Guanang Su

Preferred Name: **Shirley** Portfolio: xxs90.github.io
Email: guanang.0228@gmail.com / su000265@umn.edu Mobile: +1-540-998-1432

Education

- **University of Minnesota, Twin City** — Minneapolis, MN, USA
  Doctor of Philosophy in Computer Science — *Sep. 2023 - Now*
- **Northeastern University** — Boston, MA, USA
  Master of Science in Robotics — *Sep. 2021 - Jul. 2023*
- **Virginia Polytechnic Institute and State University** — Blacksburg, VA, USA
  Bachelor of Science in Computer Engineering — *Aug. 2016 - May 2021*

  Major: *Controls, Robotics, and Autonomy* ***Minor:*** *Mathematics & Biomedical Engineering*

Research Experience

- **Robot Manipulation - Robotics: Perception and Manipulation (RPM) Lab** — University of Minnesota
  Research Assistant - Supervised by Prof. Karthik Desingh — *Aug. 2023 - Now*
  - **Pre-trained Learning for Environment Awareness**
  - **High-precision Bimanual Manipulation Tasks**
- **Robot Learning in Manipulation - The Helping Hands Lab** — Northeastern University
  Research Assistant - Supervised by Prof. Robert Platt — *Nov. 2021 - Jul. 2023*
  - **Sample Efficient Equivariant Reinforcement Learning** (Link)
    - Designed collision detection and avoidance algorithm for robot arm in Python.
    - Implemented and tested a sample-efficient equivariant grasp learning algorithm on a robot arm platform.
  - **Imitation Learning** (Link)
    - Developed simulation learning environments for robot manipulation using PyBullet.
    - Conducted real-world robot imitation learning experiments for solving household tasks on UR5 with ROS.

Work Experience

- **DJI** — Shenzhen, China
  R & D Engineer Intern., Robomaster Research and Development Center — *Jun. 2019 - Aug. 2019*
  - **Overall Duties:** Designed a new missile launching robot, with missiles, launcher, and launch silo components, which was used to substantiate new rules for the 2020 DJI Robomaster competition.
  - **Mechanical Design:** Designed missile airfoils and supplied fringes with flow simulation and aerodynamic analysis.
  - **Control System and Embedded Software Design**
    - Engineered a PID-based feedback controller for missiles and achieved agile control and precise landing performance.
    - Developed a basic embedded framework for missiles using C with Keil's embedded development tool.
    - Designed internal programs for missiles to achieve auto-targeting at a distance of 20-30m with OpenCV.
- **Changchun Surveying and Mapping Institute** — Changchun, China
  Technician Intern., Smart City Department — *May 2017 - Aug. 2017*
  - **Overall Duties:** Assisted in constructing Changchun City Cloud Platform for intelligent city service, an intelligent network of connected objects and machines that transmit data using wireless technology and the cloud.
  - Processed collected data from sensors and cameras in Urban areas, and carried out UI and content designUsed Arcgis with Python to collect, clean, process and store data.
  - Connected traffic lights receive data from sensors and cars adjusting light cadence and timing to respond to real-time traffic, significantly reducing road congestion in morning and evening peaks.

Teaching Experience

Algorithms and Data Structures, CSCI 4041 — Teaching Assistant, 2024
Elementary Computational Linear Algebra, CSCI 2033 — Teaching Assistant, 2024
Pattern Recognition and Computer Vision, CS5330 — Teaching Assistant, 2023
Reinforcement Learning and Sequential Decision Making, CS4180/5180 — Teaching Assistant, 2022

Publications

- Mingxi Jia*, Dian Wang*, **Guanang Su**, David Klee, Xupeng Zhu, Robin Walters, Robert Platt. *SEIL: Simulation-augmented Equivariant Imitation Learning.(Link)* **2023 IEEE International Conference on Robotics and Automation (ICRA)**. (Also presented in **Workshop on Sim-to-Real Robot Learning**, CoRL 2022.)
- Xupeng Zhu, Dian Wang, **Guanang Su**, Ondrej Biza, Robin Walters, Robert Platt. *On Robot Grasp Learning Using Equivariant Models. (Link)* **Autonomous Robots Journal 2023**, 04 July 2023.
- Xupeng Zhu, Dian Wang, Ondrej Biza, **Guanang Su**, Robin Walters, Robert Platt. *Sample Efficient Grasp Learning Using Equivariant Models.(Link)* **Robotics: Science and Systems XVIII (RSS 2022)**. (Also presented in **RLDM 2022** & **Workshop on Scaling Robot Learning**, ICRA 2022.)
- Dian Wang, Xupeng Zhu, Jung Yeon Park, Mingxi Jia, **Guanang Su**, Robert Platt, Robin Walters*A General Theory of Correct, Incorrect, and Extrinsic Equivariance. (Link)* **Advances in Neural Information Processing Systems 36 (NeurIPS 2023)**.

