# Parth Ganeriwala, Ph.D.

RESEARCH SCHOLAR

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## Summary

Ph.D. in Computer Science (Florida Institute of Technology, 2026) researching formal verification and assurance of learning-enabled, safety-critical autonomous systems, spanning transfer learning, cognitive-architecture verification, and computer vision for aviation. Author of 34 publications (30 accepted, including NASA Formal Methods, IEEE SysCon, AIAA, and CVPR/ICCV workshops) supported by NASA-, DARPA-, and NAVAIR-funded research. Advises graduate and undergraduate researchers on transfer learning and assurance frameworks for autonomous aircraft systems, and serves as an invited reviewer for NeurIPS, ICML, and ICLR.

## Education

**Florida Institute of Technology** — *Melbourne, Florida*
**PH.D. IN COMPUTER SCIENCE: GPA - 4.0/4.0** — *January 2023 – May 2026*

- Research Interests: Formal Methods, Artificial Intelligence, Machine Learning, Deep and Transfer Learning, LLMs and Automation
- *Dissertation:* **What is Common Knowledge Across Domains? Investigating Shared Representations in Transfer Learning** *(Advisor: Dr. Siddhartha Bhattacharyya)*
- Honors: **Outstanding Student of the Year** (Honors Convocation 2025); Inducted Member of **Phi Kappa Phi**

**Florida Institute of Technology** — *Melbourne, Florida*
**M.S. IN COMPUTER SCIENCE: GPA - 4.0/4.0** — *May 2022 – December 2023*

- Core subjects: Artificial Intelligence, Database Systems, Formal Methods, Advanced Software Engineering, Speech Recognition.

**Birla Institute of Technology and Science, Pilani** — *Dubai, United Arab Emirates*
**B.E. IN COMPUTER SCIENCE: GPA - 3.5/4.0 (CONVERTED FROM CGPA)** — *August 2018 – December 2021*

- Thesis: *ERF-CondLaneNet: an Ego Car Lane Detection Framework*

## Publications

**Why Trust Machine Learning? Evolution of Trustworthiness Debt Leveraging Trustworthiness Attributes** — *Under Review*
KMAL FARABI, A PRITCHETT, M SYNBORSKI, J LIU, M CARROLL, M NAMUKASA, N MANNING, R SEN, MAH KHAN, **P GANERIWALA**, S BHATTACHARYYA, S RAY, S BHUNIA, M MAHMOUD, A HOMAIFAR, P KEBRIA, M PAVONE, M GANAI AND C LIU — *AAAI 2027*

**It Is Not the Model, It Is the Input: Test-Time Input-Space Refinement for Few-Shot Segmentation** — *Under Review*
MAH KHAN, **P GANERIWALA**, A ALVAREZ AND S BHATTACHARYYA — *AAAI 2027*

**Surveying the Landscape of Transfer Learning: Common Knowledge and Beyond** — *Under Review*
**P GANERIWALA**, N NEOGI AND S BHATTACHARYYA — *IEEE Trans on Pattern Analysis and Machine Intelligence*

**Formalizing Natural Language Specifications for MBSE with an NLP-Based Grammar for Automated System Architecture Generation** — *Under Review*
C CHAMBERS, **P GANERIWALA**, S MUELLER, S BHATTACHARYYA AND C SEN — *IEEE Systems Journal*

**VIROPLEX: A GNN-Driven Assessment of the Pandemic Potential of Zoonotic Bat Viruses**
A AGNIHOTHRAM, **P GANERIWALA**, AND S BHATTACHARYYA — *IEEE ICTAI 2026*

**Formal Analysis of Stochastic Cognitive Models: A Translation Framework from Soar to PRISM**
**P GANERIWALA**, C CHAMBERS, JI LATHROP, S BHATTACHARYYA, J BABAR, S GILBERT, I AMUNDSON, M DORNEICH AND MAH KHAN — *NASA Formal Methods 2026*

