LIHAO LIU

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RESEARCH INTERESTS

My research interests are Video Processing and Medical Image Analysis. Specifically, I focus on using Machine Learning techniques to solve surgical video processing, and video shadow detection tasks. Besides, I am also working on unsupervised medical image registration and segmentation tasks.

EDUCATION

University of Cambridge — **Cambridge, UK**
Ph.D. in Applied Mathematics — *Oct. 2020 - Present*
- Research Group: Cambridge Image Analysis Group — *Expected Graduation: Spet. 2024*
- Supervisor: Carola-Bibiane Schönlieb, Angelica I. Aviles-Rivero
- Ph.D. Award: Girton College Ph.D. Scholarship & GSK Ph.D. Fellowship

Chinese University of Hong Kong — **Hong Kong SAR**
M.Phil. in Computer Science and Engineering — *Aug. 2017 - Jul. 2020*
- Supervisor: Pheng-Ann Heng
- M.Phil. Award: CUHK M.Phil. Student Scholarship

Chongqing University — **Chongqing, China**
B.Eng. in Software Engineering — *Sep. 2012 - Jul. 2016*
- Ranking: Top 10% in Department
- B.Eng. Award: Outstanding Student in Chongqing University

RESEARCH EXPERIENCE

Microsoft Research — **Cambridge, UK**
Research Intern at Healthcare Intelligence Group — *Jun. 2021 - Aug. 2021*
- I joined the InnerEye project, and worked with Ozan Oktay.
- I focused on cross-modality self-supervised data alignment tasks, especially for Chest X-ray applications.

University of Cambridge — **Cambridge, UK**
Visiting Student at Cambridge Image Analysis Group — *Feb. 2020 – Jul. 2020*
- I designed a basic registration-based unsupervised segmentation model for brain images.

Imsight Technology — **Shenzhen, China**
Research Intern at AI for Medical Imaging Group — *Aug. 2017 – Oct. 2017*
- I designed and developed the DeepLung software, and deployed it to multiple hospitals in Beijing for clinical usage.

Chinese University of Hong Kong — **Hong Kong SAR**
Junior Research Assistant at Medical Imaging Lab (CUMed) — *Feb. 2017 – Jul. 2017*
- I developed and integrated the deep learning algorithms into ITK-SNAP for lung nodule analysis. [video demo]

Weiboyi Technology Co., Ltd — **Beijing, China**
Data Mining Engineer at Big Data Group — *May. 2016 – Feb. 2017*
- I developed a hive-based auto-update system for big files storing and updating.

PUBLICATIONS [Google Scholar]

SCOTCH and SODA: A Transformer Video Shadow Detection Framework
Lihao Liu, Jean Prost, Lei Zhu, Nicolas Papadakis, ... , and Angelica I Aviles-Rivero.
Computer Vision and Pattern Recognition (**CVPR**), 2023. [paper][project]

TrafficCAM: A Versatile Dataset for Traffic Flow Segmentation
Zhongying Deng, Yanqi Chen, *Lihao Liu*, ... , and Angelica I Aviles-Rivero.
Under Review at International Conference on Computer Vision (**ICCV**), 2023. [paper][project]

Why Deep Surgical Models Fail?: Revisiting Surgical Action Triplet Recognition through the Lens of Robustness
Yanqi Cheng, _Lihao Liu_, Shujun Wang, Yueming Jin, Carola-Bibiane Schönlieb, Angelica I. Aviles-Rivero.
Trustworthy Machine Learning for Healthcare (**ICLR-TML4H**), 2023.   [paper][project]

PC-SwinMorph: Patch Representation for Unsupervised Medical Image Registration and Segmentation
Lihao Liu, Zhening Huang, Pietro Liò, Carola-Bibiane Schönlieb, and Angelica I Aviles-Rivero.
Under Review at IEEE Transactions on Medical Imaging (**TMI**, IF: 10.048), 2023.   [paper]

You Only Look at Patches: A Patch-wise Framework for 3D Unsupervised Medical Image Registration
Lihao Liu, Zhening Huang, Pietro Liò, Carola-Bibiane Schönlieb, and Angelica I Aviles-Rivero.
Biomedical Image Registration (**WBIR**), 2022.   [paper]

CoNIC Challenge: Pushing the Frontiers of Nuclear Detection, Segmentation, Classification and Counting
Simon Graham, Quoc Dang Vu, _Lihao Liu_, Chengyang Hong, and et. al.
Under Review at Medical Image Analysis (**MIA**, IF: 13.83), 2023.   [paper][code]

Simultaneous Semantic and Instance Segmentation for Colon Nuclei Identification and Counting
Lihao Liu, Chengyang Hong, Angelica I Aviles-Rivero, and Carola-Bibiane Schönlieb.
Medical Image Understanding and Analysis (**MIUA**), 2022.   [paper][code]
[Merit NVIDIA Paper Award in MIUA-2022!]   [Ranking 4/373 in the Grand Challenge CoNIC-2022!]

