Gokul Raju Govinda Raju

Machine Learning / Computer Vision Engineer
Robotics, Systems and Control MSc at ETH Zürich

Bahnhofstrasse 12, 8180 Bülach, CH +41 76 234 7196
gokul10012000@gmail.com gokul-8011a
gokulraju.com github.com/BjfpgZOC
Residence Permit B (Switzerland) [Job Seeker Permit]

Education

ETH Zürich   *Sep 2022 – Aug 2025*
MSc in Robotics, Systems and Control

- **Coursework:** Machine Learning, Probabilistic AI, Computer Vision, 3D Vision, Planning & Decision Making for Autonomous Robots, Robot Dynamics, Dynamic Programming & Optimal Control, Algorithms & Fairness
- **Master Thesis:** State-Space Models for Efficient Reinforcement Learning in Quadrotors
- **Semester Thesis:** Pushing the Limits of Optical Flow Estimation for Event Cameras

Heriot-Watt University, Dubai   *Sep 2018 – Aug 2021*
BEng in Mechanical Engineering (Hons.)

- **Bachelor Thesis:** Fault Diagnosis of Rolling Element Bearings using Artificial Neural Networks
- **Watt Club Medal (2021):** Awarded to the student and achieving **(University Rank: 1/254)** in the Mechanical Engineering batch across all campuses

Skills

Programming: Python, C++, MATLAB

Frameworks & Tools: PyTorch, JAX, TensorFlow, Keras, NumPy, SciPy, scikit-learn, Matplotlib, Pandas, OpenCV, Git, SQL, Weights & Biases (Wandb), Docker, Kubernetes, Hugging Face, AWS, FastAPI, Flask

Domains: Computer Vision, Machine Learning, Reinforcement Learning, Sequence Modeling, Neuromorphic Vision, Diffusion Models, Natural Language Processing, Large Language Models

Languages: English (C2), Tamil (C2), Hindi (C1)

Experience

Machine Learning Intern   *Zürich*
FPrime AI   *Apr 2025 – Present*

- Fine-tuned diffusion models using **Low Rank Adaptation (LoRA)** for product photography
- Increased customer retention by **40%** by training a **RAG (Retrieval-Augmented Generation)** WhatsApp Chatbot to answer order queries, suggest complementary items, and trigger post-purchase engagements

Graduate Researcher   *Zürich*
Robotics and Perception Group, University of Zürich   *Apr 2024 – Oct 2024*

- **Master Thesis:** State-Space Models for Efficient Reinforcement Learning in Quadrotors [GitHub]
- Proposed the first **SSM-based** RL framework for Autonomous Drone Racing for both state and vision based domains
- Developed a novel **PPO JAX RL framework** for Flightmare Simulator, resulting in SOTA performance - **10% faster lap times** and **50% faster inference times** compared to existing policies

Graduate Researcher   *Zürich*
Robotics and Perception Group, University of Zürich   *Aug 2023 – Dec 2023*

- **Semester Thesis:** Pushing the Limits of Optical Flow Estimation for Event Cameras [GitHub]
- Pioneered the first **multi-event** optical flow framework for event-based vision, achieving a **8% reduction in EPE**
- **Accelerated inference times by 30%** when compared to existing baselines on DSEC and MVSEC benchmarks by optimizing the model architecture with a SSM-based encoder

Research Assistant   *Dubai*
Heriot-Watt University   *Sep 2021 – Aug 2022*

- Curated bearing-vibration datasets with over **1000 samples**, featuring varied fault sizes and RPM ranges
- Conducted ablations on spectrogram CNNs and achieved **97% classification accuracy** through hyper-parameter tuning
- Tutored **120** undergraduate students in CoppeliaSim and OnShape; delivered **6 labs** and **4 demos**

Publications

Perturbed State Space Feature Encoders for Optical Flow with Event Cameras Jun 2025
Gokul Raju Govinda Raju, Nikola Zubić, Marco Cannici, Davide Scaramuzza [arXiv ↗]
IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (CVPRW), Nashville, 2025

Projects

Spaceship Obstacle Avoidance and Trajectory Planning *Nov 2024 – Dec 2024*
Planning and Decision Making for Autonomous Robots Project [GitHub ↗]

- Implemented a **SCvx (Successive Convexification)** planning and control algorithm for a 2-D spaceship to avoid static obstacles (planets) & dynamic obstacles (satellites) and to dock with the docking station

Robust Soccer Ball Detection and Tracking (FIFA) *Mar 2023 – Jun 2023*
3D Vision Project [GitHub ↗]

- Created an end-to-end pipeline to detect & track soccer balls in both sharp and blurred broadcast frames
- Engineered a synthetic dataset with Google Research Football Simulator to enhance YOLOv8n object detection through transfer learning and improved **recall by 717%** and **precision by 216%**
- Integrated the fine-tuned detection model with a state-of-the-art approach, Motion-from-Blur (MfB) to handle high-speed blurry motion, resulting in a **8% improvement** in soccer ball detections
- Combined multi-view detections with camera pose information to triangulate the position of the soccer ball **(95.78% tracking accuracy at 0.75 IoU)** and visualized the tracking results by generating 3D trajectories for coaching analytics

Fault Diagnosis of Rolling Element Bearings using Artificial Neural Networks *Sep 2020 – Apr 2021*
Bachelor Thesis

- Engineered an ANN-based fault diagnosis system using MATLAB's Wavelet and Neural Network Toolboxes, achieving **100% fault classification accuracy** in bearings
- Evaluated the system's performance on unseen data, achieving **99.64% accuracy** in fault magnitude estimation
- Implemented a data augmentation strategy to address class imbalance, leading to a **20% improvement** in minority class classification and enhanced model robustness

ATLAS-D: Industrial Autonomous Robot Vacuum *Sep 2020 – Mar 2021*
Industrial Project

- Collaborated with EGA (Emirates Global Aluminum) to design a functional CAD Design for an industrial autonomous robot vacuum to clean substations
- Designed a CAD model of the robot vacuum and an algorithm assisted by LiDAR Sensors and IR sensors on ROS, Gazebo, and RViz for mapping and navigation
- Designed a 4-stage dust separation system (multi-cyclone, HEPA-grade washable filters, BLDC-driven impeller) targeting **a >99% capture efficiency** for fine dust particles

Honors and Awards

UAE Golden Visa for Academic Excellence (2022-2032): Received the prestigious UAE Golden Visa for academic excellence

James Anderson Memorial Prize (2021): £5000 Monetary Prize awarded for exceptional Merit and Distinction in the Mechanical Engineering batch

Eric Gibb Prize (2020): Certificate and £100 Monetary Prize awarded to the student securing the highest total marks in the Mechanical Engineering batch

Deputy Principal's Award (2021, 2019): Awarded for securing straight A's in all modules in the year

Heriot-Watt Merit Scholarship (2018): AED 30,000 Scholarship and direct Year-2 undergraduate entry for exceptional high school results