Zhuohong (Zooey) He

2214 Schott Ct.
Santa Clara, CA 95054

✉ zhe17@jhu.edu
📞 +1 (610) 969-8391
🏠 zooeyhe.com

EDUCATION

Johns Hopkins University   Sept 2020 - May 2021
M.S.E in Robotics, specialized in Perception & Cognitive Systems   Baltimore, MD
Research Advised By: Russell H. Taylor, Gregory Hager

Johns Hopkins University   Sept 2016 - May 2020
B.S. in Mechanical Engineering, minor in Computer Science   Baltimore, MD
Graduated with Departmental Honors

RESEARCH EXPERIENCE

Intuitive Surgical, Future Forward Research   July 2021 - Present
Computer Vision Research Engineer – Advisor: Omid Mohareri   Sunnyvale, CA
❖ Intelligent Operating Room Analytics
  - Building computer vision models to analyze operating room videos to understand surgical workflow.
  - *Video Understanding:* Researched state-of-the-art (attention & conv) models for activity recognition in OR videos. Explored models' performances on medical datasets and developed adaptation techniques for new ORs. My first author paper on this work was published in **ML4H** with SOTA results on OR-AR and Cholec80**.**
  - *Multiview Video Understanding:* Developed models to fuse multiple video viewpoints for predictions which are robust against occlusions. Also researched models for 3D point cloud registration and understanding.
  - *Deployment:* Built software packages powered by top video models to generate key OR workflow metrics for the end user and pseudo-labels to reduce human annotation time by 60%.
  - *Data:* Reduced the database size by 90% through compression and extraction packages. Responsible for all aspects of data collection hardware & processing pipeline.

JHU Computational Interaction and Robotics Laboratory (CIRL)   Dec 2020 - June 2021
Research Assistant – Advisor: Gregory D. Hager   Baltimore, MD
❖ Robot Block Stacking with Natural Language Input
  - Developed reinforcement learning methods to learn robot-arm block-stacking task with language commands.
  - Trained a DenseNet + Transformer model end-to-end to learn the stacking policy. Worked on model building, reward shaping, and simulated training.
  - Publication at **CoRL.**

JHU Computer Integrated Interventional Systems Laboratory (CIIS)   Jan 2020 - June 2021
Research Assistant – Advisor: Russell H. Taylor   Baltimore, MD
❖ Mosquito Microdissection Robot
  - Developed software control for a robot which automates mosquito dissection for malaria vaccine production.
  - Implemented low & high level logic in Python/C++ to operate the robot with error recovery and parallelization.
  - Built a ROS RVIZ simulation to mimic the physical robot and created an interface which allows remote testing and debugging of the robot control and vision packages. Developed a Qt GUI for manual commands.
  - One publication at **ICRA** and one at **CASE.**

PUBLICATIONS

[1] **An Empirical Study on Activity Recognition in Long Surgical Videos**
He, Z., Mottaghi, A., Sharghi, A., Jamal, M. A., & Mohareri, O. *Machine Learning for Health Symposium (**ML4H**),* 2022.
[Link]

[2] **Guiding Multi-Step Rearrangement Tasks with Natural Language Instructions**
Stengel-Eskin, E., Hundt, A., **He, Z**., Aditya, M., Gopalan, N., Gombolay, M., & Hager, G. *Conference on Robot Learning (**CoRL**)*. 2021. [Link]

[3] **Progress in Development of an Automated Mosquito Salivary Gland Extractor: A Step Forward to Malaria Vaccine Mass Production**
Li, W., Zhang, Z., **He, Z.**, Vora, P., Lai, A., Vagvolgyi, B., Leonard, S., Goodridge, A., Iordachita, I., Chakravarty, S., Sim, K., Hoffman, S., & Taylor, R. *International Conference on Automation Science and Engineering (**CASE**)*. 2021. [Link]

[4] **Automated Mosquito Salivary Gland Extractor for PfSPZ-based Malaria Vaccine Production**
Li, W., **He, Z.**, Vora, P., Wang, Y., Vagvolgyi, B., Leonard, S., Goodridge, A., Iordachita, I., Hoffman, S., Chakravarty, S., & Taylor, R. *International Conference on Robotics and Automation (**ICRA**)*. 2021. [Link]

INDUSTRY EXPERIENCE

Bosch Security Systems   May 2019 - May 2020
Robotics Engineering Intern, Senior Design Project   Lancaster, PA
❖ Parallel Robot Project
   ▪ Built a 6-DoF parallel manipulator (Stewart Platform) to simulate wind-induced shaking on outdoor cameras.
   ▪ Programmed Raspberry Pi to handle touchscreen commands and perform path planning. Programmed Arduino for inverse kinematic control and low-level motor control loops.
   ▪ Wrote an optimization code to obtain mechanical dimensions for ideal robot dynamics & kinematics.
   ▪ Designed and assembled all electro-mechanical components.

Volvo Trucks   May 2018 - Aug 2018
Automation Engineering Intern   Macungie, PA
❖ TRACE Workflow Monitoring
   ▪ Developed an original IoT project using a motorized camera to monitor trucks flow through repair stalls.
   ▪ Programmed algorithms to follow vehicles using a camera on servos to identify vehicles by QR code (OpenCV). Developed an UI (JavaFX), linked data to cloud (MS Azure), and performed analytics (AWS).
   ▪ Hardware: Interfaced with a Raspberry Pi, camera, LIDAR sensor, several servos, and touchscreen
   ▪ Presented to hundreds of Volvo employees, directors, and VPs in an innovation showcase. Project featured in company-wide newspaper and lauded by Senior Management.

OTHER EXPERIENCE

TEACHING

❖ **Teaching Assistant** at Johns Hopkins University   2020
   Robot Dynamics, Kinematics, Devices, and Control (EN.530.646)
   Graduate level course, 30 students (Instructor: Jin Seob Kim)
❖ **Teaching Assistant** at Johns Hopkins University   2019
   General Physics I, Mechanics (EN.171.103)
   Undergraduate level course, 60 students (Instructor: Dan Reich)
❖ **Teaching Assistant** at Johns Hopkins University   2017 – 2019
   General Physics II, E&M (EN.171.108)
   Undergraduate level course, 60 students (Instructor: Petar Maksimovic)
❖ **Head Teacher** at Northampton Community College   2015 - 2016
   Mathcounts (Competition Math) Course
   Middle school level course, 15 students

PROJECTS

Multi-Task Learning for Monocular Depth Estimation   Sept 2020 - Dec 2020
❖ By simultaneously training with instance segmentation, we improved the performance of monocular depth estimation compared to a state-of-the-art model on the KITTI360 self-driving dataset.

Remote Exam Cheating Detection   Sept 2020 - Dec 2020
❖ Developed a software package to detect cheating through the webcam videos of remote test-takers. We used Eigenfaces for identification; and facial key points + pupil tracking to estimate gaze and measure attention.

STANDARDIZED TESTS

▪ GRE: Verbal 164/170, Math 167/170, Writing 4.5/6.0
▪ SAT: Reading 730/800, Math 800/800, Writing 750/800, Essay 9/12