Xiaoling Hu

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Current Position

- **Harvard Medical School, Athinoula A. Martinos Center for Biomedical Imaging, USA** **Aug. 2023 - Present**
  Postdoctoral Research Fellow
  - Hosted by Prof. Juan Eugenio Iglesias and Prof. Bruce Fischl

Research Interests

My research interest is **Biomedical AI**, and I am focusing on developing core AI/ML algorithms applied to medical imaging problems. In particular, I am interested in:

- **Topology-Driven Deep Image Analysis**
- **Uncertainty Estimation and Its Applications**
- **Learning with Imperfect Data**

Education

- **Stony Brook University, Department of CS, USA** **Jan. 2018 - June 2023**
  Doctor of Philosophy
  - 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**
  Master of Science

- **Huazhong University of Science and Technology, Department of EE, China** **Sep. 2010 - June 2014**
  Bachelor of Science

Selected Publications

(* indicates equal contribution, † denotes students working closely with me)

[1] **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

[2] **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

[3] **Calibrating Uncertainty for Semi-Supervised Crowd Counting**
Chen Li†, Xiaoling Hu, Shahira Abousamra, Chao Chen
*International Conference on Computer Vision (**ICCV**)*, 2023

[4] **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

[5] **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%**)

[6] **Confidence Estimation Using Unlabeled Data**
Chen Li†, Xiaoling Hu, Chao Chen
*International Conference on Learning Representations (**ICLR**)*, 2023

[7] **Structure-Aware Image Segmentation with Homotopy Warping**
Xiaoling Hu
*Thirty-sixth Conference on Neural Information Processing Systems (**NeurIPS**)*, 2022

[8] **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 Tassiopoulos, Prateek Prasanna, Chao Chen
*European Conference on Computer Vision (**ECCV**)*, 2022 (**Oral, 2.7%**)

[9] **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

[10] **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

[11] **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

[12] **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%**)

[13] **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

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

[15] **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, † denotes students working closely with me)

[1] **Semi-Supervised Contrastive VAE for Disentanglement of Digital Pathology Images**
Mahmudul Hasan†, Xiaoling Hu, Shahira Abousamra, Prateek Prasanna, Joel Saltz, Chao Chen
Tech Report

[2] **Hard Negative Sample Mining for Whole Slide Image Classification**
Wentao Huang†, Xiaoling Hu, Shahira Abousamra, Prateek Prasanna, Chao Chen
Tech Report

[3] **Registration by Regression (RbR): a framework for interpretable and flexible atlas registration**
Karthik Gopinath*, Xiaoling Hu*, Malte Hoffmann, Oula Puonti, Juan Eugenio Iglesias
Tech Report

[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
Tech Report

[5] **Spatial Diffusion for Cell Layout Generation**
Chen Li†, Xiaoling Hu, Shahira Abousamra, Meilong Xu, Chao Chen
Tech Report

[6] **TopoSemiSeg: Enforcing Topological Consistency for Semi-Supervised Segmentation of Histopathology Images**
Meilong Xu†, Xiaoling Hu, Saumya Gupta, Shahira Abousamra, Chao Chen
Tech Report

[7] **Brain-ID: Learning Robust Feature Representations for Brain Imaging**
Peirong Liu, Oula Puonti, Xiaoling Hu, Daniel C. Alexander, Juan Eugenio Iglesias
Tech Report

[8] **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%)

Experiences

Stony Brook University, Department of CS, USA **Sep. 2018 - June 2023**
Research Assistant
Advisor: *Prof.* Chao Chen

- Topological Data Analysis
- Computer Vision, Medical Imaging
- Robust Machine Learning

Allen Institute, USA **May 2022 - Aug. 2022**
Research Intern
Mentor: *Dr.* Matheus Viana

- Topology-Aware Image Segmentation

United Imaging Intelligence (UII), USA **May 2021 - Aug. 2021**
Research Intern
Mentor: *Dr.* Shanhui Sun

- Deep Shape Model Based Network

Tencent Youtu Lab, China **Jun. 2017 - Jan. 2018**
Research Intern
Mentor: *Dr.* Yuwing Tai

- Clothes Detection, Attribute Prediction

Skills

- **Languages**: C/C++, Matlab, Python, Lua, Java
- **OS**: Linux, Mac OS, Windows
- **Tools**: Caffe, Torch, Tensorflow, PyTorch, OpenCV

Mentoring

- Jiaqi Yang (Spring 2020 – Now, **MICCAI'21, ISBI'21, MedIA'24**), Ph.D Student at Department of CS, CUNY
- Chen Li (Fall 2021 – Now, **ICLR'23, ICCV'23**), Ph.D Student at Department of BMI, Stony Brook University
- Saumya Gupta (Fall 2021 – Summer 2023, **ECCV'22, NeurIPS'23**), Ph.D Student at Department of CS, Stony Brook University
- Meilong Xu (Summer 2023 – Now), Ph.D Student at Department of CS, Stony Brook University
- Wentao Huang (Summer 2023 – Now), Ph.D Student at Department of CS, Stony Brook University
- John Xie (Summer 2021), High School Student → University of Michigan

Service

- Lead Organizer, MICCAI'24 workshop on *The First Workshop on Topology- and Graph-Informed Imaging Informatics (TGI3)*
- Lead Organizer, MICCAI'23 tutorial on *Topology-Driven Image Analysis*
- Reviewer, International Conference on Machine Learning (ICML)
- Reviewer, International Conference on Learning Representations (ICLR)
- Reviewer, Conference on Neural Information Processing Systems (NeurIPS)
- Reviewer, Computer Vision and Pattern Recognition (CVPR)
- Reviewer, European Conference on Computer Vision (ICCV)
- Reviewer, European Conference on Computer Vision (ECCV)
- Reviewer, Winter Conference on Applications of Computer Vision (WACV)
- Reviewer, Artificial Intelligence and Statistics (AISTATS)
- Reviewer, International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)

- Reviewer, Learning on Graphs Conference (LoG)
- Reviewer, Medical Imaging with Deep Learning (MIDL)
- Program Committee, AAAI Conference on Artificial Intelligence (AAAI)
- Reviewer, Pattern Recognition (PR)
- Reviewer, IEEE Transactions on Medical Imaging (TMI)

Talks

Deep Structural Reasoning for Biomedical Imaging

- School of Computing and Augmented Intelligence, 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 (GTDAML), Online, Aug. 2021

Topology-aware Segmentation Using Discrete Morse Theory

- International Conference on Learning Representations (ICLR), Online, May 2021

References

- **Chao Chen**
  Associate Professor, Stony Brook University
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  `https://chaochen.github.io/`
- **Dimitris Samaras**
  SUNY Empire Innovation Professor, Stony Brook University
  samaras@cs.stonybrook.edu
  `https://www3.cs.stonybrook.edu/~samaras/`

- **Fuxin Li**
  Associate Professor, Oregon State University
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