

Yanhao Zhang

Computer Science and Information Technology The Australian National University (ANU)

SLAM | Deformation Reconstruction | Medical Robotics | Deep Learning

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📍 ANU Computer Science and Information Technology Building, 108 North Road, Acton, ACT 2601, Australia

Education

University of Technology Sydney

ROBOTICS INSTITUTE, SCHOOL OF MECHANICAL AND MECHATRONIC ENGINEERING

Ph.D in Robotics, Supervisors: A/Prof. Shoudong Huang and Dr. Liang Zhao

Sydney, Australia

Aug. 2017 - Dec. 2021

Northeastern University

DEPARTMENT OF MATHEMATICS, COLLEGE OF SCIENCE

Master in Applied Statistics, GPA: 90.97/100 (4.10/5)

Shenyang, China

Sep. 2014 - Jan. 2017

Northeastern University

DEPARTMENT OF MATHEMATICS, COLLEGE OF SCIENCE

B.S. in Mathematics and Applied Mathematics, GPA: 84.65/100 (3.47/5)

Shenyang, China

Sep. 2010 - Jun. 2014

Employment

Postdoctoral Research Fellow

SCHOOL OF COMPUTING, ANU COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

Cross-View Geo-Localization for Autonomous Driving (ARC Project). Supervised by [Prof. Hongdong Li](#).

Canberra, Australia

Dec. 2021 - Now

Part-time Research Engineer

UTS SCHOOL OF MECHANICAL AND MECHATRONIC ENGINEERING

Visual Simultaneous Localisation and Mapping (SLAM) in Deformable Environments (ARC Project).

Supervised by [A/Prof. Shoudong Huang](#).

Sydney, Australia

Aug. 2021-Nov. 2021

Publication

Accepted:

[1] Huang, S., Chen, Y., Zhao, L., **Zhang, Y.**, Xu, M. (2021). Some research questions for SLAM in deformable environments, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, IEEE, pp. 7653–7660.

[2] **Zhang, Y.**, Falque, R., Zhao, L., Huang, S., Hu, B. (2020). Deep learning assisted automatic intra-operative 3d aortic deformation reconstruction, *In International Conference on Medical Image Computing and Computer-assisted Intervention (MICCAI)*. Springer, pp. 660–669.

[3] **Zhang, Y.**, Zhao, L., Huang, S. (2020). Aortic 3d deformation reconstruction using 2d x-ray fluoroscopy and 3d pre-operative data for endovascular interventions, *In 2020 IEEE International Conference on Robotics and Automation (ICRA)*. IEEE, pp. 2393–2399.

[4] Chen, Y., Zhao, L., **Zhang, Y.**, Huang, S. (2020). Dense isometric non-rigid shape-from-motion based on graph optimization and edge selection. *IEEE Robotics and Automation Letters*, 5(4), pp. 2377–2376.

[5] Chen, Y., Zhao, L., **Zhang, Y.**, Huang, S., Dissanayake G. (2020). Anchor selection for SLAM based on graph topology and sub-modular optimization, *IEEE Transactions on Robotics*, accepted.

[6] **Zhang, Y.**, Zhang, T., Huang, S. (2018). Comparison of EKF based SLAM and optimization based SLAM algorithms, *In 13th IEEE Conference on Industrial Electronics and Applications (ICIEA)*. IEEE, 2018, pp. 1308–1313.

Under Reviewing:

[1] **Zhang, Y.**, Falque, R., Zhao, L., Chen, Y., Huang, S., Li, H. (2021). Structure-to-Shape Aortic 3D Deformation Reconstruction for Endovascular Interventions, *submitted to IEEE Transactions on Robotics*

Under Writing:

- [1] **Zhang, Y.**, Falque, R., Zhao, L., Huang, S., Chen, Y. (2021). 3D Intra-articular Dense Reconstruction from Arthroscopic Images.
- [2] Chen, Y., **Zhang, Y.**, Parashar S. Zhao, L., Huang, S. (2021). Isometric/Conformal NRSfM via Differential Geometry with recoverable conformal scale.

