

## Xiaoling Hu

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<b>Current Position</b>	<ul style="list-style-type: none"><li>• <b>Harvard Medical School, Athinoula A. Martinos Center for Biomedical Imaging, USA</b> Aug. 2023 - Present <i>Postdoctoral Research Fellow</i> - Hosted by Prof. Juan Eugenio Iglesias and Prof. Bruce Fischl</li></ul>
<b>Research Interests</b>	<p>My research interest is <b>Machine Learning for Healthcare</b>, and I am focusing on developing core machine learning algorithms applied to medical imaging problems. In particular, I am interested in:</p> <ul style="list-style-type: none"><li>• <b>Topology-Driven Deep Image Analysis</b></li><li>• <b>Learning with Reliability, Interpretability, and Robustness</b></li><li>• <b>Multimodal AI and GenAI for Healthcare</b></li><li>• <b>Empowering Clinical and Biomedical Applications</b></li></ul>
<b>Education</b>	<ul style="list-style-type: none"><li>• <b>Stony Brook University, Department of CS, USA</b> 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</li><li>• <b>Tsinghua University, Department of EE, China</b> Sep. 2014 - June 2017 <i>Master of Science</i></li><li>• <b>Huazhong University of Science and Technology, Department of EE, China</b> Sep. 2010 - June 2014 <i>Bachelor of Science</i></li></ul>
<b>Selected Publications</b>	<p>(* indicates equal contribution, <sup>†</sup> denotes students (co-)mentored by me, <sup>‡</sup> denotes co-senior supervision)</p> <ol style="list-style-type: none"><li>[1] <b>TopoSemiSeg: Enforcing Topological Consistency for Semi-Supervised Segmentation of Histopathology Images</b> Meilong Xu<sup>†</sup>, Xiaoling Hu, Saumya Gupta, Shahira Abousamra, Chao Chen <i>European Conference on Computer Vision (ECCV)</i>, 2024</li><li>[2] <b>Brain-ID: Learning Robust Feature Representations for Brain Imaging</b> Peirong Liu, Oula Puonti, Xiaoling Hu, Daniel C. Alexander, Juan Eugenio Iglesias <i>European Conference on Computer Vision (ECCV)</i>, 2024</li><li>[3] <b>Registration by Regression (RbR): a framework for interpretable and flexible atlas registration</b> Karthik Gopinath*, Xiaoling Hu*, Malte Hoffmann, Oula Puonti<sup>‡</sup>, Juan Eugenio Iglesias<sup>‡</sup> <i>Workshop on Biomedical Image Registration-MICCAI (WBIR)</i>, 2024</li></ol>

- [4] ***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
- [5] **Semi-Supervised Contrastive VAE for Disentanglement of Digital Pathology Images**  
Mahmudul Hasan<sup>†</sup>, Xiaoling Hu, Shahira Abousamra, Prateek Prasanna, Joel Saltz, Chao Chen  
*International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2024
- [6] **Hard Negative Sample Mining for Whole Slide Image Classification**  
Wentao Huang<sup>†</sup>, Xiaoling Hu, Shahira Abousamra, Prateek Prasanna, Chao Chen  
*International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2024
- [7] **Spatial Diffusion for Cell Layout Generation**  
Chen Li<sup>†</sup>, Xiaoling Hu, Shahira Abousamra, Meilong Xu, Chao Chen  
*International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2024
- [8] **Anomaly-Guided Weakly Supervised Lesion Segmentation on Retinal OCT Images**  
Jiaqi Yang<sup>†</sup>, Nitish Mehta, Gozde Merve Demirci<sup>†</sup>, Xiaoling Hu, Meera Ramakrishnan, Mina Naguib, Chao Chen, Chialing Tsai  
*Medical Image Analysis (MedIA)*, 2024
- [9] **Topology-Aware Uncertainty for Image Segmentation**  
Saumya Gupta<sup>†</sup>, Yikai Zhang, Xiaoling Hu, Prateek Prasanna, Chao Chen  
*Thirty-seventh Conference on Neural Information Processing Systems (NeurIPS)*, 2023
- [10] **Calibrating Uncertainty for Semi-Supervised Crowd Counting**  
Chen Li<sup>†</sup>, Xiaoling Hu, Shahira Abousamra, Chao Chen  
*International Conference on Computer Vision (ICCV)*, 2023
- [11] **Enhancing Modality-Agnostic Representations via Meta-Learning for Brain Tumor Segmentation**  
Aishik Konwer<sup>†</sup>, Xiaoling Hu, Xuan Xu, Joseph Bae, Chao Chen, Prateek Prasanna  
*International Conference on Computer Vision (ICCV)*, 2023
- [12] **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
- [13] **Confidence Estimation Using Unlabeled Data**  
Chen Li<sup>†</sup>, Xiaoling Hu, Chao Chen  
*International Conference on Learning Representations (ICLR)*, 2023