Domain Generalisation for Mammography Classification
Yijun Yang, Shujun Wang, _Lihao Liu_, Angelica I Aviles-Rivero, and Carola-Bibiane Schönlieb.
Under Review at **Nature Machine Intelligence**, 2022.   [coming soon]

Unsupervised Lung CT Image Registration via Stochastic Decomposition of Deformation Fields
Jing Zou, Youyi Song, _Lihao Liu_, Angelica I Aviles-Rivero, Jing Qin.
Under Review at IEEE Transactions on Medical Imaging, (**TMI**, IF: 10.048), 2022.   [coming soon]

Deformable Lung CT Registration by Decomposing Large Deformation
Jing Zou, _Lihao Liu_, Youyi Song, Kup-Sze Choi, Jing Qin.
Biomedical Image Registration (**WBIR**), 2022.   [paper][code]

Contrastive Registration for Unsupervised Medical Image Segmentation
Lihao Liu, Angelica I Aviles-Rivero, and Carola-Bibiane Schönlieb.
Under Review at IEEE Transactions on Neural Networks and Learning Systems (**TNNLS**, IF: 14.26), 2022.   [paper][code]

Ψ-Net: Stacking Densely Convolutional LSTMs for Sub-cortical Brain Structure Segmentation
Lihao Liu, Xiaowei Hu, Lei Zhu, Chi-Wing Fu, Jing Qin, and Pheng-Ann Heng.
IEEE Transactions on Medical Imaging (**TMI**, IF: 10.048), 2020.   [paper][code]

Probabilistic Multilayer Regularization Network for Unsupervised 3D Brain Image Registration
Lihao Liu, Xiaowei Hu, Lei Zhu, and Pheng-Ann Heng.
Medical Image Computing and Computer Assisted Intervention (**MICCAI**), 2019.   [paper][code]

Multi-Task Deep Model with Margin Ranking Loss for Lung Nodule Analysis
Lihao Liu, Qi Dou, Hao Chen, Jing Qin, and Pheng-Ann Heng.
IEEE Transactions on Medical Imaging (**TMI**, IF: 10.048), 2019.   [paper][code]

MTMR-Net: Multi-Task Deep Learning with Margin Ranking Loss for Lung Nodule Analysis
Lihao Liu, Qi Dou, Hao Chen, Iyiola E. Olatunji, Jing Qin, and Pheng-Ann Heng.
Deep Learning in Medical Image Analysis (**MICCAI-DLMIA**), 2018.   [paper][code]

HONORS & AWARDS

- ICIAM FS1 Travel Award - Tokyo	_March. 2023_
- NoMADS Secondments for UCLA Visting Graduate Researcher - NoMADS	_Jan. 2023_
- Merit NVIDIA Paper Award - MIUA	_July. 2022_
- Smith-Knight and Rayleigh-Knight Essay Prizes - University of Cambridge	_Mar. 2022_
- Ranking 4/373 in the Grand Challenge CoNIC-2022	_Mar. 2022_
- GSK Ph.D. Scholarship - GlaxoSmithKline (GSK)	_Aug. 2020_

- Girton College Ph.D. Scholarship - University of Cambridge *Aug. 2020*
- Research Funding for Visiting Student - University of Cambridge *Nov. 2019*
- CUHK M.Phil. Student Scholarship - Chinese University of Hong Kong *Mar. 2017*
- Outstanding Student Award - Chongqing University *Jul. 2016*
- Qiu Shi Scholarship - Chongqing University *Sept. 2014*

ACADEMIC ACTIVITIES

Invited Talks:
- SIAM Conference on Imaging Science, "Contrastive Registration for Unsupervised Image Segmentation", Mar. 2022.
- Chongqing University, "How Registration can Help to Segment Medical Images without Ground Truths?", Nov. 2021.
- East China Normal University, "Deep Learning Application in Medical Image Anaylsis", Nov. 2020.

Paper Review:
- MICCAI, IEEE TMI, MIA, CVPR, ICCV, ECCV

Teaching Assistant:
- CSCI2100 Data Structures   2019 - 2020   Spring
- CSCI3160 Design and Analysis of Algorithms   2018 - 2019   Fall
- CSCI3160 Design and Analysis of Algorithms   2017 - 2018   Fall

Volunteer Experience:
- I am the webpage manager and event in-person volunteer in MIUA conference and Women in MIUA workshop.
- I am an in-person volunteer in GeoMedIA workshop.