Internship and Visiting

Australian National University

COLLEGE OF ENGINEERING & COMPUTER SCIENCE

Eight months visit to [Prof. Hongdong Li](#).

Canberra, Australia

Apr. 2021 - Dec. 2021

Zhejiang University

STATE KEY LABORATORY OF INDUSTRIAL CONTROL TECHNOLOGY

Short time visit to [Prof. Rong Xiong](#).

Hangzhou, China

Apr. 2019

Brief Introduction to My Research

Aortic 3D Deformation Reconstruction: This research studies the techniques to recover aortic 3D shape from a pre-operative model and multiple intra-operative X-ray fluoroscopic images. The deformation field is formulated based on embedded deformation graph and is solved according to the vessel's contour pixels from each image (ICRA2020). The selection of vessel's silhouette is based on a UNet neural network architecture and the vertex-pixel correspondence is based on modified SDFs (MICCAI2020). Currently, we are improving the reconstruction accuracy by introducing vessel's centreline information. Besides, working with Prof. Hongdong Li, we are also developing a new aortic reconstruction framework using deep learning techniques, e.g., graph convolutional networks.

Dense Reconstruction from Arthroscopic Images: This research studies the problem to reconstruct the joint inner surface from a sequence of arthroscopic images. A self-supervised CNN is used for monocular depth prediction, and a local-to-global SLAM pipeline is deployed for the dense reconstruction.

Cross-View Geo-Localization for Autonomous Driving: This research studies the problem of localizing a vehicle in a satellite image using the on-board cameras. This is important but very challenging for autonomous driving due to the domain difference between the ground-view images and the satellite images. This is the project I will focus on during my Research Fellow at ANU. Working with Prof. Hongdong Li, we will investigate the state-of-the-art deep learning methods for this task.

Professional Activity

Reviewer:

- IEEE International Conference on Robotics and Automation (ICRA) 2020, 2021
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2020, 2021

Project:

- Research assistant for Development of Precision Localisation Technology for a Mobile Platform 2018-2019
Operating in Industrial Environment. (Industrial project)
- Visual Simultaneous Localisation and Mapping in Deformable Environments. (ARC Project) 2020-2021

Teaching:

- Tutor for UTS 49274 Advanced Robotics Spring (49274-2018-SPRING-CITY) 2018
- Tutor for 2021 IEEE RAS Winter School on SLAM in Deformable Environments 2021

Skill

Language:

- English (Regular Practice)
- Mandarin (Native Speaker)

Software and Programming:

- Matlab, Python, C++, CUDA, Ubuntu Linux, Latex, Microsoft Office

Award

- Northeastern University Outstanding Student 2011-2012
- First prize in the CUMCM (China Undergraduate Mathematical Contest in Modeling) 2012
- Northeastern University Excellent student for Volunteer Work 2012
- Northeastern University Triple-A Postgraduate Student 2014-2015
- Northeastern University First Prize Scholarship twice, Second Prize Scholarship twice, Third Prize Scholarship four times. 2011-2016
- UTS Vice-Chancellor's Postgraduate Research Students Conference Fund 2020
- UTS FEIT PhD Post-Thesis Scholarship Award 2021

Referee

A/Prof. Shoudong Huang

DEPUTY DIRECTOR (RESEARCH) OF CENTRE FOR AUTONOMOUS SYSTEMS, UNIVERSITY OF TECHNOLOGY SYDNEY

✉ Shoudong.Huang@uts.edu.au

Dr. Liang Zhao

SENIOR LECTURER, CORE MEMBER OF CENTRE FOR AUTONOMOUS SYSTEMS, UNIVERSITY OF TECHNOLOGY SYDNEY

✉ Liang.Zhao@uts.edu.au

Prof. Hongdong Li

TENURED PROFESSOR WITH THE COMPUTER VISION GROUP OF AUSTRALIAN NATIONAL UNIVERSITY. CHIEF INVESTIGATOR FOR THE AUSTRALIA ARC CENTRE OF EXCELLENCE FOR ROBOTIC VISION (ACRV).

✉ Hongdong.Li@anu.edu.au