

# FRANCIS JOSEPH

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## WORK

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**Engineer** AutoX, San Jose, CA

July 2018 - Present

Tech lead for the prediction module running on the car.

Deployed trajectory prediction deep learning models in C++ to run using TensorRT.

Trained deep learning models for predicting obstacle trajectories.

Architect of a unified dataset for multi model training and evaluation.

Tech lead for the Hybrid project (Remote assistance to AI)

Developed the occlusion detection and handling of occlusion in planning.

Wrote a dynamic routing strategy for pullover and entering parking lots.

Improved mapping of decision boundaries for obstacles in the planning problem.

Wrote an asynchronous interface for parsing sensor inputs to perceive the environment.

**Intern** PlusAI, Palo Alto, CA

June 2017 - September 2017

Built a data driven model to calibrate steering of the autonomous vehicle parameterized over speed.

Wrote an ACC controller in C++ to handle highway driving with the control law handling cut-in of vehicles.

**Software Engineer** ESI, Bengaluru, India

August 2012 - July 2016

Developed features for the pre-processor for a finite element method solution involving linear algebra.

Worked on applying transformations to loads onto meshed surfaces.

Wrote run-time code in C++ and python for automated testing scripts.

## EDUCATION

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**Master of Science** University of California San Diego

September 2016 - June 2018

Course Work: Principles of Artificial Intelligence: Probabilistic Reasoning and Decision Making, Estimation and Sensing, Linear Control Systems, Optimal Control, Robot Manipulation, Robot Motion Planning, Design and Analysis of Algorithms

**Bachelor of Engineering** PES Institute of Technology, Bengaluru, India

September 2008 - June 2012

Course Work: Computer Programming, Kinematics of Machinery, Automotive Transmissions, Design of Machine Elements, Operations Research

## PROJECTS

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**Learning based approach to control a self-assembling robot**

September 2016 - June 2018

Manufactured the self-assembling robot whose manufacturing process was published in IROS 2017.

Determined one step prediction using Gaussian and Neural network function approximation.

Compared closed loop PID with a MDP using the learned model for trajectory tracking.

**Autonomous Mail Delivery**

January 2018 - June 2018

Bring up Autoware with Dataspeed drive by wire unit.

Built 3D maps and semantic maps offline using NDT matching and used the same algorithm for localization.

Wrote and tuned a throttle, brake and steering controller with a dp planner for trajectory following.

**Learning Control of a Two-Link Arm**

April 2017 - June 2017

Learned the controls of two link arm without knowledge of the model of the arm using DDPG.

Optimized the network to learn in less than 10,000 random demonstrations using MuJoCo for simulation.

## SIDE PROJECTS / SKILLS / SOFTWARE

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- Gaussian model to detect red barrels • Kalman filter to track the pose of the camera • Particle filter to localize and map for SLAM • Strain sensors to map internal coral reef • RRT & RRT\* planner for a 2D configuration space • JPS incremental planner for a 2D space • Contribute to Autoware and Apollo open source projects • Scrape public data on mutual funds for investment insights
- C++ • Python • MATLAB • CMake • Bazel • ROS • ROS2 • gRPC • Docker •  $\text{\LaTeX}$  • GIT • SVN • Pybullet
- OpenAI Gym • MuJoCo • Pytorch • TensorRT • Onnx • Eigen • OpenCV