Vivek Reddy Munnangi

Bloomington,IN | vmunnang@iu.edu | 9303335001 | in - Vivek Reddy Munnangi

Education

Indiana University Bloomington, MS in Data Science — Aug 2023 – May 2025

- GPA: 3.7/4.0

SRM University Chennai, B Tech in Mechanical Engineering — July 2017 – May 2021

- GPA: 8.47/10.0

Experience

Research Engineer, Vehicle Autonomy and Intelligence Lab – Bloomington, IN — Aug 2024

- Developed a state estimation equation with parameters from IMU, rosbag2 message, Motec M1 and CAN dump files, to understand vehicle dynamics.(Additional details under confidentiality restrictions.)
- Revamped the ROS2 node structure, creating dedicated command channels and integrating a predictive grip model with MPC/PID controller, enabled autonomous vehicle to navigate a test track 20mph faster on average lap speed in dry conditions. During Laguna Seca race week collected new OEM data (brakes, suspension) to refine and revalidate vehicle dynamics models, improving simulation gap and estimating real-world performance by controller.
- Built a fail-safe module capable of identifying optimal stopping trajectories in real-time based on current LiDAR and sensor data. The system will respond to controller or track-flag signals by evaluating viable safe-stop paths and executing trajectory-level braking decisions at any given state. This was a crucial module in multi-car racing.
- Worked alongside localization team to fuse IMU, GPS, and LiDAR signals, improving robustness and redundancy in sensor-denied or communication loss scenarios. Researching and evaluating VectorNav-based predictive localization techniques to maintain safe vehicle operation during brief GNSS drop or sensor outages.
- Initiated discussions with GM Motorsports performance team to compare human vs. autonomous control behavior on INDY NXT chassis, pursuing sim-to-real transfer analysis using simulator access and telemetry data comparison.

Partner - AI, dentalmatrix.ai – Indianapolis, IN — Sep 2024

- Created an API to integrate OpenDental with CRM platforms, building an ETL pipeline to extract and sync structured data into a centralized relational database. Utilized SQL for querying and transforming patient and billing data; enabled seamless CRUD operations and 100% real-time synchronization.
- Using unstructured text and relative fields in database, and with custom build agent(Qwen3 architecture details confidential) with a judge LLM to answer questions with relevance to data and create workforce-analytics style dashboards for detailed resources usage and billing trends. (Example question: Which procedure has highest number of write-off?). Used Accelerator, Deepspeed to speed up training and best use NVIDIA H100 GPU.

Research Assistant, Frontiers of Optical Imaging and Biology Lab – Bloomington, IN — May 2024 – May 2025

- Designed a machine learning and neural network (currently under review for publication) to register 3D volume data of eye images (scans taken under 2 μm focus) without fixed reference points due to cell movements and to generalization across datasets for different subjects taken in different time frames.
- Processed large medical imaging datasets through automated preprocessing pipelines, boosting data quality for model accuracy. This involved advanced data representation and similarity matching methods to optimize the registration process. Achieved 97% registration accuracy with 6.5 MB/s processing speed.

Consultant, Economic Development District — Aug 2024 – Jan 2025

- Combined a data retrieval system with a generative AI model to assist Economic Development Districts in creating CEDS documents. Defined a database to store all the information from CEDS documents, label and organized to feed the agent for training. The trained agent will provide real-time feedback and optimization suggestions(Question and answer style with option to enable thinking) to improve the chances of EDA approval and secure funding. Later compared computation and effectiveness of LLM to VLM and tradeoffs in switching model.

QC Intern, RockMan Advance Composites — Nov 2019 – Jan 2020

- Interned in Quality Control, focusing on dimensional accuracy, tolerance, and material testing analysis. Gained hands-on exposure to composite material production processes, emphasizing precision and meticulous evaluation to reduce part rejection by 10%.

Patent

3-Phase BLDC motor May 2022

Vivek Reddy Munnangi,

Invented a high-efficiency 3-phase BLDC wheel hub motor with advanced stator design, achieving 95.03% efficiency and 210°C max temperature without airflow. Currently researching axial flux BLDC motors for improved power, reduced size, and better thermal distribution, alongside analyzing simulation data for performance.

Projects

Full-Stack Web Application for Restaurants | MERN Stack, Render

- Developed a full-stack web application using the MERN stack for restaurant owners to store and retrieve customer data, including food preferences and allergies. Familiar with Databricks for big data processing and scalable machine learning workflows.

Image Recognition using Deep Learning | Colab, Tensorflow, PyTorch, ResNet50, ViT, CNN

- Restructured and trained a neural network model to predict and classify images using the Caltech image dataset. Utilized ResNet50, Vision Transformer (ViT), and CNNs for feature extraction and pattern recognition. Implemented Vector embedding to handle large data size.

All Terrian Vehicle | Solidworks, Lotus software, CAD/CAM, Manufacturing techniques

- Engineered an All-Terrain Vehicle (ATV) for All India Championship event. Worked as Head of the Powertrain department, to design a gearbox with required gear ratio that can produce enough torque, maintain vehicle dynamics and reach top speeds, while retaining off-road characteristics.

Technologies

Computer Science and Data Science
Languages: Python, C++, R, SQL, ROS2
Tools: NumPy, Pandas, Scikit-Learn, Matplotlib, Tensorflow, PyTorch, NLTK, OpenCV, PowerBi, Tableau, Jupyter, Git, VS Code.
Database: Mysql, Mongodb, AWS S3.
High Performance Computing: Quartz(A100, V100, H100), BigRed200.
AI Agent Frameworks: AutoGen, Semantic-kernel, CREW AI

Mechanical Engineering
CAE Software: MATLAB – Simulink, Ansys, SolidWorks, Fusion360