**Compositional Reasoning over System Architectures with Integrated Cognitive Model**
**P GANERIWALA**, C CHAMBERS, S BHATTACHARYYA, I AMUNDSON, AND J BABAR — *IEEE SysCon 2026*

**Correlation-Threshold Feature Selection for Internet of Things (IoT) Device Identification under Domain Shift**
A DHANAWADE, **P GANERIWALA**, AND S BHATTACHARYYA — *ISAIM 2026*

**AssistTaxi-v2: A Scalable Dataset for Taxiway/Runway Scene Understanding Under Diverse Conditions**

**P GANERIWALA**, MAH KHAN, A ALVAREZ, S BHATTACHARYYA, N NEOGI AND S LEHMAN — *AIAA SciTech 2026*

**Explainable Assurance through Compositional Verification with Cognitive Models**

**P GANERIWALA**, C CHAMBERS, S BHATTACHARYYA, AND J BABAR — *IEEE RTSS/ESRA 2025*

**Evaluating LLM Translation for Prompt-Enhanced ACT-R and Soar Models**

**P GANERIWALA**, S WU, S BHATTACHARYYA AND F RITTER — *BRIMS 2025*

**Enabling Formal Verification in a Common Model of Cognition**

**P GANERIWALA**, M MATSUMURO, F RITTER AND S BHATTACHARYYA — *BRIMS 2025*

**Integrating Reconfigurable Accelerators with Quantum Computing**

PRATIBHA, **P GANERIWALA** AND N MAHMUD — *IEEE QCE QCore Workshop 2025*

**Adapt, But Don't Forget: Fine-Tuning and Contrastive Routing for Lane Detection under Distribution Shift**

MAH KHAN, **P GANERIWALA**, S LEHMAN, A ALVAREZ, S BHATTACHARYYA AND N NEOGI — *ICCV 2COOOL Workshop 2025*

**AI Driven Differentiation and Quantification of Metal Ions Using ITIES Electrochemical Sensors**

M AHMED, **P GANERIWALA**, A SAVVIDOU, N BREEN, S BHATTACHARYYA, P PATHIRATHNA — *Journal of Sensor and Actuator Networks 2025*

**FLAIR: Few-Shot Learning for Grapheme Recognition in Ancient Scripts**

**P GANERIWALA** AND D MITRA — *CVPR SINT4CH Workshop 2025*

**Few-Shot Learning for Grapheme Recognition in Ancient Scripts**

**P GANERIWALA** AND D MITRA — *ACM Journal on Computing and Cultural Heritage 2025*

**Can Someone Prove Your Operator Won't Get Distracted? A Gentle Introduction to Formal Methods in Human Factors**

S GILBERT, **P GANERIWALA**, J LATHROP, A NEWENDORP, S FIEFFER, P WU, I AMUNDSON, C CHAMBERS, A KOHL, S KHAN, M SANAEI, J BABAR, T WANG, D MUSLINER, R GOLDMAN, J GOTTLIEB, E WINER, M DORNEICH AND S BHATTACHARYYA — *HFES 2025*

**Modeling and Formal Analysis of High-Assurance Mixed-Reality Systems**

I AMUNDSON, J BABAR, H HERENCIA-ZAPANA, S F ROLLINI, B BRUSSEE, P WU, T WANG, D MUSLINER, R GOLDMAN, J GOTTLIEB, A NEWENDORP, A KOHL, S FIEFFER, S KHAN, M SANAEI, M MUSCALA, S GILBERT, E WINER, M DORNEICH, J LATHROP, **P GANERIWALA**, C CHAMBERS AND S BHATTACHARYYA — *AIAA DATC/IEEE DASC 2025*

**Systems Engineering with Architecture Modeling, Formal Verification and Human Interactions for Learning-Enabled Autonomous Agent**

