Pranav Unnikrishnan

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Personal Profile

- Machine learning engineer with strong proficiency in coding, math, and analyzing research papers.
- Ability to work remote, independently, and with diverse teams in flexible environments.
- Curious to learn new things and collaborate with teams.

Education

Master of Science in Data Science - University of Colorado Boulder (06/2026), GPA – 3.967/4 Boulder, CO
B.tech in Computer Science (Artificial Intelligence) - Amrita University (06/2024), **GPA – 3.36/4** Coimbatore, India

Technical Skills

- **Languages and Tools:** Python, C, SQL, MongoDB, Scala, R, LangChain, TensorFlow, PyTorch, MATLAB, Simulink, AWS
- **Domains:** Statistics, Machine learning, Computer Vision, Data driven modeling, Large Language Models, Cloud Computing, Big data architectures, Robotic kinematics, Motion Planning, ROS

Experience

Research Intern – Amrita School of Engineering , Tamil Nadu, India Sep 2022 – Oct 2023

- Applied DMD and LSTM on century-scale spatio-temporal rainfall data for forecasting, with LSTM outperforming in capturing nonlinear patterns. Validated models using MAE/RMSE and historical data for disaster preparedness.
- Optimized model parameters to improve long-term forecasting accuracy. Built GRU, Bi-GRU, and transformer (attention) models using MFCC features to generate higher-quality speech-driven gestures.
- Applied representation learning to encode gestures in a compact form. Enhanced realism and synchronization of generated gestures for human-robot interaction. Trained and tested models on motion capture datasets. Demonstrated improvements in accuracy and expressiveness of gesture generation over baseline methods.
- Developed real-time face mask detection models using MobileNet, ResNet, and EfficientNet with transfer learning. Achieved over 80% accuracy for the models across all the classes.
- Deployed optimized models on Jetson Nano with TensorRT, boosting throughput from 4 FPS to 85 FPS. Enabled efficient inference on resource-constrained embedded systems.
- Designed a client-server framework for real-time video processing. Demonstrated scalable deployment for public health and surveillance applications.

Machine Learning Intern - AI India Innovation Center, Pune, India Oct 2023 – Jan 2024

- Fine-tuned open-source LLMs to answer high school math questions by generating synthetic data according to client's needs and achieved model accuracy of 70%.
- Implemented quantization techniques to optimize LLM performance, reducing model size while maintaining accuracy. Developed and deployed LLM-based solution with frontend integration, creating a functional application for end-users.
- Engineered image augmentation pipeline, incorporating advanced techniques such as image in-painting and image-to-image translation. Designed and implemented OCR system for passport information extraction, automating information parsing and improving efficiency.

Machine Learning Intern - Hyperworks Imaging, Bengaluru, India Mar 2024 – Jul 2024

- Analyzed research and developed automated systems for digitizing raster well log images, increasing efficiency and accuracy of information extraction for machine learning models. Trained and finetuned CNN models, successfully extracting multiple segments from well log images while achieving 80% precision.
- Engineered solution using GANs to remove gridlines and transformer model to map curves, enabling precise digital representation of well log data.
- Designed and executed OCR-based system with clustering and post-processing techniques to accurately extract depth information from well logs. Validated digitization results against corresponding LAS files, ensuring high accuracy and reliability of extracted information for downstream analysis.

IT Student Assistant – Office of Information Technology, **University of Colorado**, Boulder, USA. Oct 2024 – Present

- Provided technical support for hardware/software issues across campus, resolving support tickets. Diagnosed and troubleshot issues related to university network connectivity, and user access management, ensuring minimal downtime while collaborating with cross-functional IT teams.
- Gained hands-on experience in enterprise systems, Active Directory, and endpoint device management, reinforcing foundational IT infrastructure skills.

Publications

- Face Mask Detection Using Transfer Learning and TensorRT Optimization
- Comparative Analysis on Speech Driven Gesture Generation
- Unleashing the Power of Dynamic Mode Decomposition and Deep Learning for Rainfall Prediction in North-East India

Projects

Autonomous RC Car

- Built an autonomous hallway-navigation system using LiDAR-based SLAM, RF2O odometry, and a ROS2-ArduPilot pipeline.
- Implemented a PD-based waypoint follower with dual-criteria waypoint advancement, enabling reliable multi-lap navigation with accurate cornering.
- Developed a LiDAR-only wall-following controller using RANSAC line extraction and geometric distance/orientation estimation for map-free navigation.
- Created an A* path-planning pipeline including map preprocessing, padding, distance-field cost shaping, and waypoint discretization.
- Prototyped a NumPy-only camera navigation system (denoising, masking, RANSAC line fitting) and additionally evaluated a custom ICP-EKF localization approach.

Social Navigation Project

- Extended the SocNavGym framework by implementing generalized environment handling (padding + attention-based encoders) and designing a custom proxemics-based reward function.
- Trained DQN agents across simple and complex social environments, comparing reward models (Baseline, DSRNN, TGRF, Proxemics) using success rates, collision metrics, and discomfort measures.
- Conducted large-scale evaluation including 100-episode rollouts per agent and human A/B preference tests, showing improved performance and human preference for proxemics-based policies in complex scenes.

Algorithms for Exploration and Exploitation in Reinforcement Learning

- Implemented and compared value-based (Q-learning, SARSA, DQN) and policy-based (REINFORCE, PPO, DDPG) reinforcement learning algorithms.
- Designed and trained agents in simulated environments (Cliff Walking, Taxi, LunarLander-v2, Pendulum) using Python, NumPy, and neural networks.
- Applied concepts of temporal-difference learning, Bellman equations, policy gradients, and actor-critic methods to improve exploration-exploitation trade-offs.
- Produced training curves and performance evaluations, demonstrating convergence and stability across algorithms.

Sawyer Robot Analysis

- Analyzed Sawyer robot task data with Python, OpenCV, and NumPy, visualizing kinematics, trajectories, and control signals for performance benchmarking.
- Implemented reinforcement learning (Q-Learning, PPO, DDPG) in Sawyer environments (mujoco), training agents for robotic grasping and trajectory-following tasks with convergence and stability analysis.

DRL-Based Map-less Crowd Navigation for Mobile Robots

- Designed and implemented a deep reinforcement learning navigation system for autonomous mobile robots in crowded environments.
- Developed custom reward functions incorporating collision probability (CP), improving success rate in obstacle-dense simulations and trained models with Twin Delayed DDPG (TD3) and Soft Actor-Critic (SAC) in Gazebo simulator using TurtleBot3 and 2D laser scans.
- Achieved significant performance gains: TD3 with CP reached 1387 successful episodes out of 1400 compared to 255 without CP.

Football Player Performance Scraper & Analysis

- Built a web scraper (Python, fastapi, Requests) to collect structured performance, contract, and market value data for 12,900+ football players across multiple seasons (2020–2025).
- Designed a 64-feature dataset covering player details, yearly stats (goals, assists, cards, appearances, minutes), market values, and club/contract metadata and performed exploratory data analysis (EDA) and trend modeling to evaluate player performance, predict market value fluctuations, and identify top performers.
- Applied data cleaning, feature engineering, and visualization (Pandas, NumPy, Matplotlib/Seaborn) to derive insights for transfer market analytics and fantasy football predictions.