Manojpriyadharson Kannan

Automotive Engineer specialized in advanced vehicle dynamics and control systems, autonomous systems, test engineering, and model-based design & validation

PROFILE

Skills and Ambition

Experienced in model-based design, software development, and validation, I specialize in control strategy design, MIL/SIL/HIL testing, and algorithm optimization for automotive and high-tech systems. Proficient in Python, C++, MATLAB/Simulink, and real-time simulation frameworks, I develop scalable, AI-driven, and embedded software solutions.

With expertise in path planning, obstacle avoidance, localization, and ROS-based autonomous systems, I leverage tools like PreScan, Autoware Auto, dSPACE, JIRA, and GIT to drive software innovation and automation. Skilled in Agile, ASPICE, and CI/CD, I aim to contribute to innovative software development projects, focusing on scalable, high-performance, and sustainable solutions across automotive, embedded, and high-tech industries.

Personal Details

Nationality	Indian
Current Residence	Eindhoven, Netherlands
Date of Birth	08-March-1995
Availability/Notice Period	Two calendar months
Driving License	Class B
Work Permit	HSM Visa (till 2026)

Key competences

Programming Languages	MATLAB/Simulink (4+ years), Python (3+ years), C++ (1 year), ROS (2+ years)
OS	MS Office (5+ years), Linux (3+ years), Windows (3+ years)
Management Tools	JIRA (3+ years), Git (3+ years), Github (3+ years), Bitbucket (3+ years), Polarion (3+ years), IBM Doors, Jenkins (3+ years)
Hardware	Microcontrollers, GPS RTK system
CAE software	ANSYS (2 years)
CAD software	Catia (2 years), Creo (2 years),
Other software	dSPACE tools, Siemens Prescan, Autoware Auto, ROS, Vector tools (CANoe & CANalyzer)
Methodologies/Norms/Standards	ISO 26262, Agile methodology, V model, ASPICE, AUTOSAR, BDD, ROS, Sensor fusion algorithms
Authorizations/Certifications	TMap certified test engineer Nanodegree on self-driving cars (UDACITY)
People Skills	Stakeholder management, Team Collaboration, Agile Leadership

Contact: **Manojpriyadharson Kannan**
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AUTONOMOUS SYSTEMS & SW DEVELOPMENT PROJECTS

UDACITY NANODEGREE ON SELF DRIVING CARS | October 2024 - Present | Expected Completion Date: April 2025 |

- Probabilistic Robot Localization Simulation
  - Implemented Bayesian localization for robot navigation using color-based sensing.
  - Developed a belief update system to handle sensor noise and motion uncertainty.
  - Utilized Python, NumPy, and Matplotlib for visualization.
  - Applied concepts from probabilistic robotics and sensor fusion.
- Kalman Filter for Object Tracking
  - Designed a tracking system using Lidar sensor data and a Kalman filter.
  - Generated synthetic vehicle motion data with velocity, acceleration, and position.
  - Implemented filtering techniques to reduce noise and enhance measurement accuracy.
  - Compared ground truth, raw Lidar data, and Kalman filter outputs via visual analysis.
- A* path planning algorithm
  - Developed a modular Python implementation of A* search for optimal pathfinding.
  - Implemented helper functions dynamically within a PathPlanner class.
  - Integrated test cases and map visualization for validation.
- Traffic Light Classifier using Computer Vision
  - Implemented HSV-based color classification for traffic light recognition.
  - Standardized and preprocessed images to improve accuracy.
  - Applied computer vision techniques for real-time classification.
  - Evaluated performance with misclassification analysis.
- CRC-Based Data Integrity Mechanism for Automotive UART Communication
  - Designed and implemented a CRC-8 SAE J1850-based error detection mechanism for UART communication in automotive ECUs.
  - Developed a Python prototype for rapid testing and validation before porting to an embedded system.
  - Evaluated error detection performance against various data corruption scenarios, ensuring reliable data integrity.
  - Optimized the implementation for minimal computational overhead, making it suitable for real-time applications.
- Extending prior research in autonomous driving for articulated vehicles in constrained spaces
  - Path planning algorithm redesign: Leveraging Model-Based-Design (MBD) principles to create a modular and reusable framework, with ongoing integration of machine learning techniques to optimize computational efficiency.
  - Modular Framework Development: Building a standardized architecture for path planning and obstacle avoidance, enabling easy customization for various vehicle types and operational domains.

