

APURV KUSHWAHA

Robotics, Perception and Embedded Systems

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SUMMARY

Robotics graduate student and hands-on engineer working at the intersection of research and product development. Experienced in navigating open-ended problems, coordinating multidisciplinary work, and turning early concepts into tested, working systems.

EDUCATION

Master of Science in Robotics (GPA: 3.83/4.00)

Aug 2025 – May 2027

University of Minnesota, Twin Cities

Minneapolis, MN

Bachelor of Technology in Engineering Physics

Jul 2020 – May 2024

Indian Institute of Technology Guwahati

Guwahati, India

EXPERIENCE

Graduate Researcher

Apr 2026 – Present

University of Minnesota, Twin Cities – Prof. Zhu-Tian Chen

Minneapolis, MN

- Developing a human-in-the-loop bimanual robotics platform that uses complementary XR and vision-based interfaces to collect manipulation data for downstream model training.
- Implemented task-frame calibration, articulated-joint tracking, inverse kinematics, and safety-gated MuJoCo validation; verified the hardware control loop at 90 Hz.

Lead Technical Engineer

Nov 2024 – Jun 2025

SamaritanBio

New Delhi, India

- Led end-to-end development of a 24-hour catheter-based urine-monitoring device for kidney patients using Fusion 360/3D printing, dual-ESP32 C++ firmware, calibrated color and weight sensing, and RTC-based collection.
- Built an Arduino-controlled peristaltic-pump simulator and LVGL HMI for 24-hour bench testing, reducing measurement inconsistency by 87%; developed an HL7/EHR proof of concept using synthetic data.
- Owned MVP requirements, roadmap, feature priorities, vendors, and risk planning with the founders; delivered demos to 2 hospitals and 3 investors and supported a successful 2025 BIRAC BIG grant.

Research and Development Engineer

May 2024 – Nov 2024

Swachh.io

New Delhi, India

- Developed vehicle-mounted pollution-control prototypes using SolidWorks, DFM, fabrication, and ANSYS CFD/FEA; achieved approximately 27% simulated efficiency improvement and up to 88% simulated PM10 capture.
- Built ESP32- and Arduino-based Wi-Fi and HTTP DAQ and control systems for multi-sensor vehicle platforms, led six interns through integration and testing, and helped secure a \$50K+ 2022 CAQM grant.

RESEARCH PAPERS

Probabilistic Physics Digital Twin for Human-Robot Interaction

Sep 2026

Coauthor | Submitted to IEEE ICRA 2027

- Models uncertainty in object mass, friction, and center of mass to predict action outcomes and guide human-robot manipulation.

SELECTED PROJECTS

Quest 3 Mixed-Reality Bowling Analysis | Code | Demo | *Unity, YOLO, SAM2, Python*

Apr 2026

Course team project

- Tracks a bowling ball from Meta Quest 3 video and replays its lane trajectory in the headset for post-shot review.
- Reviews 20 accepted SAM2 tracks and curates 322 positive and 80 negative images with run-level splits for training a YOLO initializer.

Semantic-Aware Image Retargeting | Code | Demo | *PyTorch, DINOv3, OpenCV*

Dec 2025

- Resizes images to new aspect ratios while protecting salient subjects and overall visual composition through saliency detection, depth estimation, and seam carving.
- Uses a DINOv3-based classifier trained and evaluated on the approximately 43,000-image PICD dataset, achieving repository-reported 75% to 80% validation accuracy.

SKILLS

Programming & Robotics: Python, C++, MATLAB, ROS 2, Gazebo, Nav2, SLAM, CMake

Perception & AI: OpenCV, PyTorch, TensorFlow, LiDAR, Sensor Fusion, Computer Vision, YOLO, SAM2

Embedded & Mechatronics: ESP32, Arduino, Embedded C, ESP-IDF, LVGL, I2C, SPI, UART, CAN, 3D Printing

Engineering & Product: Linux, Git, Docker, MuJoCo, SolidWorks, Fusion 360, ANSYS Fluent, DFM, BOM