Jony Chen

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EDUCATION

Columbia University **New York, USA**
Master of Science in Mechanical Engineering with Concentration in Robotics and Control *Aug. 2022 - May 2024*
GPA: 3.96 / 4.00

- Relevant Coursework: *Robot Learning, Applied Robotics, Intro to Robotics, Data Science, Artificial Intelligence, Applied Machine Learning, Intro to Control Theory, Evolutionary Computation and Design Automation, Mechatronics*

The University of New South Wales (UNSW) (No.1 Engineering School in Australia) **Sydney, Australia**
Bachelor of Engineering in Mechanical Engineering (Honors) *Feb. 2017 – May 2022*
Core Courses Average Grade: 85 / 100 (High Distinction)

- Relevant Coursework: *Finite Element Analysis, Computational Fluid Dynamics, Engineering Design, Fracture and Fatigue, Statistics, Mechanics, Automobile Engine Technology, Thermodynamics, Fluid Mechanics, Composites*

SKILLS

Python, PyTorch, ROS2, Robotics Simulation, Real-Time Control Systems, Machine Learning, Neural Networks, Reinforcement Learning, SQL, SolidWorks, Abaqus, Mechanical Design

WORK EXPERIENCE

Live Building Systems **New York, USA**
Data Science and Machine Learning Engineer *Aug. 2024 – Present*

- Developed Python workflow for large dataset extraction, data cleaning, analysis, and visualization.
- Prepared training dataset of millions of water meter reading data points, including information leak prevention and time-based feature engineering.
- Developed a machine learning model with 87% recall in water leak prediction, saving up to 244,596 gallons of water per building per year.
- Developed a CNN model for water meter image classification and achieved 80% accuracy.

Midea **Foshan, China**
Mechanical Structure Engineer Intern *June 2021 – Aug. 2021*

- Designed air-cooling and conduction-cooling systems prototypes for a novel kitchen appliance in a department with a 45% market share in China.
- Prototypes achieved a rapid temperature reduction of 1L of water from 95°C to 18°C within 25 minutes in the actual test.
- Identified a critical issue with 3D-printed evaporators, and redesigned the component, saving 20% of the R&D budget.

PROJECTS

Columbia University **Manhattan, NY**

1. Model Predictive Control (MPC) and Forward Dynamics Learning for a Robotic Arm *Apr. 2024*

- Designed and implemented an MPC algorithm to optimize the robot arm's movements.
- Developed a neural network architecture to predict joint accelerations from current states and actions.
- Leveraged the MPC to obtain training data covering all desired goal positions.
- Integrated the trained model into the MPC framework, enabling optimized control based on learned dynamics.

2. Deep Q-Network Reinforcement Learning for Robotic Arm Control *Apr. 2024*

- Designed and implemented a Q-network using PyTorch from scratch to learn optimal policies for robotic arm control.
- Developed and executed the training loop using an epsilon-greedy policy, gradient clipping, and periodic target network updates.
- Evaluated the trained model's performance on 5 different goal positions, achieving an average reward of -2.99.

3. Behavioral Cloning for Autonomous Navigation Using Machine Learning and Neural Networks *Mar. 2024*

- Developed vision-based robot navigation systems using traditional machine learning and CNNs in PyTorch.
- Implemented PCA for dimensionality reduction and feature normalization to handle a large feature space and small sample size.
- Conducted extensive testing to ensure the model's robustness and ability to generalize to new obstacle maps.

4. Deep Learning Model for the Forward Dynamics of a 3-link Robot Arm *Mar. 2024*

- Developed a DNN model to predict the forward dynamics of a 3-link robotic arm based on data generated from the ground truth model.
- Collected and processed 250000 state-action pairs and resulting new states by simulating the ground truth model as training data.
- Validated the model through rigorous tests, achieving an average MSE of 1.87e-5.

5. Dynamics Engine Development for 2D Kinematic Chain *Dec. 2023*

- Implemented a physics simulator for a 2D kinematic chain using Newton-Euler dynamics and Euler integration on Python.
- Calculated forces, torques, and accelerations for each link based on external inputs and internal constraints.
- Achieved accurate simulation of 1-link, 2-link, and 3-link robotic arms, the simulated arm aligned with the ground truth in the visualization.

6. Rapidly Exploring Random Tree (RRT)-Based Motion Planning for UR5 Robotic Arm *Nov. 2023*

- Developed and implemented an RRT algorithm in Python for collision-free path planning for UR5 Robotic Arm.
- Enhanced the RRT algorithm with path smoothing and resampling techniques to generate optimized and executable joint trajectories.
- Archived a compute and path execution time of 35s in extreme scenarios, validating algorithm robustness.

7. Extended Kalman Filter (EKF) Implementation for Mobile Robot Localization *Nov. 2023*

- Designed and coded the EKF algorithm in Python to predict and update the robot's state based on sensor inputs and the motion model.
- Utilized ROS 2 for real-time data processing and state estimation.
- Archived high localization accuracy in test scenarios, including environments with high sensor noise and close-range landmarks.

8. Cartesian Control and Numerical Inverse Kinematics for Robotic Arms *Oct. 2023*

- Developed real-time cartesian control on ROS 2 for 6 and 7-axis robotic arms, converting desired end-effector movements into joint velocities.
- Developed a numerical inverse kinematics function in Python to compute joint positions for target end-effector poses.
- Validated functionality by testing Cartesian control and inverse kinematics functions on Franka Panda and Universal UR5 and visualized on RVIZ2.