Gopalakrishnan Thirunellai Venkitachalam

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EDUCATION

Carnegie Mellon University (GPA 4.0/4.0)   Pittsburgh, PA
Master's of Science, AI & Robotics Research, Mechanical Engineering   May 2026
Relevant Courses: Deep Learning, Planning & Decision-Making, Computer Vision for Robotics, Modern Control Theory

Indian Institute of Technology Madras (GPA 8.71/10.0)   Chennai, India
Bachelor of Technology in Mechanical Engineering with **Honors**   June 2024
Minor in **Artificial Intelligence and Machine Learning**
Relevant Courses: Machine Learning, Reinforcement Learning, Deep Learning, Multi-Armed Bandits, Field and Service Robotics, Multi-Body Dynamics, Stochastic Processes, Signal Processing, Control of Automotive Systems, Design and Optimization

WORK EXPERIENCE

Search Based Planning Lab, Robotics Institute (RI), CMU   Pittsburgh, PA
Graduate Research Assistant | Advisor: Prof. [Maxim Likhachev](#)   Sep 2024 – Present
- **Developing a Constant Time Motion Planning (CTMP) algorithm** for **mobile manipulators**, optimizing dynamic task allocation and motion planning in warehouse robotics
- **Implementing in C++ & ROS** to enhance real-time adaptability and execution efficiency
- **Simulated door-opening tasks** with **Ridgeback UR10e teleoperation** in *SAPien* and *Maniskill*, demonstrating precision for hazardous applications like nuclear waste disposal and developing a planner for the environment

Caterpillar Inc.   Chennai, India
Research Intern in ML, Control, and Data Analytics   May 2023 – Jan 2024
- Developed **MATLAB** and **Simulink** models for predicting diesel engine exhaust gas temperature dynamics
- Implemented **Python** scripts for cleaning and analyzing large-scale engine datasets using **PCA** and **K-means clustering**
- Designed a **data visualization dashboard** with **Plotly** for spectral and operational cycle analysis

PROJECTS

Financial Market Prediction | CMU [Link](#)   Jan 2025 – Present
- Developing a **Finance-Informed Neural Network** for predicting SPY S&P 500 stock prices using time-series data
- Leveraging **FinBERT** for advanced sentiment analysis of financial news, earnings reports, and market sentiment to improve prediction accuracy

Speech & Face Recognition using Deep Learning | CMU [Link](#)   Feb 2025 – Present
- **Face Classification & Verification:** Trained CNN models (inspired by ResNet50, ConvNeXt-T) with **Transforms & CutMix**, achieving a **2.793 EER**. Used **ArcFace loss** for enhanced feature distinction and robustness
- **Automatic Speech Recognition (ASR)**: Developing a **phoneme recognition model** using **LSTM RNNs**

Formation Control and Multi-Agent Pathfinding (MAPF) | CMU [Link](#)   Sept 2024 – Dec 2024
- Developed **GIF-PIBT**, a cutting-edge algorithm that integrates global formation heuristics with the Priority Inheritance with Backtracking (PIBT) framework to maintain agent formations while ensuring scalable, collision-free pathfinding
- Developed a multi-resolution grid system and formation-maintenance heuristic using cost functions and transformations, optimizing transitions between formation-based and individual strategies in dynamic, obstacle-rich environments

House Inspection Automation | CMU   Sept 2024 – Dec 2024
- Developed a comprehensive image-processing pipeline leveraging classical and deep learning methods to detect structural damages such as rust, cracks, and wear in property images, enabling automated and reliable inspection reports
- Engineered a modular system integrating semantic segmentation and contour-based algorithms for damage localization and classification, ensuring adaptability across diverse lighting and material conditions

Qualitative Analysis of RL Algorithms in Various Gym Environments | IIT Madras [Link](#) [Link](#)   Jan 2024 – May 2024
- Applied **SARSA**, **Q-learning**, and **Dueling DQN** across diverse environments, including Acrobot, Cartpole, and Taxi-v3
- Leveraged advanced techniques like **Monte-Carlo REINFORCE**, **SMDP-Q**, and **Dyna-Q** in various gym environments

SKILLS

Technical Skills: C++, Python, C, Matlab & Simulink, Linux, Git, Machine/Deep Learning, Reinforcement Learning
Framework: Pytorch, Tensorflow, Scikit**,** OpenCV, Moveit, ROS, Pandas, Numpy, Sympy, Vaex