**P GANERIWALA**, R JONES, M MATESSA, S BHATTACHARYYA, J DAVIS, S ROLLINI, H PUROHIT, N NEOGI — *INCOSE Systems Journal*

**Design and Validation of Learning Aware HMI for Learning-Enabled Increasingly Autonomous Systems**

**P GANERIWALA**, M MATESSA, S BHATTACHARYYA, R JONES, J DAVIS, P KAUR, S ROLLINI, N NEOGI — *IEEE SysCon 2025*

**Automating Physics-Based Reasoning for SysML Model Validation**

C CHAMBERS, S MUELLER, **P GANERIWALA**, S BHATTACHARYYA AND C SEN — *IEEE SysCon 2025*

**Runway vs. Taxiway: Challenges in Automated Line Identification and Notation Approaches**

**P GANERIWALA**, A ALVAREZ, A ALQAHTANI, S BHATTACHARYYA, MAH KHAN, N NEOGI — *IEEE SysCon 2025*

**Exploring Machine Learning Engineering for Object Detection and Tracking by Unmanned Aerial Vehicle (UAV)**

A GUNA, **P GANERIWALA**, AND S BHATTACHARYYA — *IEEE ICMLA 2024*

**ALINA: Advanced Line Identification and Notation Algorithm**

MAH KHAN, **P GANERIWALA**, S BHATTACHARYYA, N NEOGI AND R MUTHALAGU — *CVPR VDU Workshop 2024*

**AssistTaxi: A Comprehensive Dataset for Taxiway Analysis and Autonomous Operations**

**P GANERIWALA**, S BHATTACHARYYA, S GUNTHER, B KISH, MAH KHAN, A DHADOTI AND N NEOGI — *IEEE ICMLA 2023*

**Towards Knowledge Extraction and Parsing of XML Metadata for SysML System Architecture Modeling**

C CHAMBERS, **P GANERIWALA**, S BHATTACHARYYA, C SEN AND N NUR — *IEEE UEMCON 2023*

**Automated Framework to Extract Software Requirements from Source Code**

C MISKELL, R DIAZ, **P GANERIWALA**, K SLHOUB, F NEMBHARD — *ACM NLPIR 2023*

**Assuring Learning-Enabled Increasingly Autonomous Systems (ALEIAS)**

N NARAYAN, **P GANERIWALA**, R JONES, M MATESSA, S BHATTACHARYYA, J DAVIS, H PUROHIT AND S ROLLINI — *IEEE SysCon 2023*

**IPAssess: A Protocol-Based Fingerprinting Model for Device Identification in IoT**

**P GANERIWALA**, S NANDANWAR, A GUPTA, S BHATTACHARYYA AND R MUTHALAGU — *SAI IntelliSys 2023*

**Cross Dataset Analysis and Network Architecture Repair for Autonomous Car Lane Detection**

**P GANERIWALA**, S BHATTACHARYYA AND R MUTHALAGU — *IEEE Intelligent Vehicles Symposium (IV) 2023*

**Functional Reasoning of System Architecture in the System Modeling Language (SysML) With XML Representation**

**P GANERIWALA**, C CHAMBERS, C SEN AND S BHATTACHARYYA — *ASME IDETC-CIE 2023*

**Modeling IoT Behavior for Enforcing Security and Privacy Policies**

A GUPTA, D CAMPOS, A DCOSTA, **P GANERIWALA**, S BHATTACHARYYA AND T OCONNOR — *SAI Computing Conference 2022*

**Toward Generating System Architecture and Formal Functional Description in the Architecture Analysis & Design Language (AADL) With Structured Natural Language**

A CHAUHAN, **P GANERIWALA**, C SEN AND S BHATTACHARYYA — *ASME IDETC-CIE 2022*

# Experience

### Software and Systems Engineering, Avidyne — *Melbourne, FL*

SOFTWARE ENGINEER II — *May 2026 – Present*

- Design and implement **embedded C++ software** for avionics flight display systems, spanning **operating system services**, **device drivers**, and **touchscreen-based user interfaces**.
- Verify embedded software correctness through **unit and integration testing**, supporting **DO-178C** and **FAA** certification audits.
- Led testing for the **Vantage 12 major software release** (**60 tests across 2 hardware configurations**), cutting the release cycle by **67%** compared with the previous minor release.
- Co-create an internal **Claude Code toolkit** for **DO-178C** certification work (reusable skills for requirements lookup, traceability audits, and AI-graded test logs), adopted by **5 engineers**; built an AI test-log grading workflow targeting ∼**20 minutes** of manual review per run.
- Mentor **6 early-career engineers**, including **4 interns**, guiding onboarding and technical growth.

