Ranjani Narayanan

https://www.linkedin.com/in/ranjanin2

Portfolio: ranjanin.com

Email : rnarayanan35@gatech.edu

OrciD: 0000-0003-4351-6501

Mobile : +1 (908)-340-7845

EDUCATION

Doctor of Philosophy (Ph.D.) in Electrical and Computer Engineering Aug 2021 – 2026 (Expected)
Georgia Institute of Technology, Atlanta

Dissertation: *Investigating a human-centered approach towards supporting Shared Mental Models in hierarchical human-agent teams for decision making.*

Advisor: Prof. Karen Feigh

Master of Science (MS) in Electrical Engineering Aug 2019 – May 2021
University of Pennsylvania, Philadelphia **GPA:** *3.8/4.0*

Bachelor of Technology (B.Tech) in Electrical Engineering Aug 2015 – May 2019
Sardar Patel College of Engineering, Mumbai **GPA:** *9.3/10.0*

RESEARCH EXPERIENCE

Graduate Research Assistant- Georgia Institute of Technology Atlanta, GA
Advised by Prof. Karen M. Feigh, Cognitive Engineering Center *Feb 2022 - Present*

- Designed and executed IRB-compliant, controlled human-in-the-loop studies to **investigate the causal effects of AI-driven interventions on user behavior and performance**. Applied human factors and cognitive engineering methods, including heuristic evaluations and cognitive walkthroughs, to **iteratively develop and refine research hypotheses.**
- Developed and maintained **multi-modal data collection and processing pipelines** using process-tracing techniques.
- **Created and validated human-centered evaluation metrics** to measure human-AI team effectiveness, trust calibration, reliance behaviors, workload, and decision-making performance within AI-supported systems.
- Utilized **statistical inference, mixed-effects modeling, and regression analyses** to **evaluate behavioral outcomes and team-level performance impacts** of AI system designs.
- **Translated empirical findings into clear, actionable insights** that informed the design and improvement of AI-assisted workflows and decision-support systems.
- **Published 8+ peer-reviewed papers** in leading international journals and conferences, contributing to interdisciplinary research at the intersection of cognitive science, human-AI interaction, and AI.
- **Co-led the development of a successful three-year research grant proposal**; communicated project plans and progress through written reports and presentations to stakeholders at the Office of Naval Research on annual and biannual cycles.

INDUSTRY EXPERIENCE

GE Aerospace Research Niskayuna, NY
AI Fellow- Intern *June - Aug 2025*

- Created a **multi-domain evaluation dataset** (Engineering and Scientific Q&A) to **assess text completeness** in **retrieval-augmented generation (RAG) systems**, **benchmarking across** 2 LLMs, 2 embedding models, and multiple temperature **settings**.
- Developed a domain-agnostic proof-of-concept framework to **improve LLM trustworthiness** by evaluating three dimensions: (1) **response completeness and hallucination detection**, (2) **knowledge sufficiency** for answering queries, and (3) **query completeness** relative to available knowledge.
- Implemented **user-facing diagnostics** that highlight contradictions, missing facts, partial answers, and hallucinations directly within model responses and retrieved knowledge, **enabling early identification of unreliable outputs.**
- Communicated findings at a GE Research Center–wide poster session (1,000+ attendees) and collaborated with GE Research Bangalore and the VP of Engineering at GE Aerospace HQ to inform downstream model improvement and cross-domain adoption.

- **GE Aerospace Research**   Niskayuna, NY
  AI Fellow- Intern   *June - Aug 2024*
    - Designed a **domain-agnostic, automated NER pipeline** that uses an LLM (Instruct model) for **synthetic dataset creation** and BERT-based models for **low-latency training and inference**. Demonstrated recognition of 11+ different entity types using **prompt engineering** for constructing a synthetic dataset and **heuristic filtering** for **robust labeling** of LLM outputs. Reduced dependency on LLM inference at runtime, enabling scalable, low-latency entity extraction across domains through fine-tuned BERT models.
    - Co-authored a conference publication **evaluating the robustness of open-source LLMs** on **2 newly curated datasets** (Arithmetic, Interval Labeling), spanning model scales from 3.8B to 236B parameters. Designed **synthetic benchmarks** with semantic-preserving perturbations to systematically assess model degradation on math problems.
    - **Communicated findings** at a GE Research Center–wide poster session (1,000+ attendees) and collaborated with GE Research Bangalore and the VP of Engineering at GE Aerospace HQ to **inform downstream model improvement and cross-domain adoption.**

- **Autodesk**
  Machine Learning Intern   *May - Aug 2022*
    - Extracted and structured user-stored features to **enhance AutoCAD's recommendation system**, applying NLP methods to **parse metadata from 1M+ users** and producing a clean unsupervised dataset of 55K high-quality samples.
    - Performed **feature engineering** and generated **high-dimensional BERT embeddings for clustering**, increasing effective data coverage from 23% to 92% and enabling robust insights from large-scale user behavior.

