Xiao-Yun Zhou

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WORK

Senior research scientist - work closely with Dr. Le Lu   2020−now
PAII Inc. USA
    selected research: deep learning, machine learning, computer vision

EDUCATION

PhD - supervised by Prof. Guang-Zhong Yang and Dr. Su-Lin Lee   2015−2020
The Hamlyn Centre for Robotic Surgery, Imperial College London, UK
    Department of computing - *computer vision for medical image analysis*
    selected research: deep learning, machine learning, computer vision

MRes - supervised by Dr. Su-Lin Lee and Prof. Guang-Zhong Yang   2014−2015
The Hamlyn Centre for Robotic Surgery, Imperial College London, UK
    Department of surgery and cancer - *3D navigation and robotic path planning for RFCA*
    selected courses: medical imaging, minimally invasive surgery, image guided intervention, medical robotics

Master - supervised by Prof. Jian Wu   2011−2014
Tsinghua University, China
    Department of biomedical engineering - *fast 3D reconstruction from point cloud*
    selected courses: image processing, machine learning and pattern recognition

Bachelor   2007−2011
Wuhan University of Technology, China
    Department of communication engineering
    selected courses: communication principle, information theory and coding, electronic circuit, digital signal processing, C++

RESEARCH EXPERIENCE

My PhD research at the Hamlyn centre for robotic surgery is to bring machine intelligence - deep learning, machine learning and computer vision into surgery, with main focuses on pre-operative image/volume segmentation, intra-operative 3D navigation, and surgical robotic path planning:

- *Medical image/volume segmentation - DL*

  - Proposed novel 2D/3D architectures for deep convolutional neural network, 2D/3D normalization methods, and loss functions to improve the performance of deep learning in medical image/volume segmentation

- *Real-time 3D shape instantiation from a single intra-operative 2D projection - ML, DL, CV, GCN*

  - Improved two popular surgeries, heart and abdominal aneurysm, from using simple 2D navigation to real-time precise 3D intra-operative navigation. Proposed a registration-free and real-time instantiation framework for heart and liver, instantiation frameworks for fenestrated stent graft at

fully-compressed, partially-deployed and fully-deployed states, a general instantiation framework based on deep learning, and Instantiation-Net based on DCNN and GCN.

- *3D robotic path planning towards surgical autonomy - 3D CV*

  - RFCA and FEVAR were automated with efficient, safe and patient-specific robotic paths along the anatomical axis and central line respectively

SKILLS

Languages	Mandarin (native), English (fluent)
Programming	working knowledge: Matlab, Tensorflow, Python
	basic knowledge: C++, CUDA, Keras, PyTorch, Vtk, Qt, Opencv

AWARDS

IROS student travel award	2018
Hamlyn centre scholarship (Helen Hamlyn Trust)	2014-present
Merit student (twice)	2008-2010
The first prize scholarship	2009-2010
Academic progress award	2007-2008

ACHIEVEMENTS

- Cooperated closely with

  - hospitals: St Mary's, Royal Brompton, Charing Cross, Northwick Park

  - surgeons: Professor Lord Darzi of Denham, Professor Nick Cheshire, Professor Pallav Shah, Doctor Celia Riga, Doctor Sabine Ernst

  - industries: Intuitive surgical, Auris health, Medtronic, Johnson & Johnson

- Supervisor for three MRes individual projects

- Tutor for computer vision and image guided intervention course in 2016-2018

- Reviewer for TMI, CMIG, ICRA, IROS and so on

- Actively volunteer for public events including Imperial open day and Hamlyn open day

- Achieved 144/150 marks in national entrance test for MA/MS candidates 2011, including advanced mathematics, probability theory and linear algebra

INVITED TALKS

- Machine/Deep Learning for 3D Shape Instantiation (Keynote) - Emerging Learning Techniques for Robotics Workshop in conjunction with the Hamlyn Symposium on Medical Robotics, 2019

- Being the Eye for Robot-assisted Minimally Invasive Surgery - Microsoft Cambridge, Facebook Reality, Tsinghua University, 2019

CHAIR EXPERIENCE

- Chair of the Hamlyn Symposium for Medical Robotics - Deep Learning Workshop 2018, 2019

- Program chair of MICCAI-MMMI workshop 2019

PUBLICATIONS

1 . **Xiao-Yun Zhou**, Guang-Zhong Yang, Su-Lin Lee. "A real-time and registration-free framework for dynamic shape instantiation [J]", *Medical Image Analysis (**MedIA**)*, 44: 86-97, 2018. PDF

