

Marco Conati

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EDUCATION

University of Michigan

M.S. Robotics, GPA: 4.0

Ann Arbor, MI

Aug. 2023 – May 2024

Harvey Mudd College

B.S. Engineering, GPA: 3.81

Claremont, CA

Aug. 2018 – May 2022

TECHNICAL SKILLS

Languages: Python, MATLAB, C++, CUDA, ROS2

Design Tools: Fusion360 CAD, KiCAD, Simulink, LTspice

Development Tools/Platforms: Git, Docker, VS Code, Linux, Raspberry Pi, Arduino, NVIDIA Jetson

Notable Libraries: Pytorch, Huggingface, IPOPT, NumPy, OpenCV

EXPERIENCE

Graduate Research Assistant

September 2023 – Present

ROAHM (Robotic Optimization for Analysis of Human Motion) Lab, University of Michigan

Ann Arbor, MI

- Developed a suction-based grasping system using Python, CUDA, and IPOPT. This approach guarantees safety, specifically no collisions and obeying motor limits, with bounded uncertainty on all masses and inertia.
- Validated the grasping system through Pybullet simulations using the YCB dataset, conducting randomized pick and place tasks with 100% success rate on a variety of objects.
- Performed in-lab hardware demonstrations using the Kinova Gen 3 arm to validate the system's performance.

Systems Test Engineer

June 2022 – August 2023

Trellisware Technologies

San Diego, CA

- Developed an automated topology testbed for stress testing network formation using Python and Visual Basic, allowing simulation of 10k randomized network topologies daily.
- Led the creation of a new frequency pipelining technique, coordinating cross-functional teams across hardware, software, and test engineering. Personally developed lab and field tests for error rates and throughput, and coordinated with other teams to guide updates to the Trellisware radio app and FPGA implementations. This new waveform allowed for 100% more data throughput by communicating in parallel on multiple frequency bands.

Undergraduate Research Assistant

November 2021 – May 2022

Music Information Retrieval Lab, Harvey Mudd College

Claremont, CA

- Pioneered generating Chopin-esque piano scores using Huggingface BERT models and a novel embedding technique for note events.
- Designed and finetuned transformers using Pytorch for next measure prediction and hand compatibility tasks, using their predictions to inform the generation of new pieces.

PROJECTS

Multimodal Misinformation Detection | Python, Llama.cpp, Replicate API, Duckduckgo API

May 2024

- Collaborated with a partner to develop a retrieval-augmented large vision language model system for detecting multimodal misinformation, based on Xuan et. al's *LEMMA* paper.
- Adapted *LEMMA* to exclusively use open-source models, namely LLaVA over GPT4-V, and experimented with finetuning and Chain-of-thought prompting, using prompts from the work in Kovach et. al's *Blur* paper.
- Found that naively swapping GPT4-V for LLaVA severely reduced performance from 82.4% to 52.1% on Twitter misinformation detection, but finetuning and Chain-of-Thought prompting improved performance to 76.5%.

Michigan Botlab | C++, Python, LCM, Raspberry Pi, Jetson Nano

Dec 2023

- Built a differential-drive robot to autonomously navigate and move small boxes using an RGBD camera and LiDAR. Parts were designed and 3D printed using Fusion360.
- Implemented low-level PID motor control on an STM32. Ran high-level path planning with integrated SLAM and A* search algorithms on a Jetson Nano. Communication between the two was done with the LCM library.
- The differential drive robot was able to successfully navigate and map unknown mazes while moving boxes.

ARMLAB project | ROS2, C++, Python, Pytorch

Nov 2023

- Wrote software for controlling the RX200 5-DOF robotic arm. This code involved implementing forward and inverse kinematics solutions for joint angles, along with developing a CNN for block detection. ROS2 was used to manage camera input and arm commands. The full system was able to complete both pick-and-place and stacking tasks.