Activities

- **Shark Genus Identification from Images - SharkPulse** — Virginia Tech
  Undergraduate Research - Supervised by Prof. Edward Fox and Prof. Francesco Ferretti — *Jan. 2021 - Jun. 2021*
  - **Data Process** (Link)
    - Performed data preprocessing, including data augmentation, noise reduction, and object identification.
  - **Machine Learning and Image Classification** (Link)
    - Applied networks including VGG16, ResNet with inception v2 and v3 models for classifying shark genus and achieved 70% accuracy across top 20 species with approximately 8,000 images.
    - Built a novel classifier for solving challenging bio-hierarchical classification tasks in small species datasets.
- **Bionic Bat Robot - Bioinspired Science & Technology Lab (BIST)** — Virginia Tech
  Interdisciplinary Research - Supervised by Prof. Rolf Müller — *Sep. 2020 - Jan. 2021*
  - Developed a stereo vision detection model based on ConvNet with Python and OpenCV library.
  - Detected and recorded a bat robot's motions during real-world tunnel flying tasks.
  - Recorded flight patterns in simulated forest environments while avoiding collisions using integrated sensing systems.
- **RoboGrinder, Team of DJI Robomaster University Championship** — Virginia Tech
  Chief Mechanical Engineer and Electrical Group Member — *Oct. 2017 - Oct. 2019*
  - **Team Lead of Engineering Robot**
    - Arranged project agenda for designing, prototyping, installing and testing stages.
    - Led a team of 6 to design a robot for climbing stairs and auto-grasping boxes.
    - Carried out 3D model design in SolidWorks and assembled the robot with 3D printing and other materials.
    - Collaborated with other teams to discuss re-supply and rescue capabilities for the robot.
  - **Software Embedded Design and Vision Detection**
    - Optimized robot structure with ROS to improve movement efficiency.
    - Simulated a 3-DoF low-fidelity control model with OpenCV-based infrared camera detection in Gazebo to achieve intelligent positioning for the robotic manipulator.
    - Conducted hardware programming control in C to resolve communication restriction problems between the robot arm and the embedded system.
- **VT inVenTs Rocketry, Team of Midwest High-Power Rocket Competition** — Virginia Tech
  Member in Mechanics Team — *Sep. 2016 - Jun. 2017*
  - Designed and assembled the power system for J and K rocket types.
  - Developed a drag system to manipulate height during flight.
  - Programmed with Arduino to control the ignition, detachment drag control and parachute stages of flight.

Projects

- **End-to-End Scene Flow Estimation and Application (Link)**: Implemented scene flow estimation with point-voxel correlation fields from point cloud data with PyTorch.
- **ORB-SLAM3 on iPhone (Link)**
  - Implemented ORB-SLAM3 on a host computer using pre-recorded indoor and outdoor videos from monocular cameras.
  - Achieved real-time off-iPhone detection process by using remote video streaming through WiFi connection.
  - Developed an on-iPhone ORB feature detector with a user-friendly graphic interface.
- **Robot Manipulation with Hindsight Experience Replay (Link)**
  - Implemented a Hindsight Experience Replay reinforcement learning with Deterministic Policy Gradient algorithm.
  - Improved sample efficiency in goal-conditioned robot arm environments from OpenAI Gym.
- **Background Removal and Inpainting**
  - Built an object detection method by decoupling foreground and background objects.
  - Reconstructed images by removing unwanted crowds from portrayed pictures with inpainting technology, CycleGAN.
- **Autonomous System Serial-Link (6-joint) Robotic Manipulator:** Developed a motion and movements manipulator with forward and backward kinematic calculation and MATLAB visualization.
- **Miniature Online Banking App**
  - Developed a C++ application that simulated an online banking app with a Text-based User Interface (TUI) with functions such as withdrawal, deposit, balance check and accounts information display.
  - Improved TUI to a GUI appearance window with multi-thread and concurrency processing capibilities with Qt library.

Honors and Awards

- GAGE Fellowships in Unversity of Minnesota — *Jan. 2024*
- 2nd Prize in the Robomaster 2019 Final Tournament — *Aug. 2019*
- Special Award in the Robomaster 2019 International Regional Competition — *August 2019*
- 2nd Prize in the Robomaster 2018 Final Tournament — *Jul. 2018*
- 1st Prize in the Robomaster 2018 International Regional Competition — *Jul. 2018*
- 2nd Prize in NASA's Space Grant Midwest High-Power Rocket — *May 2017*

Skills Summary

- **Programming Languages**: Python, Java, Processing, C++, C, MATLAB, Swift, JavaScript/HTML/CSS, LaTeX
- **Robotics**: Robot Operating System(ROS), UR5, Arduino, Raspberry Pi, STM32
- **Frameworks**: PyTorch, TensorFlow, OpenCV, Keras, Django, Flask, NodeJS
- **Tools**: Ubuntu, Git, Gazebo, XCode, Godot, Keil, SolidWorks, Creo, Adobe Premiere