# SANJAR NORMURADOV

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## WORK EXPERIENCE

**Graduate Teaching Assistant**　　　　　　　　　　**Electrical & Computer Engineering Department UW**
*"The Self-Driving Car: Intro to AI for Mobile Robots"*　　　　　　*Seattle, WA / Sep 2023 – Present (4 mo.)*

Guided practical applications of Autonomous Vehicles fundamentals on 1/10th scale MuSHR rally car.
- Prepared course materials on PID/MPC control, PF/EKF localization, and Djkstra/RRT/RRT*/A* path planning.
- Developed a Raspberry Pi based mechatronic gate featuring an ultrasound distance sensor, 16x2 LCD for IP and distance display, a servo, and a buzzer to create a ROS service-managed obstacle for the course's final race.

**Graduate Research Assistant**　　　　　　　　　　　　　**UW & Amazon Science Hub**
*Robotic Manipulation in Densely Packed Containers* 🦾　　　　　*Seattle, WA / Jan 2023 – Present (1 y.)*
- Synthetic Data Generation: Utilized Scanned Objects from Google Research and NViSII to enhance synthetic imagery datasets, simulating diverse backgrounds and object arrangements.
- Improved the average precision of the STOW framework for Warehouse Picking Robots on the expanded 140K-image dataset: 0.424 to 0.646 overall, and 0.336 to 0.573 for stacked bins.
- Architecture Development: Investigated performance boosts in Instance Segmentation by integrating the Segment Anything Model by Meta AI.
- Simulation: Enhanced simulation environment precision and robustness by revising URDF/Xacro/XML files and creating a single source for all pod models, thereby expanding the system's versatility.
- Motion Planning: Optimized pod positioning relative to the robot workstation by automating test-run procedures and refining control and MoveIt parameters, such as collision checking frequency and discretization.
- Reachability Test: Reduced UR16e reachability failures from 20/1600 to 1/1600 via modifications above.

**Robotics Software Engineer**　　　　　　　**Airbus Robotics ✈ & UW ENGINE Capstone** ∞
*Robotic Fuselage Inspection for Dents and Scratches*　　　　　　　　　*Jan 2023 – Jun 2023 (6 mo.)*
- Set up workstations in Gazebo, RoboDK, and RoboGuide with UR5e, UR16e, and Fanuc CRX 20-iA/L
- Generated motion plans using MoveIt and other built-in or proprietary packages to automate the inspection.
- Certified by completing on-site Core Training and online Core, Pro, and Application Tracks for UR e-series

**Mechatronics Intern**　　　　　　　　　　　　　　　　**JSC "ENPO SPELS"** ∞
*Robotic Arm, Mentor: Nekrasov P.V.* ✉@　　　　　　*Moscow, Russia / Feb 2022 – Jul 2022 (7 mo.)*

Developed a 5-DoF portable Robotic Arm, with enhanced maneuverability and versatile object handling, featuring a human-mimetic end-effector for advanced research in Mechatronics.
- Design: Utilized CAD and FDM/FFF 3D printing technologies on Tevo Flash/Tornado printers with diverse filaments (PLA, PETG, TPU, Nylon), to optimize the robot for functionality and portability.
- Electronics: Design dual-sided PCBs for the robot's base and controller in Altium Designer, and fabricated using photolithography with SLA 3D printer (Anycubic Photon S) and Ordl Alpha 350 dry film.
- Software: Developed software for the robot base (6 servos, nRF24L01 module) and controller (nRF24L01, OLED 128x64, 2 joysticks) using STM32F103 MCU and Finite State Machines.

## PROJECT EXPERIENCE

**Autonomous Robotics**　　　　　　　　　　　　　　　　**UW Graduate Studies**
*"Self-Driving Cars"* | *"AI – Robotics"*　　　　　　　　　*Sep 2022 – Present (1 y. 3 mo.)*

Applied novel methods in Autonomous Robotics to varied robotic platforms (MuSHR car, 3-DoF robotic arm)
- Control: Implemented PID and MPC to manage the steering angle and speed of the rally car.
- Localization: Implemented PF/EKF (Odometry/Velocity Motion and Landmark/Beam-based Sensor Models)
- Path Planning: Applied RRT/RRT*/A*/LPA* to navigate in robotic arm C-space, and A* to the rally car.
- Reinforcement Learning: Explored Behavior Cloning, DAgger, and Policy Gradient techniques in MuJoCo.

**TetrArm**　　　　　　　　　　　　　　　　　　　　　**UW Graduate Studies**
*"SWE for Embedded Applications"*　　　　　　　　　　　　　*Jan 2023 – Mar 2023*
- Gained fluency in testing code across various scenarios and implementing FSMs using Docker container images.
- Leveraged STL containers, including vectors, maps, and deques to create custom ADTs.

## EDUCATION

**University of Washington**　　　　　　　　　　　　　　　　　　**Seattle, WA**
*M.S. in Electrical and Computer Engineering, Robotics (GPA: 3.5)*　　　　　*Oct 2022 – Mar 2024*
- Activities: UW + Amazon Science Hub; Sensor System Lab; Robotic and State Estimation Lab.
- Courses: Self-Driving Cars; AI-Robotics; SWE for Embedded Applications; Machine/Deep Learning.

## SKILLS

ROS | Linux | XML, Rviz | Gazebo | MoveIt | Pybullet | MuJoCo, Control | Localization | Path Planning | Perception
Python | C++, Git | Docker, CV | ML | DL | PyTorch, PCB | CAD | 3D Print, RPi | STM32 | ATmega | Assembly