

## 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>Medical AI</b>, and I am focusing on developing core AI/ML 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>Uncertainty Estimation and Its Applications</b></li><li>• <b>Learning with Imperfect Data</b></li><li>• <b>Brain Image Analysis</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 working closely with me)</p> <ul style="list-style-type: none"><li>[1] <b>Semi-Supervised Contrastive VAE for Disentanglement of Digital Pathology Images</b> Mahmudul Hasan<sup>†</sup>, <u>Xiaoling Hu</u>, Shahira Abousamra, Prateek Prasanna, Joel Saltz, Chao Chen <i>International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)</i>, 2024</li><li>[2] <b>Hard Negative Sample Mining for Whole Slide Image Classification</b> Wentao Huang<sup>†</sup>, <u>Xiaoling Hu</u>, Shahira Abousamra, Prateek Prasanna, Chao Chen <i>International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)</i>, 2024</li><li>[3] <b>Spatial Diffusion for Cell Layout Generation</b> Chen Li<sup>†</sup>, <u>Xiaoling Hu</u>, Shahira Abousamra, Meilong Xu, Chao Chen <i>International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)</i>, 2024</li></ul>

- [4] **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
- [5] **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
- [6] **Calibrating Uncertainty for Semi-Supervised Crowd Counting**  
Chen Li<sup>†</sup>, Xiaoling Hu, Shahira Abousamra, Chao Chen  
*International Conference on Computer Vision (ICCV)*, 2023
- [7] **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
- [8] **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%**)
- [9] **Confidence Estimation Using Unlabeled Data**  
Chen Li<sup>†</sup>, Xiaoling Hu, Chao Chen  
*International Conference on Learning Representations (ICLR)*, 2023
- [10] **Structure-Aware Image Segmentation with Homotopy Warping**  
Xiaoling Hu  
*Thirty-sixth Conference on Neural Information Processing Systems (NeurIPS)*, 2022
- [11] **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%**)
- [12] **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
- [13] **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
- [14] **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

- [15] **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%**)
- [16] **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
- [17] **Topology-Preserving Deep Image Segmentation**  
Xiaoling Hu, Li Fuxin, Dimitris Samaras, Chao Chen  
*Thirty-third Conference on Neural Information Processing Systems (NeurIPS)*, 2019
- [18] **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

(\* indicates equal contribution, <sup>†</sup> denotes students working closely with me)

- [1] **Registration by Regression (RbR): a framework for interpretable and flexible atlas registration**  
 Karthik Gopinath<sup>\*</sup>, Xiaoling Hu<sup>\*</sup>, Malte Hoffmann, Oula Puonti, Juan Eugenio Iglesias  
*Tech Report*
- [2] **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  
*Tech Report*
- [3] **TopoSemiSeg: Enforcing Topological Consistency for Semi-Supervised Segmentation of Histopathology Images**  
 Meilong Xu<sup>†</sup>, Xiaoling Hu, Saumya Gupta, Shahira Abousamra, Chao Chen  
*Tech Report*
- [4] **Brain-ID: Learning Robust Feature Representations for Brain Imaging**  
 Peirong Liu, Oula Puonti, Xiaoling Hu, Daniel C. Alexander, Juan Eugenio Iglesias  
*Tech Report*
- [5] **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	<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>
	<ul style="list-style-type: none"> <li>• <b>United Imaging Intelligence (UII), USA</b> May 2021 - Aug. 2021  <i>Research Intern</i>  Mentor: <i>Dr. Shanhui Sun</i>  Topic: Deep Shape Model Based Network</li> </ul>
	<ul style="list-style-type: none"> <li>• <b>Tencent Youtu Lab, China</b> Jun. 2017 - Jan. 2018  <i>Research Intern</i>  Mentor: <i>Dr. Yuwing Tai</i>  Topic: Clothes Detection, Attribute Prediction</li> </ul>
Mentoring	<ul style="list-style-type: none"> <li>• Jiaqi Yang (<b>MICCAI'21, ISBI'21, MedIA'24</b>), Ph.D. student at Department of CS, CUNY Since Spring 2020</li> </ul>
	<ul style="list-style-type: none"> <li>• Chen Li (<b>ICLR'23, ICCV'23, MICCAI'24</b>), Ph.D. student at Department of BMI, Stony Brook University Since Fall 2021</li> </ul>
	<ul style="list-style-type: none"> <li>• Saumya Gupta (<b>ECCV'22, NeurIPS'23</b>), Ph.D. student at Department of CS, Stony Brook University Fall 2021 – Summer 2023</li> </ul>
	<ul style="list-style-type: none"> <li>• Meilong Xu, Ph.D. student at Department of CS, Stony Brook University Since Summer 2023</li> </ul>
	<ul style="list-style-type: none"> <li>• Wentao Huang (<b>MICCAI'24</b>), Ph.D. student at Department of CS, Stony Brook University Since Summer 2023</li> </ul>
	<ul style="list-style-type: none"> <li>• Mahmudul Hasan (<b>MICCAI'24</b>), Ph.D. student at Department of CS, Stony Brook University Since Summer 2023</li> </ul>
	<ul style="list-style-type: none"> <li>• John Xie, High School student → University of Michigan Summer 2021</li> </ul>
Professional Service	<b>Organizer</b> <ul style="list-style-type: none"> <li>• MICCAI'24 workshop on <i>The First Workshop on Topology- and Graph-Informed Imaging Informatics (TGI3)</i> 2024</li> <li>• MICCAI'23 tutorial on <i>Topology-Driven Image Analysis</i> 2023</li> </ul>
	<b>Reviewing</b> <ul style="list-style-type: none"> <li>• International Conference on Machine Learning (ICML) Since 2022</li> <li>• International Conference on Learning Representations (ICLR) Since 2022</li> <li>• Conference on Neural Information Processing Systems (NeurIPS) Since 2021</li> <li>• Computer Vision and Pattern Recognition (CVPR) Since 2021</li> <li>• European Conference on Computer Vision (ICCV) Since 2021</li> <li>• European Conference on Computer Vision (ECCV) Since 2022</li> <li>• Winter Conference on Applications of Computer Vision (WACV) Since 2022</li> <li>• Artificial Intelligence and Statistics (AISTATS) Since 2022</li> <li>• Learning on Graphs Conference (LoG) Since 2022</li> <li>• Medical Imaging with Deep Learning (MIDL) Since 2022</li> </ul>

- 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)

## Talks

### 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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- **Dimitris Samaras**  
SUNY Empire Innovation Professor, Stony Brook University  
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