Link to the above projects could be found in the following link: Udacity_Projects | Path_Planner\Research

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INDUSTRY EXPERIENCE

Technical Consultant | August 2021 - Present | 3+ years | Eindhoven, The Netherlands

Digital twin Development of ASML machine

- **Developed and optimized digital twin plant models** of cutting-edge lithographic machines in MATLAB Simulink, adhering to MAAB guidelines, which led to a 20% improvement in simulation accuracy and ensured high-fidelity results.
- Designed and implemented **control strategies for closed loop simulations** of lithographic machine subsystems, ensuring alignment with system requirements and enhancing overall performance.
- Generated optimized **C/C++ code** from Simulink models for integration into Software-in-the-Loop (SIL) frameworks, bridging high-level modeling with embedded software testing.
- Analyzed low-level code to extract functionality and implemented equivalent behavior in high-level Simulink models, improving model accuracy and system understanding.
- Conducted in-depth **requirements analysis** and translated system requirements into actionable user stories in JIRA, aligning team deliverables with stakeholder expectations and boosting team productivity.
- Enhanced software reliability through **Model-in-the-Loop (MIL)** and **Software-in-the-Loop (SIL)** testing within the V-model, coupled with **TMap methodology**, ensuring compliance with industry standards.
- Automated model and machine interactions using **Python scripts**, reducing manual effort, increasing configurability, and improving testing efficiency by over 30%.
- Delivered key simulation features and comprehensive release notes under a rigorous three-month release plan, showcasing effective resource management and timely delivery of high-quality results.
- Leveraged **GitHub** for version control, **CI/CD** pipelines, and **Polarion** for maintaining requirements, design decisions, and other artifacts, promoting consistent project documentation and efficient collaboration.
- Collaborated with developers to expand the **BDD framework** for functional testing, improving test case accuracy and ensuring alignment with both business and system requirements.

Autonomous Valet parking system – Capgemini Automotive

- Enhanced the Stanley controller code, improving application performance, scalability, and reliability, significantly elevating the efficiency of the autonomous parking system within a short development lifecycle.
- Integrated PreScan scenarios with Autoware Auto using ROS for sensor simulation and autonomous driving logic, developing custom maps and routes to thoroughly test and validate vehicle behavior in varied environments.
- Configured and validated HIL setup by seamlessly linking PreScan, Autoware Auto, and the RCU, ensuring smooth operation, synchronization, and reliability of the entire autonomous driving system.
- Applied Scrum methodology throughout the project lifecycle, leveraging tools such as JIRA and GIT for agile project management and version control, while maintaining a solid understanding of Linux environments.

Digital twin project - Racetrack

- Contributed to the development and testing of a digital twin for a racetrack, enhancing Python-based virtual simulations for improved performance and accuracy, while utilizing 2D visualizations to depict car positioning.
- Developed comprehensive test plans, scripts, and use cases, ensuring thorough system evaluation, while adhering to Scrum methodology and utilizing JIRA and GIT for agile project management.

Student Researcher | 03/2020 – 01/2021 | Arnhem, The Netherlands

HAN Automotive Research Institute

Autonomous docking manoeuvring of articulated vehicles in the presence of obstacles

- Developed and optimized a bi-directional path planning algorithm for autonomous docking of articulated vehicles in confined areas, using A* search and lattice-based motion planning.
- Designed and improved motion primitive libraries to enhance computational efficiency and reduce final pose error in path planning.
- Implemented advanced heuristic functions incorporating spatial obstacle information for optimized path cost estimation.
- Integrated static and dynamic obstacle avoidance modules ensuring collision-free path generation, including consideration of moving vehicles with rectilinear motion.
- Conducted real-world benchmark tests at a distribution center using GPS-RTK to study and replicate driver maneuvers for realistic validation.
- Validated path planning and tracking algorithms in both simulation (MATLAB/Simulink) and scaled model environments to ensure robust performance.
- Applied kinematic vehicle modeling techniques to enable low-speed, precise maneuvering of articulated vehicles.
- Collaborated with HAN Automotive Research (HAN-AR) to advance automation in logistics through innovative Connected and Automated Transport (CAT) solutions.

Early career: Design Engineer Researcher | 02/2016 – 09/2017 | Chennai, India
Caresoft Global Private Limited

ACADEMIC PROJECTS

HAN-UAS, Arnhem, The Netherlands (Sep 2019 – Jan 2020)
Vehicle Vertical Dynamics Modeling and Analysis

- Developed a half-car vertical dynamics model in MATLAB/Simulink to analyse suspension performance.
- Derived and implemented the rear axle suspension system dynamics, combining air spring and leaf spring characteristics using differential equations.
- Conducted experimental validation through vehicle testing, including real-time data acquisition and post-processing to ensure model accuracy.
- Evaluated vertical dynamic response to determine the optimal speed for traversing road bumps, improving ride comfort and vehicle stability.

HAN-UAS, Arnhem, The Netherlands (Sep 2019 – Jan 2020)
System Identification and Temperature Control Design

- Performed system identification using black-box and grey-box modeling techniques to determine the transfer function of a room temperature control system.
- Designed and implemented a feedback control system with specified transient and steady-state characteristics, ensuring precise temperature regulation.
- Validated system performance through simulation and experimental testing.

Czech Technical University, Prague, Czech Republic (Mar 2019 – May 2019)
Suspension System Design and Structural Analysis

- Engineered a rear-driven double-wishbone suspension system with helical springs for a saloon car, adhering to specified load and performance criteria.
- Simulated vertical dynamic response using a quarter-car model to analyze suspension behavior under bump negotiation scenarios.
- Conducted finite element analysis (FEA) on critical suspension components to evaluate stress distribution, deformation, and safety factors under operational loads.

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