ISHAN CHADHA

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EDUCATION

MS Computer Science - Georgia Institute of Technology January 2023 - May 2024
Specialization - Robotics and Perception; Thesis Option *GPA* - 4.0;
Teaching Assistant - Artificial Intelligence

BS Computer Science - Georgia Institute of Technology August 2019 - May 2022
Specialization - Intelligence and Devices; Research Option; *GPA* - 3.9
Teaching Assistant - Intro to Robotics, Algorithms II, Discrete Math

PROFESSIONAL EXPERIENCE

Relativity Space ROBOTICS ENGINEERING INTERN

CLOSED-LOOP CONTROL June 2023 - August 2023
- Mounted laser profilometers to KUKA robot end effector and scanned rocket barrel being welded in real-time.
- Computed weld layer height/thickness during print with RANSAC and HMM to segment point cloud.
- Matched scan features over time to create mesh, and graph neural network to simulate mesh as part deforms.
- Tuned PID for weld tool position control, and started model-based reinforcement learning control.
- Collaborated with other teams to build edge-case paths for unit testing of control algorithms.
- Developed shared memory communication between real-time kernel, ROS nodes, and React UI to allow welders and print operators to easily interface with control algorithms.

SENSOR INTEGRATION September 2022 - December 2022
- Benchmarked IMU and Motion Capture sensor for KUKA robot position tracking and adjusting robot path.
- Developed PID position control based on sensor input, and direct collocation for trajectory correction.
- Constructed industrial communication between sensors and robots with EtherCAT and DDS middleware.

Capital One

TRAVEL CARD ANALYTICS TEAM June 2022 - August 2022
- Enabled real-time personalization for travel card users by consuming and analyzing data from Kafka topic.
- Reduced user segmentation latency from 24 hours to 5 ms with write-back cache using AWS DynamoDB.

VOICE ASSISTANT NLP TEAM June 2021 - August 2021
- Designed search architecture for voice responses in graph database, bringing search time from 2 sec to 50 ms.
- Collaborated with ML team to improve CharCNN and speed up semantic search tokenization by 88%.

RESEARCH EXPERIENCE

Surgical Robotics - Biomedical Mechatronics Lab August 2022 - Present
- Developing position-based visual-servoing control of continuum robots to automate colonoscopy.
- Testing graphics-based approaches such as NeRF for accurate feature analysis.
- Implemented photometric depth map construction of colon based on previous work as baseline.

Sign Language Translation - Contextual Computing Group January 2020 - Present
- Helped deaf children acquire language skills with video game using computer vision/NLP.
- Published in CHI '21 Extended Abstracts.
- Undergraduate thesis for visualization of feature selection process for HMMs.
- Currently working on adaptation of old Hidden Markov Models to new users of system.
- Compared segmentally-boosted HMMs to Transformers with multi-head attention.

PROJECT EXPERIENCE

Automatic Differentiation In Progress

Creating automatic differentiaion engine to better grasp deep learning and optimization frameworks, particularly the Ceres solver used for my previous photometric reconstruction project.

Photometric 3D Reconstruction Paper Implementation April 2023

Open sourced implementation of paper on photometric 3D reconstruction of the colon as baseline for research. Stereo cameras are often too large to fit into medical environments, so by modeling the simplified light distribution from a monocular camera, a depth map can be constructed for Visual SLAM.

Robot Planning in Dynamic Environments April 2022

Developed and simulated novel robot path planning algorithm, called Field-aided RRT*, to navigate partially observable environments. Outperformed state-of-the-art RRT-X in heavily clustered environments.

Teleoperated Robotic Hand March 2022

3D-printed robotic hand and forearm. Utilized glove with flex sensors, Arduino, and communication/control programs to teleoperate fingers/wrist motors. Worked with Georgia Tech's BrainLab to control motors with brain waves.

ML Stock Forecasting April 2021

Performed sentiment analysis using natural language model BERT, trained on webscraped news from Reuters. Anomaly detection used self-organizing map with swarm optimization instead of gradient descent for faster training.

TECHNICAL SKILLS

Languages: C++, Python, C, SQL, Java, Bash, TypeScript, HTML/CSS
Libraries: ROS, PyTorch, TensorFlow, OpenCV, Eigen, Gazebo, Django, React
Prototyping: Raspberry Pi, VHDL, FPGA, Raspberry Pi, Soldering, 3D Printing, Fusion 360
CI/CD: Git, Docker, Ansible, Jenkins

AWARDS

- 1st Place Georgia Tech Research Symposium (2022)
- 1st Place CHI Student Research Competition (2021)
- President's Undergraduate Research Award (2021)
- Dean's List/Faculty Honors (2019-2022)