2 . **Xiao-Yun Zhou***, Zhao-Yang Wang*, Peichao Li, Jian-Qing Zheng, Guang-Zhong Yang. "One-stage shape instantiation from a single 2D image to 3D point cloud [C]", *International Conference on Medical Image Computing and Computer Assisted Intervention (**MICCAI**)*, 30-38, 2019. PDF

3 . **Xiao-Yun Zhou**, Guang-Zhong Yang. "Normalization in training U-Net for 2D biomedical semantic segmentation [J]", *IEEE Robotics and Automation Letters (**RAL**)*, 4(2): 1792-1799 2019. PDF Code

4 . **Xiao-Yun Zhou**, Celia Riga, Su-Lin Lee, Guang-Zhong Yang. "Towards automatic 3D shape instantiation for deployed stent grafts: 2D multiple-class and class-imbalance marker segmentation with equally-weighted focal U-Net [C]", *IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**)*, 1261-1267, 2018. PDF Code

5 . **Xiao-Yun Zhou**, Jianyu Lin, Celia Riga, Guang-Zhong Yang, Su-Lin Lee. "Real-time 3D shape instantiation from single fluoroscopy projection for fenestrated stent graft deployment [J+C]". *IEEE Robotics and Automation Letters (**RAL**) + International Conference on Robotics and Automation (**ICRA**)*, 3(2): 1314-1321, 2018. PDF Code

6 . Jian-Qing Zheng*, **Xiao-Yun Zhou***, Celia Riga, Guang-Zhong Yang. "Real-time 3D shape instantiation of partially-deployed stent segment from a single 2D fluoroscopic image for fenestrated endovascular aortic repair [J]". *IEEE Robotics and Automation Letters (**RAL**)*, 4(4): 3703-3710, 2019 PDF

7 . **Xiao-Yun Zhou***, Jian-Qing Zheng*, Peichao Li, Guang-Zhong Yang. "ACNN: a full resolution DCNN for medical image segmentation [C]" *IEEE International Conference on Robotics and Automation (**ICRA**)*, 8455-8461, 2020 PDF

8 . **Xiao-Yun Zhou**, Sabine Ernst, Su-Lin Lee. "Path planning for robot-enhanced cardiac radiofrequency catheter ablation [C]", *IEEE International Conference on Robotics and Automation (**ICRA**)*, 4172-4177, 2016. PDF Code

9 . Zhao-Yang Wang*, **Xiao-Yun Zhou***, Peichao Li, Guang-Zhong Yang. "Instantiation-Net: 3D RV mesh instantiation from a single 2D MRI projection [C]", *International Conference on Medical Image Computing and Computer Assisted Intervention (**MICCAI**)*, 680-691, 2020. PDF

10 . Peichao Li*, **Xiao-Yun Zhou***, Zhao-Yang Wang, Guang-Zhong Yang. "Z-Net: an asymmetric 3D DCNN for medical CT volume segmentation [J+C]". *accepted by ICRA 2020*

11 . **Xiao-Yun Zhou**, Yao Guo, Mali Shen, Guang-Zhong Yang. "Artificial intelligence for surgery [J]". *Frontier of Medicine*, 1-14, 2020.

12 . **Xiao-Yun Zhou**, Peichao Li, Zhao-Yang Wang, Guang-Zhong Yang. "U-Net training with Instance-Layer Normalization [C]", *Multiscale Multimodal Medical Imaging workshop in conjunction with International Conference on Medical Image Computing and Computer Assisted Intervention (**MICCAI MMMI workshop**) 2019 accepted.* <u>PDF</u>

13 . **Xiao-Yun Zhou**, Celia Riga, Guang-Zhong Yang, Su-Lin Lee. "Stent graft shape instantiation for fenestrated endovascular aortic repair [C]". *The Hamlyn Symposium on Medical Robotics*, 2017 <u>PDF</u>

14 . Jian-Qing Zheng, **Xiao-Yun Zhou**, Celia Riga, Guang-Zhong Yang. "Towards 3D path planning from a single 2D fluoroscopic image for robot assisted fenestrated endovascular aortic repair [C]", *IEEE International Conference on Robotics and Automation (**ICRA**)*, 8747-8753, 2019 <u>PDF</u>

15 . Yingjing Feng, Ziyan Guo, Ziyang Dong, **Xiao-Yun Zhou**, Ka-Wai Kwok, Sabine Ernst, Su-Lin Lee. "An efficient cardiac mapping strategy for radiofrequency catheter ablation with active learning [J]", *International journal of computer assisted radiology and surgery (**IJCARS**)*, 12(7): 1199-1207, 2017. <u>PDF</u>

* - equal contribution, J - journal, C - conference