling Hu**, Shahira Abousamra, Aniruddha Ganguly, Saarthak Kapse, Alisa Yurovsky, Prateek Prasanna, Tahsin Kurc, Joel Saltz, Michael L. Miller, Chao Chen
Tech Report, 2024
- [5] **Adversarial Vessel-Unveiling Semi-Supervised Segmentation for Retinopathy of Prematurity Diagnosis**
Gozde Merve Demirci, Jiachen Yao, Ming-Chih Ho, **Xiaoling Hu**, Wei-Chi Wu, Chao Chen, and Chia-Ling Tsai
Tech Report, 2024
- [6] **A Multimodal Approach Combining Structural and Cross-Domain Textual Guidance for Weakly Supervised OCT Segmentation**
Jiaqi Yang, Nitish Mehta, **Xiaoling Hu**, Chao Chen, Chia-Ling Tsai
Tech Report, 2024
- [7] **Deep Statistic Shape Model for Myocardium Segmentation**
Xiaoling Hu, Xiao Chen, Terrence Chen, Shanhui Sun
Tech Report, 2022

Selected Honors and Awards

- Catacosinos Fellowship (2 out of 200+ PhD students in SBU CS Department), 2023
- NeurIPS Travel Award, 2019
- First-class Scholarship, Tsinghua University, 2016 (5%)

Mentoring

- Chen Li (**ICLR'23, ICCV'23, MICCAI'24**), Ph.D. student at Department of BMI, Stony Brook University
Since Fall 2021
- Meilong Xu (**ECCV'24, CVPR'25 Oral Presentation**), Ph.D. student at Department of CS, Stony Brook University
Since Summer 2023
- Wentao Huang (**MICCAI'24**), Ph.D. student at Department of CS, Stony Brook University
Since Summer 2023
- Qingqiao Hu, Ph.D. student at Department of CS, Stony Brook University
Since Fall 2024

- Jiaqi Yang (**MICCAI'21, ISBI'21, MedIA'24**), Ph.D. student at Department of CS, CUNY
Spring 2020 – Summer 2023
- Saumya Gupta (**ECCV'22 Oral Presentation, NeurIPS'23**), Ph.D. student at Department of CS, Stony Brook University
Fall 2021 – Summer 2023
- Mahmudul Hasan (**MICCAI'24**), Ph.D. student at Department of CS, Stony Brook University
Summer 2023 – Summer 2024
- John Xie, High School student → University of Michigan
Summer 2021

Professional Organizer Service

- MICCAI'25 workshop on *Topology- and Graph-Informed Imaging Informatics (TGI3)* 2025
- MICCAI'24 workshop on *The First Workshop on Topology- and Graph-Informed Imaging Informatics (TGI3)* 2024
- MICCAI'23 tutorial on *Topology-Driven Image Analysis* 2023

Area Chair

- International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI) 2025
- Conference on Neural Information Processing Systems (NeurIPS) 2025

Reviewing

- International Conference on Machine Learning (ICML) Since 2022
- International Conference on Learning Representations (ICLR) Since 2022
- Conference on Neural Information Processing Systems (NeurIPS) 2021 - 2024
- Computer Vision and Pattern Recognition (CVPR) Since 2021
- European Conference on Computer Vision (ICCV) Since 2021
- European Conference on Computer Vision (ECCV) Since 2022
- Winter Conference on Applications of Computer Vision (WACV) Since 2022
- Artificial Intelligence and Statistics (AISTATS) Since 2022
- Learning on Graphs Conference (LoG) Since 2022
- Medical Imaging with Deep Learning (MIDL) Since 2022
- AAAI Conference on Artificial Intelligence (AAAI) Since 2022
- International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI) 2020 - 2024
- Transactions on Machine Learning Research (TMLR)
- IEEE Transactions on Medical Imaging (TMI)
- Medical Image Analysis (MedIA)

Talks	<i>Learn2Synth: A Learnable Data Synthesis Strategy for Image Segmentation</i>	
	• Nobrainer Seminar, Massachusetts Institute of Technology	June 2024
	Deep Structural Reasoning for Biomedical Imaging	
	• School of CAI, Arizona State University	Feb. 2024
	Topology-Aware Deep Image Segmentation	
	• MICCAI'23 tutorial on <i>Topology-Driven Image Analysis</i> , Vancouver	Oct. 2023
	Learning Topological Representations for Deep Image Understanding	
	• Department of CS, Florida State University	Apr. 2023
	• Department of BMI, Ohio State University	Mar. 2023
	• Department of CS, Rochester Institute of Technology	Feb. 2023
	• Department of ECE, University of California, Riverside	Feb. 2023
	• Athinoula A. Martinos Center for Biomedical Imaging, MGH/Harvard Medical School	Nov. 2022
	Learning Probabilistic Topological Representations Using Discrete Morse Theory	
	• Medical Imaging meets NeurIPS Workshop, New Orleans	Dec. 2022
	Topology-Informed Image Analysis	
	• Center for Computational Neuroscience, Flatiron Institute	Oct. 2022
	Topology-Aware Deep Image Segmentation	
	• Geometry and Topology meet Data Analysis and Machine Learning	Aug. 2021
	Topology-aware Segmentation Using Discrete Morse Theory	
	• International Conference on Learning Representations (ICLR)	May 2021
Industry Experiences	• Allen Institute, USA	May 2022 - Aug. 2022
	<i>Research Intern</i>	
	Mentor: <i>Dr. Matheus Viana</i>	
	Topic: Topology-Aware Image Segmentation	
	• United Imaging Intelligence (UII), USA	May 2021 - Aug. 2021
	<i>Research Intern</i>	
	Mentor: <i>Dr. Shanhui Sun</i>	
	Topic: Deep Shape Model Based Network	
	• Tencent Youtu Lab, China	Jun. 2017 - Jan. 2018
	<i>Research Intern</i>	
	Mentor: <i>Dr. Yuwing Tai</i>	
	Topic: Clothes Detection, Attribute Prediction	

References

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