

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 interest is Machine Learning for Healthcare, and I am focusing on developing core machine learning algorithms applied to healthcare problems. In particular, I am interested in:</p> <ul style="list-style-type: none">• Topology-Driven Deep Image Analysis• Learning with Reliability, Interpretability, and Robustness• Multimodal AI and Generative AI (GenAI) for Healthcare• Empowering Clinical and Biomedical 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] Hierarchical Uncertainty Estimation for Learning-based Registration in Neuroimaging Xiaoling Hu, Karthik Gopinath, Peirong Liu, Malte Hoffmann, Koen Van Leemput, Oula Puonti[‡], Juan Eugenio Iglesias[†] <i>International Conference on Learning Representations (ICLR)</i>, 2025[2] Semi-supervised Segmentation of Histopathology Images with Noise-Aware Topological Consistency Meilong Xu[†], Xiaoling Hu, Saumya Gupta, Shahira Abousamra, Chao Chen <i>European Conference on Computer Vision (ECCV)</i>, 2024[3] Brain-ID: Learning Contrast-agnostic Anatomical Representations for Brain Imaging Peirong Liu, Oula Puonti, Xiaoling Hu, Daniel C. Alexander, Juan Eugenio Iglesias <i>European Conference on Computer Vision (ECCV)</i>, 2024

- [4] **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
- [5] **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
- [6] **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
- [7] **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
- [8] **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
- [9] **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
- [10] **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
- [11] **Calibrating Uncertainty for Semi-Supervised Crowd Counting**
Chen Li[†], Xiaoling Hu, Shahira Abousamra, Chao Chen
International Conference on Computer Vision (ICCV), 2023
- [12] **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
- [13] **Learning Probabilistic Topological Representations Using Discrete Morse Theory**
Xiaoling Hu, Dimitris Samaras, Chao Chen
International Conference on Learning Representations (ICLR), 2023 (**Spotlight, notable-top-25%**)

Short version is selected as **Oral presentation** at Medical Imaging meets NeurIPS Workshop, 2023

- [14] **Confidence Estimation Using Unlabeled Data**
Chen Li[†], Xiaoling Hu, Chao Chen
International Conference on Learning Representations (ICLR), 2023
- [15] **Structure-Aware Image Segmentation with Homotopy Warping**
Xiaoling Hu
Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS), 2022
- [16] **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 Tsisiopoulos, Prateek Prasanna, Chao Chen
European Conference on Computer Vision (ECCV), 2022 (**Oral, 2.7%**)
- [17] **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
- [18] **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
- [19] **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
- [20] **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, 5.6%**)
- [21] **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
- [22] **Topology-Preserving Deep Image Segmentation**
Xiaoling Hu, Li Fuxin, Dimitris Samaras, Chao Chen
Thirty-third Conference on Neural Information Processing Systems (NeurIPS), 2019
- [23] **Saliency Detection based on Integration of Central Bias, Reweighting and Multi-Scale for Superpixels**
Xiaoling Hu, Wenming Yang, Fei Zhou, Qingmin Liao
IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2016

Preprints

- [1] ***Learn2Synth: Learning Optimal Data Synthesis Using Hypergradients***
Xiaoling Hu, Oula Puonti, Juan Eugenio Iglesias, Bruce Fischl[‡], Yaël Balbastre[‡]
Tech Report
- [2] ***TopoCellGen: Generating Histopathology Cell Topology with a Diffusion Model***
Meilong Xu[†], Saumya Gupta, Xiaoling Hu, Chen Li, Shahira Abousamra, Dimitris Samaras, Prateek Prasanna, Chao Chen
Tech Report
- [3] ***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
- [4] ***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
- [5] ***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
- [6] ***Deep Statistic Shape Model for Myocardium Segmentation***
Xiaoling Hu, Xiao Chen, Terrence Chen, Shanhui Sun
Tech Report

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%)

Industry Experiences

- **Allen Institute, USA** May 2022 - Aug. 2022
Research Intern
Mentor: *Dr. Matheus Viana*
Topic: Topology-Aware Image Segmentation
- **United Imaging Intelligence (UII), USA** May 2021 - Aug. 2021
Research Intern
Mentor: *Dr. Shanhui Sun*
Topic: Deep Shape Model Based Network
- **Tencent Youtu Lab, China** Jun. 2017 - Jan. 2018
Research Intern
Mentor: *Dr. Yuwing Tai*
Topic: Clothes Detection, Attribute Prediction

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

Professional Organizer Service

- 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

Reviewing

- International Conference on Machine Learning (ICML) Since 2022
- International Conference on Learning Representations (ICLR) Since 2022
- Conference on Neural Information Processing Systems (NeurIPS) Since 2021
- 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
- Pattern Recognition (PR)

- IEEE Transactions on Medical Imaging (TMI)
- Medical Image Analysis (MedIA)

Talks

Learn2Synth: A Learnable Data Synthesis Strategy for Image Segmentation

- 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 *Topology-Driven Image Analysis*, 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

References

- **Chao Chen**
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- **Bruce Fischl**
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- **Dimitris Samaras**

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