SOFTWARE ENGINEER INTERN / CO-OP — *May 2025 – May 2026*

- Expanded **end-to-end (E2E) test and evaluation (E2TE)** coverage across navigation, communication, flight management, and flight display systems, increasing overall test coverage by ∼**25%**.
- Developed, integrated, and debugged **C-based flight software** in the avionics stack, supporting compliance with real-time, safety-critical **DO-178C** guidelines for production-ready systems.
- Built **30+ system-level and flight-specific test cases** and **TFC (Test For Credit)** software tests, reducing initial verification cycle time by **10%**.
- Merged product test libraries across multiple avionics platforms, creating unified cross-product testing infrastructure that improved code reusability and maintenance efficiency by ∼**30%**.
- Enhanced automation capabilities by developing C and Visual Basic test scripts for complex regression and validation processes, accelerating simulation turnaround by 20% and enabling seamless cross-product test execution.
- Executed hardware-in-the-loop simulations using proprietary avionics simulation frameworks, diagnosing and resolving complex execution issues to improve simulation-to-aircraft fidelity by ∼**10%**.
- Supported flight code development for Avidyne's Quantum Open Avionics Platform, supporting rapid prototyping of next-generation avionics solutions and enabling faster deployment cycles.
- Automated initial regression processes by writing Visual Basic test scripts, improving basic simulation validation efficiency by ∼**15%**.

### ASSIST Research Lab, Florida Institute of Technology — *Melbourne, FL*

RESEARCH SCHOLAR — *August 2021 - Present*

- Working with a team of research professionals for formal methods of verification and run-time assurance, ML, IoT, robotics, and cyber security.
- Helped develop **research proposals with professors** on diverse topics, including cognitive agents on human behavior, the assurance of artificial intelligence in safety-critical systems, and the fine-tuning of LLMs for domain-specific queries.
- Collaborating on NASA's ***University Leadership Initiative (Round 8)*** as part of a **Florida Tech**-led multi-university/industry team to develop a framework for **trustworthy, increasingly autonomous aviation safety systems**; partners include ***Penn State, NC A&T State, UF, Stanford, Santa Fe College, Uni of New Mexico, Collins Aerospace, and ResilienX***; part of awards totaling up to $6.9M over three years.
- Modeling human cognitive behavior representation formally with respect to cyber-sickness in AR/VR systems, with ***Collins Aerospace, Iowa State University, RTX Technologies Research Center (RTRC), and Smart Information Flow Technologies (SIFT)***, funded by ***DARPA***.
- Applied **Large Language Model (LLM) translation** to cognitive architectures with ***Penn State University***, focusing on enhancing the integration of LLMs to facilitate communication and knowledge transfer within cognitive systems.
- Developing a modeling approach for designing, maintaining, and supporting air and sea platform fiber optic communications technology with ***Critical Frequency Design***, funded by ***Naval Air Systems Command***.
- Formally verifying the autonomous agent to assure safety as well as the logical correctness of the safety-critical system, with ***Rockwell Collins and Soar Tech***, funded by ***NASA***.

