

# Heng YU

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## EDUCATION

**Robotics Institute, School of Computer Science, Carnegie Mellon University** *Aug.2021 – present*

- MS in Robotics, Major GPA: 4.25/4.33

**School of Information Science and Technology, Tsinghua University** *Aug.2014 – Jul.2018*

- BE in Automation Department, Major GPA: 3.8/4.0 (top 10%), class ranking: 1/24

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## RESEARCH EXPERIENCES

**Computational Behavior Lab, Robotics Institute, Carnegie Mellon University** *Nov.2021 – present*

Research Assistant, Advisor: Prof. Laszlo Jeni

- Focus: neural implicit representations for 3D scenes and controllable neural rendering for avatar animation
- Proposed a fully automatic controllable neural representation for face self-portraits and the paper was accepted by FG 2023.
- Proposed the Dynamic Light Field Network method that can handle non-rigid deformations and outperform state-of-the-art methods in terms of visual fidelity and compute complexity. The paper has been submitted to CVPR 2023.

**Martinos Center for Biomedical Imaging, Harvard-MIT** *Feb.2020 – present*

Research Assistant, Advisor: Prof. Berkin Bilgic, Prof. Kawin Setsompop

- Focus: fast robust scan-specific MRI reconstruction
- Proposed eRAKI method which achieved more than 10-fold improvement in training and reconstruction speed than state-of-the-art scan-specific methods, while retaining high-quality reconstruction at high accelerations. The abstract has been published by ISMRM 2021 as an oral presentation.
- Proposed a parallel network framework and introduce an attention mechanism to improve subspace-based zero-shot self-supervised learning and enable higher acceleration factors. This abstract has been submitted to ISMRM 2023.

**Li Lab, Department of Radiation Oncology, Stanford University** *Nov.2018 – Jan.2020*

Research Assistant, Advisor: Prof. Ruijiang Li

- Focus: clinical-level AI system for diagnosis and treatment evaluation of rectal cancer
- Implemented a novel convolutional neural network structure, S-Net, to predict the survival risk of gastric cancer patients and the paper has been published by Annals of Surgery.
- Implemented a deep learning model to predict lymph node metastases at 12 locations in gastric cancer patients and the paper has been published by British Journal of Surgery.
- Implemented a novel multi-task 3D network to predict the nCRT response and improved the accuracy from 76.0% to 85.9%. It was the first deep learning method using two-stage 3D MRI images and the paper has been published by Nature Communications.

**KLab, Robotics Institute, Carnegie Mellon University** *Jul.2017 – Sep.2017*

Summer Intern, Advisor: Prof. Kris Kitani

- Focus: real-time robust pedestrian detection for body-worn smartphones
- Studied pedestrian detection algorithms on mobile phones and proposed a novel network, which improved pedestrian detection accuracy from 50.9% to 74.3% with 17 fps on mobile devices. The paper has been published by WACV 2018.
- Completed the mobile app for pedestrian detection which could run on iPhone with detection results and audio speech using CoreML. This could be used to help blind people navigate along with Prof. Kris Kitani's platform NavCog.

**Intelligent Vision Group, Department of Automation, Tsinghua University** *Sep.2016 – Feb.2018*

Research Assistant, Advisor: Prof. Jie Zhou, Prof. Jianjiang Feng

- Focus: medical image segmentation and substance detection in the left atrial appendage
- Proposed an approach using optical flow and clustering methods that detected substances in the left atrial appendage by spatiotemporal motion analysis. The paper has been published by MICCAI workshop 2017 as an oral presentation.

- Proposed a precise and non-invasive modeling method of left atrial appendage neck based on the segmentation result of the maximal volume phase from CT data and performed tests in 67 occlusion surgeries with a success rate of 97.01%. The paper has been published by MICCAI workshop 2017.

## RESEARCH INTEREST

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- MRI Reconstruction and Medical Image Analysis
- Computer Vision
- AI for Healthcare

## WORK EXPERIENCES

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### Fujitsu Research of America, Inc., Sunnyvale

May.2022 – Aug.2022

Research Intern, Collaborator: Dr. Koichiro Niinuma

- Research on controllable neural radiance fields for face avatars
- Developed the anatomically correct neural avatars system and the patent is pending.

### Sangfor Technologies Inc., Shenzhen

May.2021 – Aug.2021

Machine Learning Engineer, Collaborator: Dr. Cheng Chi

- Work on evading web application firewalls with reinforcement learning
- Improved PPO algorithm using action mask technique and applied it to generate adversarial payloads to bypass the firewall.
- Found 11 bypass modes and more than 1000 bypass payload samples, which greatly helped improve the robustness of the company firewall product.

### Tsingh Technology Co., Ltd, Beijing

Jul.2018 – Apr 2021

Co-founder and Machine Learning Engineer, Collaborator: Dr. Baohua Chen, Dr. Lei Deng

- Work on AI algorithms for smart logistics
- Developed an automated warehousing system and deployed it to more than ten factories and reduced labor costs by more than \$1 million per year.
- Developed the first fully automatic boarding bridge system in China.

### Nebula Link Technology, Beijing

Feb.2018 – Jun 2018

Research Intern, Collaborator: Dr. Yizhi Wang, Dr. Mengkai Shi

- Work on vehicle detection and traffic parameter calculation
- Proposed a deep learning model with a frame difference method to calculate the speed and the distance of targets in real-time based on a fixed monocular camera, as well as improving vehicle detection performance. This paper has been published by CICTP 2019.

