Guanang Su

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Education

- **Northeastern University** — Boston, MA, USA
  Master of Science - Robotics (Computer Science Concentration); GPA: 3.83 — *July 2016 - June 2020*
  Courses: *Reinforcement Learning, Machine Learning, Computer Vision, Robotics Sensing and Navigation, Control System*
- **Virginia Polytechnic Institute and State University** — Blacksburg, VA, USA
  Bachelor of Science - Computer Engineering; GPA: 3.25 — *August 2016 - May 2021*
  Major: *Controls, Robotics, and Autonomy,* ***Minor:*** *Mathematics*
  Courses: *Robotics Systems, Artificial Intelligence, Embedded Design, Microcontroller, Applied Software Design, Biomedical Engineering*

Research Experience

- **Robot Learning and Manipulation - Helping Hands Lab** — Northeastern University
  Research Assistant - Supervised by Prof. Robert Platt — *Nov 2021 - Present*
  - **Sample Efficient Equivariant Reinforcement Learning** (Link)
    - Designed collision detection and avoidance algorithm for robot arm in Python.
    - Tested and debugged 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.
- **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)
    - Proceeded with data preprocessing, including data augmentation, noise reduction, and object identification.
  - **Machine Learning and Image Classification** (Link)
    - Applied networks including VGG16, ResNet with inception v3 and v2 model 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.
- **Finger Vein Recognition and Cipher Application** — Changchun University of Technology
  Assistant Researcher - Supervised by Prof. Jianwei Guo — *Aug 2018 - May 2019*
  - **Image Preprocessing and Augmentation**
    - Implemented rotation corrections on excursed images using OpenCV and edge detection using the Sobel algorithm.
    - Proposed a region proposal network to localize Region of Interests.
  - **Deep Learning:** Built a finger vein recognition network with ResNet using PyTorch.

Teaching Experience

- **Reinforcement Learning and Sequential Decision Making** — Northeastern University
  Teaching Assistant - Prof. Christopher Amato — *Fall 2022*
  - **Materials Design:** Designed exams and problem sets on Bandits, TD-learning, DQN and MDP.
  - **Lecture and Grading:** Held TA office hours and online discussions on homework and projects.

Work Experience

- **DJI Robomaster Research and Development Center - Da-Jiang Innovations** — Shenzhen, China
  R & D Engineer, Summer Internship - Supervised by Mr. Chuan Yang and Mr. Qun Dong — *Jun 2019 - Aug 2019*
  - **Overall Duties:** Designed a new gaming robot, the missile launching system, including Missiles, Missile Launcher and Missile Launch Silo, that contributed to new rules of the 2020 DJI Robomaster competition.
  - **Mechanical Design:** Designed missiles' airfoil and supplied fringes with flow simulation and aerodynamic analysis.
  - **Control System and Embedded Software Design**
    - Designed a PID-based feedback controller for the missile and achieved agile control and precise landing performance.
    - Developed a missiles' basic embedded framework using C with Keil's embedded development tool.
    - Designed missiles' internal program to achieve auto-aiming and shooting at a distance of 20-30m with OpenCV.

Publications

- Mingxi Jia*, Dian Wang*, **Guanang Su**, David Klee, Xupeng Zhu, Robin Walters, Robert Platt. *SEIL: Simulation-augmented Equivariant Imitation Learning.(Link)* Under review (Submitted to ICRA 2023). (Also presented in **Workshop on Sim-to-Real Robot Learning**, CoRL 2022)
- Xupeng Zhu, Dian Wang, Ondrej Biza, **Guanang Su**, Robin Walters, Robert Platt. *Sample Efficient Grasp Learning Using Equivariant Models.(Link)* **Robotics: Science and Systems(RSS) 2022**. (Also presented in **Workshop on Scaling Robot Learning**, ICRA 2022 & **RLDM 2022**)

Activities

- **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 bat's motion in real-world tunnel flying tasks.
  - Integrated robot with sensors and recorded flight patterns in simulated forest environments to avoid collisions.
- **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 engineering robot for climbing stairs and auto-grasping the resources boxes.
    - Carried out 3D model design in SolidWorks and assembled the robot with 3D printing and other materials.
    - Collaborated with other teams to discuss supplement and rescue modules.
  - **Software Embedded Design and Vision Detection**
    - Optimized robot structure with ROS to improve moving efficiency.
    - Simulated a 3-DoF low-fidelity control model with infrared camera detection in Gazebo by OpenCV to achieve intelligent positioning for the robotic manipulator.
    - Conducted the hardware programming control in C to resolve the communication restriction problem 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 achieve flight on controllable height.
  - Programmed with Arduino to control the ignition, detachment drag control and parachute.

Projects

- **Scene Flow Estimation for Autonomous Driving (Ongoing) (Link)**: Implemented scene flow estimation with point-voxel correlation fields from point cloud data in KITTI and FlyingThings3D datasets.
- **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 process by using remote video streaming through the WiFi connection.
  - Developed an on-iPhone ORB feature detector with an 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 manipulator motion and movements controller 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 with functions of withdrawal, deposit, balance check and accounts information display.
  - Improved TUI to a GUI appearance window with multi-thread and concurrency processing with Qt library.

Honors and Awards

- Special Award in the Robomaster 2019 International Regional Competition — *Aug 2019*
- 2nd Prize in the Robomaster 2019 Final Tournament — *Aug 2019*
- 1st Prize in the Robomaster 2018 International Regional Competition — *Aug 2018*
- 2nd Prize in the Robomaster 2018 Final Tournament — *Aug 2018*
- 2nd Prize in NASA's Space Grant Midwest High-Power Rocket — *Jun 2017*
- Hypatia and Galileo inVenTs Living-learning Communities Scholarship, Virginia Tech — *Aug 2016*

Skills Summary

- **Programming Languages**: Python, C++, C, MATLAB, JavaScript, HTML, CSS, LaTeX
- **Machine Learning**: PyTorch, TensorFlow, OpenCV
- **Robotics**: Robot Operating System(ROS), UR5, Arduino, Raspberry Pi, STM32
- **Software**: Gazebo, Keil, AutoCAD, SolidWorks, Creo, Mathematica, JMP, Adobe Premiere
- **Platforms**: Ubuntu, Mac, Windows