- Advising a Ph.D. student and undergraduate students on transfer learning, automated data labeling, and assurance frameworks for vision-based classification in autonomous aircraft systems funded by ***NASA***, addressing safety and reliability challenges in aviation technologies.
- Advised **4 groups of computer science students** on the design, development, and deployment of software for their senior projects
- Mentoring **20–30 undergraduate and high school students** on machine learning engineering approaches in the aerospace and systems domains, leading to **11 publications** that addressed real-world challenges in these fields.
- Investigated the development of a **cognitive-enhanced agent** for automatically piloting aircraft in dense urban environments which emphasized safe and reliable takeoff/landing among aerial traffic without human intervention.
- Created **AssistTaxi**, a novel dataset for runway and taxiway analysis published at IEEE ICMLA 2023 and extended as AssistTaxi-v2 (AIAA SciTech 2026), contributing to autonomous operations.
- Developed an **autonomous aircraft perception system** for accurately detecting and labeling line markings on an airport taxiway.
- Assisted with the **formulation of quizzes and homework projects** for the courses: Python, Database Systems, Web Applications, Big Data and Management, and Software Metrics.

**L3Harris Institute for Assured Information, Florida Institute of Technology** ***Melbourne, FL***

GRADUATE RESEARCH ASSISTANT ***May 2024 – June 2024***

- Developed a **decentralized framework** enabling **multiple autonomous agents**—robotic dogs, drones, and mobile robots—to coordinate, communicate, and reach shared goals.
- Collaborated with **developers and professors** to rigorously test the system in both **simulation** and **real-world environments**.

**IRI Research, Florida Institute of Technology** ***Melbourne, FL***

IRI RESEARCH DEVELOPER ***May 2023 - July 2023***

- Proposed and **implemented a framework using AI language models** to automatically extract software requirements from source code.
- Supervised and coordinated with undergraduate students towards the development process.

## Honors & Awards

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| 2025 | **Top Reviewer**, NeurIPS 2025 | *San Diego, CA* |
| 2025 | **Outstanding Student of the Year**, Honors Convocation, Florida Institute of Technology | *Melbourne, FL* |
| | **Inducted Member**, Phi Kappa Phi | |

## Program Committees

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| 2025 | **Invited Reviewer: Top Reviewer**, NeurIPS 2025 | *San Diego, CA* |
| 2024 | **Invited Reviewer**, NeurIPS 2024 | *Vancouver, Canada* |
| 2025 | **Invited Reviewer**, International Conference on Machine Learning (ICML) 2025 | *Vancouver, Canada* |
| 2025 | **Invited Reviewer**, International Conference on Learning Representations (ICLR) 2025 | *Singapore EXPO* |
| 2023–25 | **Invited Reviewer**, IEEE International Conference on Machine Learning and Applications (ICMLA), 22nd–24th editions | *Jacksonville, Miami, Boca Raton, FL* |
| 2023–26 | **Invited Reviewer**, Behavioral-Cultural Modeling & Prediction and Behavior Representation in Modeling and Simulation (18th, 2025); 2023 American Control Conference; and four international conferences on AI and engineering (2024–2026) | |

## Skills

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| **Programming** | Java, C/C++, Python, Visual Basic, Bash, MATLAB, LaTeX |
| **Data Analytics** | Jupyter, pandas, Dask, Statsmodels, Seaborn, MySQL, MongoDB, MySQL Workbench, Neo4j, Elasticsearch |
| **Machine Learning Libraries** | scikit-learn, XGBoost, OpenCV, nltk, pandas, scipy |
| **Deep Learning / LLMs** | TensorFlow, PyTorch, Keras, CUDA, TensorRT, BERT, GPT, Hugging Face Transformers, Hugging Face Accelerate, PEFT/LoRA, LangChain, LlamaIndex, Claude Code |
| **Cloud & MLOps** | AWS (S3, SageMaker, EC2), Ray, Weights & Biases, MLflow |
| **Formal Verification** | NuSMV/nuXmv, Uppaal, AGREE, PRISM, TLA+ - Coq (Class Projects) |
| **Robotics & Systems Engineering** | Robot Operating System (ROS), AADL, SysML, Gazebo, RViz, Agile Software Development |
| **Other Tools** | Docker, Git, Perforce, GitHub Actions, NLP Modules, SparkAR Studio, Android Studio, Arduino |