Justin Poh (he/him)

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EDUCATION

Massachusetts Institute of Technology   Cambridge, MA
Ph.D. in Aeronautics and Astronautics   December 2024
>   Thesis: A Systems-Theoretic Framework for Safety-Driven Development of System Architectures
>   (Advisor: Prof. Nancy Leveson)

Master of Science in Aeronautics and Astronautics   February 2022
>   Thesis: A Top-Down, Safety-Driven Approach to Architecture Development for Complex System
>   (Advisor: Prof. Nancy Leveson)

Franklin W. Olin College of Engineering   Needham, MA
Bachelor of Science in Mechanical Engineering   May 2016

INDUSTRY EXPERIENCE

Aptiv and Motional (Hyundai-Aptiv Joint Venture)   Boston, MA
Engineer III, Vehicle Systems Engineering   January 2018 – July 2020

- Led a team of systems engineers to work with the product management team to define product-level requirements for the company's next generation of autonomous vehicle.
- Generated vehicle system-level requirements and developed functional and physical architectures based on the product-level requirements with inputs from safety and cybersecurity teams.
- Led the development of hardware and software requirements, state machine behavior (including failure mitigation and failover behavior), and interface definitions for the radar and vision subsystems on the vehicle. These were developed in collaboration with perception team software engineers and used to inform development conversations with component and chip suppliers.
- Worked with cybersecurity team to define software and component requirements needed to enable secure on-vehicle communications and secure over-the-air software updates for components.
- Developed hardware and software requirements for an on-vehicle power management device, resulting in an issued patent. Device was also built and deployed on vehicles.
- Used Polarion to document requirements and Enterprise Architect to model system architectures in SysML.
- Developed and performed acceptance tests for hardware and software received from suppliers to ensure requirements were met and verify their behavior when integrated with the rest of the system.
- Led a team of engineers to develop a diagnostic and vehicle commissioning tool to allow technicians and other engineers to quickly gather data about the health and configuration of the various components on the vehicle.

nuTonomy (Acquired by Aptiv in 2017)   Boston, MA
Autonomous Vehicle Engineer, Vehicle Engineering   August 2016 – December 2017

- Performed on-vehicle testing and debugging of the autonomous driving software.
- Performed troubleshooting of the compute hardware, sensors, power systems, and networks on the vehicle and identified design changes to prevent identified problems from occurring in the future.
- Contributed to the development of processes for evaluating software bugs or behavioral problems identified during on-road testing to assist software development teams in identifying potential fixes.
- Developed several software improvements to the on-vehicle health monitoring software to provide better feedback to safety operators who monitor the vehicle's behavior during operation.

RESEARCH EXPERIENCE

Massachusetts Institute of Technology   Cambridge, MA
Graduate Research Assistant – Air Traffic Management Architecture Development   January 2022 – December 2024

- Developed the Safety-Driven Architecture Development Framework (SDADF), a framework that helps system architects to develop the functional architecture for a system based on safety and other considerations.
- Framework provides structured processes for using STPA (a hazard analysis method) to create and compare potential architecture options for a system to identify the safety-related benefits and tradeoffs between them.

- Applied SDADF iteratively to develop and refine an air traffic management system architecture for enabling urban air mobility (UAM). Over two design iterations, the requirements and architecture for an adaptive collision avoidance system were developed to allow ground-based air traffic management to work with pilots to collectively prevent collisions.
- Early results of this research were presented in a conference paper at ICRAT 2024.

Graduate Research Assistant – Advanced Rotorcraft Architecture Development   September 2020 – January 2022
- Developed an initial systems-theoretic approach to architecture development to define how to use STPA results to inform the development of a system architecture (approach described in Masters thesis).
- Applied this initial approach to develop the system requirements and pilot-automation architecture for an advanced rotorcraft intended to be flown in degraded visual environments (DVEs) (e.g. heavy rain/snow, fog).
- Demonstrated how system safety, human factors engineering, and software design considerations can be accounted for in an integrated manner during both hazard analysis and design of the rotorcraft architecture.
- Developed and compared 3 pilot-automation architecture options representing different levels of flight autonomy to demonstrate how this approach can help system architects decide on appropriate function allocations for the pilots and automation in the system.
- Conference paper on the human factors engineering contributions of this research will be presented at the 2025 International Symposium on Aviation Psychology.

Franklin W. Olin College of Engineering   Needham, MA
Research Assistant – Development of Autonomous System for a Ground Vehicle   September 2015 – May 2016
- Led a research group to modernize a John Deere utility vehicle serving as a robotics test bed. Updated drive-by-wire software was developed and new hardware and software implemented to generate depth-registered images of the scene in front of the vehicle for use in future obstacle and terrain detection algorithms.
- Implemented drive-by-wire capability using the Robot Operating System (ROS) and performed field testing of new hardware and software added to the vehicle.

TEACHING EXPERIENCE
Massachusetts Institute of Technology   Cambridge, MA
Graduate Teaching Assistant – System Safety Concepts   September 2022 – December 2022
- Teaching assistant for introductory graduate-level course on System Safety. Course introduces students to accident analysis and hazard analysis, including CAST for accident/incident analysis and STPA for hazard analysis.
- Reviewed student submissions for their STPA and CAST class projects and provided feedback to students.

PUBLICATIONS
J. Poh, N.G. Leveson, R.A. Copeland, "Designing Safe Highly Automated Human-Machine Systems Using An STPA-Based Approach: A Case Study", International Symposium on Aviation Psychology (ISAP), May 2025

J. Poh, N.G. Leveson, N.A. Neogi, "A Safety-Driven Approach to Exploring and Comparing Air Traffic Management Concepts for Enabling Urban Air Mobility", Proceedings of the International Conference on Research in Air Transportation (ICRAT), July 2024.

PATENTS
US Patent US-11513488-B2, "Controlling Power of Electronic Devices on a Vehicle," Nov 29, 2022.

SELECTED GRADUATE COURSE PROJECTS
Massachusetts Institute of Technology   Cambridge, MA
Pick and Place Robot – Principles of Autonomy and Decision Making Class Project   November – December 2022
- Developed a simple activity planner, motion planner, and trajectory optimizer to enable a simulated pick-and-place robot to navigate a kitchen environment to place items in required positions.

Functional Architecture for a Satellite Constellation – Space Systems Engineering Class Project   February – May 2022
- Developed the functional architecture for a non-geostationary satellite constellation to provide broadband internet to users. System requirements were developed and used to define the functions and interactions needed to adequately and safely monitor and control the constellation.