## SELECTED PUBLICATIONS AND MANUSCRIPTS († REFERS TO CO-FIRST AUTHOR)

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- **H. Yu**, J. Julin, Z. Milacski, K. Niinuma, L. Jeni. *DyLiN: Making Light Field Networks Dynamic*. Submitted to **CVPR 2023**
- **H. Yu**, Y. Arefeen, B. Bilgic. *SubZero: Subspace Zero-Shot MRI Reconstruction*. Submitted to **ISMRM 2023**
- **H. Yu**, K. Niinuma, L. Jeni. *CoNFies: Controllable Neural Face Avatars*. **FG 2023 Best Paper Candidate**
- W. Song, **H. Yu**, J. Wu. *Non-pooling Network for medical image segmentation*. **MICAD 2022 Best Paper Award**
- **H. Yu**, D. Fan, W. Song. *GPU-Net: Lightweight U-Net with more diverse features*. **MIUA 2022**
- Y. Arefeen, O. Beker, J. Cho, **H. Yu**, E. Adalsteinsson, B. Bilgic. *Scan-specific artifact reduction in k-space (SPARK) neural networks synergize with physics-based reconstruction to accelerate MRI*. **Magnetic Resonance in Medicine**, 2022
- **H. Yu**, Z. Dong, Y. Arefeen, C. Liao, K. Setsompop, B. Bilgic. *eRAKI: Fast Robust Artificial neural networks for K-space Interpolation (RAKI) with Coil Combination and Joint Reconstruction*. **ISMRM 2021 Oral**
- C. Jin<sup>†</sup>, **H. Yu**<sup>†</sup>, J. Ke<sup>†</sup>, P. Ding<sup>†</sup>, Y. Yi, X. Jiang, X. Duan, J. Tang, D. Chang, X. Wu, F. Gao, R. Li. *Predicting Treatment Response from Longitudinal Images using Multi-task Deep Learning*. **Nature Communications**, 2021
- **H. Yu**, X. Feng, Z. Wang, H. Sun. *MixModule: Mixed CNN Kernel Module for Medical Image Segmentation*. **ISBI 2020**
- Y. Jiang<sup>†</sup>, C. Jin<sup>†</sup>, **H. Yu**<sup>†</sup>, J. Wu<sup>†</sup>, C. Chen, Q. Yuan, W. Huang, Y. Hu, Y. Xu, Z. Zhou, G. Fisher Jr, G. Li, R. Li.

*Development and Validation of a Deep Learning CT Signature to Predict Survival and Chemotherapy Benefit in Gastric Cancer: A Multicenter, Retrospective Study. Annals of Surgery*, 2020

- C. Jin<sup>†</sup>, Y. Jiang<sup>†</sup>, **H. Yu<sup>†</sup>**, W. Wang, B. Li, C. Chen, Q. Yuan, Y. Hu, Y. Xu, Z. Zhou, G. Li, R. Li. *Deep Learning Analysis of the Primary Tumour and the Prediction of Lymph Node Metastases in Gastric Cancer. British Journal of Surgery*, 2020
- **H. Yu**, E. Ohn-Bar, D. Yoo, K. Kitani. *SmartPartNet: Part-Informed Person Detection for Body-Worn Smartphones. WACV* 2018
- C. Jin, J. Feng, L. Wang, **H. Yu**, J. Liu, J. Lu, J. Zhou. *Left atrial appendage segmentation using fully convolutional neural networks and modified three-dimensional conditional random fields. IEEE Journal of Biomedical and Health Informatics*, 2018
- C. Jin, **H. Yu**, J. Feng, L. Wang, J. Lu, J. Zhou. *Detection of Substances in the Left Atrial Appendage by Spatiotemporal Motion Analysis Based on 4D-CT. MICCAI workshop 2017 Oral*
- C. Jin, **H. Yu**, J. Feng, L. Wang, J. Lu, J. Zhou. *Left Atrial Appendage Neck Modeling for Closure Surgery. MICCAI workshop 2017*

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## US PATENTS

**Heng Yu**, Koichiro Niinuma, Laszlo A Jeni. Anatomically Correct Neural Avatars. (pending)

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## AWARDS

Gold Medal at the 8th China International College Students' 'Internet+' Innovation and Entrepreneurship Competition 2022

Honorable Mention in Mathematical Contest in Modeling 2017

Academic Scholarship in Automation Department, Tsinghua University 2016, 2017 (30/150)

National Encouragement Scholarship 2015, 2016, 2017 (5/150)

The "HAGE" Scholarship in Automation Department, Tsinghua University 2015, 2016, 2017

Social Service Scholarship in Automation Department, Tsinghua University 2015 (8/150)

Outstanding Volunteers Award in Tsinghua University 2014

Tsinghua talented student program 2014 (1/13,000)

First Prize in Chinese Chemistry Olympiad (Provincial Competition Area) 2013

Second Prize in Chinese Mathematics Olympiad (Provincial Competition Area) 2012, 2013

Second Prize in Chinese Biology Olympiad (Provincial Competition Area) 2013

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## SKILLS

Programming Languages: Python, Matlab, C/C++, and basic familiarity with R.

Operating System: Linux (Ubuntu, Fedora, CentOS), MacOS, Windows.

Frameworks and Tools: PyTorch Tensorflow, Keras, MXNet.

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## RELEVANT COURSEWORK

Signals and System Analysis (98/100), Process Control (98/100), Fundamentals of Engineering Graphics (98/100), C++ Programming Language (93/100), Complex Analysis (97/100), Data Structures (94/100), Interdisciplinary Research and Practice (95/100), Probability and Statistics (94/100), Computer Networks and Applications (93/100), Machine Learning\* (A+/A+), Computer Vision\* (A+/A+), Learning for 3D Vision\* (A+/A+), Math Fundamentals for Robotics\* (A/A).

\* indicates graduate courses