Lingze Zeng

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RESEARCH INTERESTS

My primary research focus centers on cultivating a human-centric interaction between AI and cyber-physical systems, with a particular emphasis on leveraging reinforcement learning and deep learning methodologies. I am dedicated to continuously advancing my comprehension across a wide spectrum of domains, encompassing but not confined to 1). Human-AI interaction, 2). Human-robotic interaction(reinforcement learning, multi-agent systems), 3). AI for Social Good in Autonomous Systems

EDUCATION

ME, Computer Engineering *School of Engineering and Applied Science* Expected December 2023
University of Virginia GPA: 3.9/4.0

BS, Computer Engineering *Department of Electrical and Computer Engineering* December 2021
Virginia Tech GPA: 3.3/4

RESEARCH EXPERIENCE

University of Virginia | *Research Assistant* Aug 2023 - Present

- Develop a dataset within the 'Virtualhome' environment, a 3D simulation platform created using the Unity Engine, featuring human-like agent action steps with partial observation
- Implement a hierarchical planning approach for the decomposition of the ultimate objective into subgoals
- Utilize particle filter methodology for agent decision-making, enabling the generation of subsequent action steps

Advisor: Dr. Yen-Ling Kuo, Assistant Professor, Department of Computer Science, University of Virginia

Institute of Automation, Chinese Academy of Science | *Research Assistant* Feb 2022 - June 2023

- Designed, constructed, and configured a 3D virtual competition arena using the Unity Engine for the 2022 COG Robo-Master Sim2Real Challenge
- Added external(sliding and rolling) and internal (Mecanum wheel) friction and PID algorithm to the virtual arena
- Incorporated both external (sliding and rolling) and internal (Mecanum wheel) friction models, along with a PID algorithm, to enhance the functionality of the virtual arena
- Created a Python API package to facilitate the invocation of functions and facilitate communication with the virtual arena
- Established a multi-threaded testing environment in Python, designed to engage participants in data collection and code testing challenges

Advisor: Dr. Dongbin Zhao, Professor, Insitute of Automation, Chinese Academy of Sciences

Virginia Tech | *Research Assistant* June 2021 - Aug 2021

- Conceived and executed a 3D module within the Unity Engine for a Rize 3D printer, integrated with server data to create a real-world simulation environment
- Implemented server and client components, leveraging a RESTful API in Python, to enable the transmission and reception of machine status data between a Raspberry Pi server and connected devices
- Preprocessed self-collected image data with OpenCV in Python and contributed to building a machine learning model with transfer learning ResNet50 for a human detection system aimed at mitigating risks associated with close proximity to working machinery or assembly lines

Advisor: Dr. James Kong, Professor, Grado Department of Industrial and Systems Engineering, Virginia Tech

Virginia Tech | *Research Assistant* Sep 2020 - May 2021

- Developed software for MSP432P401R microcontroller„ enabling the acquisition of data from a pressure sensor via ADC and providing real-time visualization of pressure variations on an LCD screen by means of dynamic color changes
- Collaborated with my team to synchronize PCB design efforts, ensuring smooth project advancement and successful outcomes

Advisor: Dr. Dong S. Ha, Professor, Department of Electrical and Computer Engineering, Virginia Tech

RELEVANT IN-COURSE PROJECT EXPERIENCES

Handheld Game System Design | *Advanced Embedded System Design* Jan 2023 - May 2023

- Innovated a novel LCD driver to mitigate the issue of recurrent screen flashing during image uploads on the LCD display.
- Developed deadlock prevention mechanism for the multi-threading Real-Time Operating System (RTOS) to enhance system reliability and performance

Autonomous Pet Feeder | *Autonomous Mobile Robots* Aug 2022 - Dec 2022

- Integrated a Proportional-Integral-Derivative (PID) controller into the robotic system using Rospy, enabling precise navigation with 'Go to goal' actions
- Developed an object trajectory prediction algorithm by harnessing the combined capabilities of LIDAR and RGB camera sensors
- Developed an obstacle-avoidance algorithm leveraging LIDAR sensor data

Attention U-Net Reproduction | *Machine Learning Image Analysis* Aug 2022 - Dec 2022

- Recreated the Attention U-Net network using PyTorch to execute image segmentation tasks on cardiac data
- Executed image augmentation and data preprocessing through the utilization of the Pillow library
- Achieved 93% accuracy from the final model in dice score methodology

Remote Controlled Rover | *Embedded System Design* Aug 2022 - Dec 2022

- Constructed and programmed a robotic arm utilizing C to establish communication with a rover using the MQTT protocol
- Developed a multi-threaded program in C, enabling concurrent operation of the robotic arm, real-time communication with the core system, and seamless data transfer with other modules

INDUSTRIAL EXPERIENCE

Software Engineering Intern | *Delaware Diagnostic Labs* May 2023 - Aug 2023

- Conducted processing of raw insurance card images through techniques such as rectangle detection and Optical Character Recognition (OCR) to extract essential features
- Developed a machine learning model utilizing the Random Forest algorithm to classify identical images of insurance cards originating from different companies
- Integrated the model into an iOS application, facilitating real-time company classification and keyword extraction from insurance card images

TECHNICAL SKILLS

Languages: | *Python, C/C++/C#, MATLAB, Verilog, LATEX, Swift*

Packages: | *Tensorflow, PyTorch, RESTful API, Rospy*

Others: | *Git, Unity Engine*