

## Xiaoling Hu

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Current Position	<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>
Research Interests	<p>My research focuses on <b>Machine Learning for Healthcare</b>, 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"><li>• <b>Topology-Driven Deep Image Analysis</b></li><li>• <b>Trustworthy Machine Learning</b></li><li>• <b>Multimodal AI and Generative AI (GenAI)</b></li><li>• <b>Healthcare Applications</b></li></ul>
Education	<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>
Selected Publications	<p>(* indicates equal contribution, __ denotes students (co-)mentored by me, <sup>‡</sup> denotes (co)-senior supervision)</p> <ol style="list-style-type: none"><li>[1] <b><i>Learn2Synth: Learning Optimal Data Synthesis Using Hypergradients for Brain Image Segmentation</i></b> <b>Xiaoling Hu</b>, Xiangrui Zeng, Oula Puonti, Juan Eugenio Iglesias, Bruce Fischl<sup>‡</sup>, Yaël Balbastre<sup>‡</sup> <i>International Conference on Computer Vision (ICCV)</i>, 2025</li><li>[2] <b><i>TopoCellGen: Generating Histopathology Cell Topology with a Diffusion Model</i></b> Meilong Xu, Saumya Gupta, <b>Xiaoling Hu</b>, Chen Li, Shahira Abousamra, Dimitris Samaras, Prateek Prasanna, Chao Chen <i>The IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)</i>, 2025 (<b>Oral Presentation, acceptance rate &lt; 1%</b>) <i>Short version is also presented at CVPR 2025 Workshop GMCV</i></li><li>[3] <b><i>Hierarchical Uncertainty Estimation for Learning-based Registration in Neuroimaging</i></b> <b>Xiaoling Hu</b>, Karthik Gopinath, Peirong Liu, Malte Hoffmann, Koen Van Leemput, Oula Puonti<sup>‡</sup>, Juan Eugenio Iglesias<sup>‡</sup></li></ol>

*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<sup>‡</sup>, Juan Eugenio Iglesias<sup>‡</sup>  
*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

- Caticosinos 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

- Luca Drole, Master student in BME, ETH Zurich  
Since Feb. 2025
- 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
- The IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) 2026
- International Conference on Artificial Intelligence and Statistics (AISTATS) 2026

## 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) 2021 - 2025
- 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
- International Conference on Artificial Intelligence and Statistics (AISTATS) Since 2022
- Learning on Graphs Conference (LoG) 2022 - 2025
- 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

	<ul style="list-style-type: none"> <li>• Transactions on Machine Learning Research (TMLR)</li> <li>• IEEE Transactions on Medical Imaging (TMI)</li> <li>• Medical Image Analysis (MedIA)</li> </ul>	
Talks	<p><b>Principled Learning for Medical AI: Structure, Reliability, and Interpretability</b></p> <ul style="list-style-type: none"> <li>• HIT Webinar - <i>Healthcare, Intelligence, Technology</i> Aug. 2025</li> </ul> <p><b><i>Learn2Synth</i>: A Learnable Data Synthesis Strategy for Image Segmentation</b></p> <ul style="list-style-type: none"> <li>• Nobrainer Seminar, Massachusetts Institute of Technology June 2024</li> </ul> <p><b>Deep Structural Reasoning for Biomedical Imaging</b></p> <ul style="list-style-type: none"> <li>• School of CAI, Arizona State University Feb. 2024</li> </ul> <p><b>Topology-Aware Deep Image Segmentation</b></p> <ul style="list-style-type: none"> <li>• MICCAI'23 tutorial on <i>Topology-Driven Image Analysis</i>, Vancouver Oct. 2023</li> </ul> <p><b>Learning Topological Representations for Deep Image Understanding</b></p> <ul style="list-style-type: none"> <li>• Department of CS, Florida State University Apr. 2023</li> <li>• Department of BMI, Ohio State University Mar. 2023</li> <li>• Department of CS, Rochester Institute of Technology Feb. 2023</li> <li>• Department of ECE, University of California, Riverside Feb. 2023</li> <li>• Athinoula A. Martinos Center for Biomedical Imaging, MGH/Harvard Medical School Nov. 2022</li> </ul> <p><b>Learning Probabilistic Topological Representations Using Discrete Morse Theory</b></p> <ul style="list-style-type: none"> <li>• Medical Imaging meets NeurIPS Workshop, New Orleans Dec. 2022</li> </ul> <p><b>Topology-Informed Image Analysis</b></p> <ul style="list-style-type: none"> <li>• Center for Computational Neuroscience, Flatiron Institute Oct. 2022</li> </ul> <p><b>Topology-Aware Deep Image Segmentation</b></p> <ul style="list-style-type: none"> <li>• Geometry and Topology meet Data Analysis and Machine Learning Aug. 2021</li> </ul> <p><b>Topology-aware Segmentation Using Discrete Morse Theory</b></p> <ul style="list-style-type: none"> <li>• International Conference on Learning Representations (ICLR) May 2021</li> </ul>	
Industry Experiences	<ul style="list-style-type: none"> <li>• <b>Allen Institute, USA</b> May 2022 - Aug. 2022  <i>Research Intern</i>  Mentor: <i>Dr. Matheus Viana</i>  Topic: Topology-Aware Image Segmentation</li> </ul>	

- **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

## References

- **Chao Chen**  
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- **Juan Eugenio Iglesias**  
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- **Bruce Fischl**  
Professor, MGH & Harvard Medical School  
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- **Dimitris Samaras**  
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