- [14] **Structure-Aware Image Segmentation with Homotopy Warping**  
Xiaoling Hu  
*Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS)*, 2022
- [15] **Learning Topological Interactions for Multi-Class Medical Image Segmentation**  
 Saumya Gupta<sup>\*†</sup>, Xiaoling Hu<sup>\*</sup>, James Kaan, Michael Jin, Mutshipay Mpoy, Katherine Chung, Gagandeep Singh, Mary Saltz, Tahsin Kurc, Joel Saltz, Apostolos Tassiopoulos, Prateek Prasanna, Chao Chen  
*European Conference on Computer Vision (ECCV)*, 2022 (**Oral, 2.7%**)
- [16] **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
- [17] **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
- [18] **Topology-Attention ConvLSTM Network for 3D Image Segmentation**  
 Jiaqi Yang<sup>\*†</sup>, Xiaoling Hu<sup>\*</sup>, Chao Chen, Chialing Tsai  
*International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2021
- [19] **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%**)
- [20] **3D Topology-Preserving Segmentation with Compound Multi-Slice Representation**  
 Jiaqi Yang<sup>\*†</sup>, Xiaoling Hu<sup>\*</sup>, Chao Chen, Chialing Tsai  
*IEEE International Symposium on Biomedical Imaging (ISBI)*, 2021
- [21] **Topology-Preserving Deep Image Segmentation**  
Xiaoling Hu, Li Fuxin, Dimitris Samaras, Chao Chen  
*Thirty-third Conference on Neural Information Processing Systems (NeurIPS)*, 2019
- [22] **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] **Hierarchical Uncertainty Estimation for Learning-based Registration in Neuroimaging**  
Xiaoling Hu, Karthik Gopinath, Peirong Liu, Malte Hoffmann, Koen Van Leemput, Oula Puonti<sup>‡</sup>, Juan Eugenio Iglesias<sup>‡</sup>  
*Tech Report*
- [2] **Learn2Synth: Learning Optimal Data Synthesis Using Hypergradients**  
Xiaoling Hu, Oula Puonti, Juan Eugenio Iglesias, Bruce Fischl<sup>‡</sup>, Yaël Balbastre<sup>‡</sup>  
*Tech Report*

- [3] **TopoCellGen: Generating Histopathology Cell Topology with a Diffusion Model**  
 Meilong Xu<sup>†</sup>, Saumya Gupta, Xiaoling Hu, Chen Li, Shahira Abousamra, Dimitris Samaras, Prateek Prasanna, Chao Chen  
*Tech Report*
- [4] **RankByGene: Gene-Guided Histopathology Representation Learning Through Cross-Modal Ranking Consistency**  
 Wentao Huang<sup>†</sup>, Meilong Xu<sup>†</sup>, Xiaoling Hu, Shahira Abousamra, Aniruddha Ganguly, Saarthak Kapse, Alisa Yurovsky, Prateek Prasanna, Tahsin Kurc, Joel Saltz, Michael L. Miller, Chao Chen  
*Tech Report*
- [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*
- [6] **A Multimodal Approach Combining Structural and Cross-Domain Textual Guidance for Weakly Supervised OCT Segmentation**  
 Jiaqi Yang<sup>†</sup>, Nitish Mehta, Xiaoling Hu, Chao Chen, Chia-Ling Tsai  
*Tech Report*
- [7] **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

## 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)  
Since 2020
- Pattern Recognition (PR)
- IEEE Transactions on Medical Imaging (TMI)
- Medical Image Analysis (MedIA)

Talks	<b><i>Learn2Synth: A Learnable Data Synthesis Strategy for Image Segmentation</i></b>	
	• Nobrainer Seminar, Massachusetts Institute of Technology	June 2024
	<b>Deep Structural Reasoning for Biomedical Imaging</b>	
	• School of CAI, Arizona State University	Feb. 2024
	<b>Topology-Aware Deep Image Segmentation</b>	
	• MICCAI'23 tutorial on <i>Topology-Driven Image Analysis</i> , Vancouver	Oct. 2023
	<b>Learning Topological Representations for Deep Image Understanding</b>	
	• 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
	<b>Learning Probabilistic Topological Representations Using Discrete Morse Theory</b>	
	• Medical Imaging meets NeurIPS Workshop, New Orleans	Dec. 2022
	<b>Topology-Informed Image Analysis</b>	
	• Center for Computational Neuroscience, Flatiron Institute	Oct. 2022
	<b>Topology-Aware Deep Image Segmentation</b>	
	• Geometry and Topology meet Data Analysis and Machine Learning	Aug. 2021
	<b>Topology-aware Segmentation Using Discrete Morse Theory</b>	
	• International Conference on Learning Representations (ICLR)	May 2021
References	• <b>Chao Chen</b>	
	Associate Professor, Stony Brook University chao.chen.1@stonybrook.edu <a href="https://chaochen.github.io/">https://chaochen.github.io/</a>	
	• <b>Juan Eugenio Iglesias</b>	
	Associate Professor, MGH & Harvard Medical School jiglesiasgonzalez@mgh.harvard.edu <a href="https://lemon.martinos.org/pi/">https://lemon.martinos.org/pi/</a>	
	• <b>Bruce Fischl</b>	
	Professor, MGH & Harvard Medical School bfischl@mgh.harvard.edu <a href="https://scholar.google.com/citations?user=t7mytXkAAAAJ&amp;hl=en">https://scholar.google.com/citations?user=t7mytXkAAAAJ&amp;hl=en</a>	

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