HARISH KUMAR KALIYAPPAN

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https://github.com/harishkumar77/ | https://harishkumar77.github.io/

PROFESSIONAL SUMMARY

Robotics and machine learning graduate student with strong hands-on experience in computer vision, deep learning, and ROS-based autonomous systems. Proven ability to design and validate end-to-end perception and control pipelines using PyTorch, TensorFlow, and physics-based simulators such as Gazebo, PyBullet, and Isaac Sim. Experienced in translating research concepts into deployable robotic solutions, with peer-reviewed publications and patented work in robotic systems.

SKILLS

Programming: C, C++, Python, MATLAB
Machine Learning & AI: Deep Learning, CNNs, LSTMs, Computer Vision, Time-Series Modeling, Supervised Learning
Frameworks & Libraries: PyTorch, TensorFlow, Scikit-learn, OpenCV, NumPy, Pandas
Robotics & Control: ROS/ROS2, Robot Kinematics and Dynamics, Motion Planning, Control Systems (PID/PD), Sensor Fusion
Simulation & Engineering Tools: Gazebo, PyBullet, Isaac Sim, ANSYS, Autodesk Fusion 360
Systems & Development Tools: Linux (Ubuntu), Git, GitHub

PROJECTS

End-to-End Video-to-Robot Motion Transfer Using Deep Learning **Chicago, USA**
Graduate Research Assistant *August 2025 – Present*

- Developed an end-to-end pipeline to convert monocular video input into quadruped robot joint trajectories using deep learning–based pose estimation with DeepLabCut and HRNet-based models.
- Designed CNN-based skeleton-to-joint-angle regression models in PyTorch to map 2D visual keypoints to robot motion.
- Validated generated motions through physics-based simulation in PyBullet, Gazebo, and Isaac Sim using a Unitree A1 quadruped robot model.

Technologies: Python, PyTorch, DeepLabCut, OpenCV, PyBullet, Gazebo, Isaac Sim

Collaborative Robot as Scrub Nurse for Cataract Surgery **Chennai, India**
Researcher *December 2023 – June 2024*

- Designed and built a custom 6-DOF collaborative robotic arm using servo and stepper motors, Arduino Mega, and DRV8825 drivers.
- Developed a vision-guided robotic control pipeline for autonomous surgical instrument pickup and placement.
- Trained YOLOv5 (s/m/n) object detection models on 4,700+ annotated images across 20+ surgical instruments.
- Achieved mAP@0.5 of 0.84 with precision of 0.99 and recall of 0.95, integrating perception outputs with motion execution.
- Validated the end-to-end vision-to-control system in PyBullet simulation and on physical robotic hardware.

Technologies: PyTorch, YOLOv5, Computer Vision, Robotics, Arduino, PyBullet

Real-Time Soil Moisture Prediction for Construction Applications **Chennai, India**
Researcher *January 2023 – June 2023*

- Designed a real-time AI and IoT system combining computer vision and time-series forecasting for soil classification and moisture prediction.
- Implemented CNN, SVM, and LSTM models using PyTorch and Scikit-learn, achieving up to 92% classification accuracy.
- Integrated DHT11, soil moisture, and light sensors to support live data acquisition and inference.

Technologies: Python, PyTorch, Scikit-learn, OpenCV, IoT Sensors, NumPy, Pandas

EXPERIENCE

IBM **Chennai, India**
Artificial Intelligence Analyst Intern *May 2023 – August 2023*

- Designed, implemented, and evaluated machine learning workflows using IBM Watson Studio and AutoAI for enterprise analytics applications.
- Developed and optimized data pipelines integrating NLP and computer vision models to support chatbot systems and automated inference.
- Applied statistical modeling and performance evaluation techniques to improve model reliability and decision support.

RESEARCH, PUBLICATIONS & PATENTS

- **Journal of Robotic Surgery (Springer):** *A Specialized Scrub Nurse Robotic System for Facilitating Surgical Operations*
  DOI: 10.1007/s11701-024-02089-0
- **Indian Patent (Published):** *A Specialized Scrub Nurse Robotic System for Facilitating Surgical Operations and the Method Thereof*
  Patent Application No. 202541011520

EDUCATION

Illinois Institute of Technology **August 2024 – May 2026**
Master of Science, Autonomous systems and robotics *GPA: 3.1*

Vellore Institute of Technology **May 2020 – April 2024**
Bachelor of Technology, Computer science specialization in AI and Robotics *GPA: 3.1*