SELECTED ACADEMIC & RESEARCH PROJECTS

- **Reinforcement Learning for Flying Gripper Configuration of Mechanically Coupled Aerial Robots for Object Picking/Placing Tasks:** Trained a Deep Q-network for executing mid-air grasping by a manipulator composed of four modular UAVs. Created a custom-Gym environment to render cooperative control of each module viz. roll, pitch, yaw, and attitude manipulation. Successfully demonstrated the ability to render mid-air grasping of solid symmetrical objects on simulation, using RL methods.

- **Generative Adversarial Imitation Learning:** Implemented Generative Adversarial Imitation Learning (model-free) on HalfCheetah-v2 to extract expert policy data and yield expected benchmark rewards. Used TRPO to overcome the non-monotonicity problem.

- **GANs and VAE to model Multimodel Distribution:** Implemented VAE, DC-GANs, and unsupervised image-to-image translation models viz. CycleGAN and BicycleGAN for FashionMNIST and STL-10 datasets, respectively. Used FID and IS scores for qualitative evaluation.

- **Learning Object Pose from UAV Motion:** Created a synthetic dataset of 2D images generated from UAV's interaction with its environment, in Unity 3D simulator. Implemented domain randomization and transfer learning to enhance 3-DOF pose estimation.

- **Object Detection and Segmentation using Feature Pyramid Networks (FPNs)- Study of Mask RCNNs, SOLO, and YOLO:** Implemented the entire pipeline for object detection and segmentation using FPNs. Optimized categorical and instance segmentation over a multi-loss paradigm and point-NMS filtering for post-processing and visualization.

- **Deep Learning based Authorship Identification:** Multi-class classification using LSTM, Bi-LSTM & GRU at sentence and article levels for corporate news datasets (C50 & Reuters' articles). Modeling was done on large corpora of texts. Handled semantic and metaphoric words, using stylometric classification, resulting in improved performance.

JOURNAL PUBLICATIONS

- **Narayanan, R.** & Feigh, K. (accepted, 2025). Designing for Oversight: An Empirical Investigation of the Dual Impact of AI Dependency and Information Abstraction on Human Supervision in Decision-Making Teams. *International Journal on Human Computer Interaction.*

- Walsh, S. E., **Narayanan, R.,** & Feigh, K. (under review, 2025). The Role of Shared Mental Models in AI-advised Decision Support. *IEEE Transactions on Systems, Man, and Cybernetics: Systems*

CONFERENCE PUBLICATIONS

- **Narayanan, R.**, Cohen, M., Feigh, K., & Cooke, N. Two Sides of the Same Coin? Joint Perspectives from Shared Mental Models and Interactive Team Cognition Theories on Human-AI Team Cognition. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 2025.* 0(0). doi:10.1177/10711813251358788

- Peshave, A., Hossain, K., Kubricht, J., **Narayanan, R.**, Burpee, Z., & Agarwal, A. (accepted, 2025). Evaluating Large Language Models on Arithmetic and Interval Labeling Problems with Syntactic Perturbations. *2025 IEEE International Conference on Data Mining Workshops (ICDMW).*

- **Narayanan, R.** & Feigh, K. Human Assessment of AI Errors and its Impact on Hybrid Teaming for Decision Making. *2025 IEEE Conference on Cognitive and Computational Aspects of Situation Management (CogSIMA), Duisburg, Germany, 2025, pp. 103-110.* doi:10.1109/CogSIMA64436.2025.11079477 **(Winner of Best Student Paper Award)**

- **Narayanan, R.** and Feigh, K. M. (2025). Impact of Team Models in Hierarchical Human-Agent Decision-Making Teams. In Proceedings of the 20th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications - Volume 1: GRAPP, HUCAPP and IVAPP, ISBN 978-989-758-728-3, ISSN 2184-4321, pages 452-463. doi:10.5220/0013097400003912 **(Nominated for Best Paper & Best Student Paper Awards)**

- **Narayanan, R.,** Walsh, S. E., & Feigh, K. M. (2023). Development of Mental Models in Decision-Making Tasks. *Proceedings of the 67th Human Factors and Ergonomics Society Annual Meeting.* doi:10.1177/21695067231192195

BOOK CHAPTERS

- **Narayanan, R.** & Feigh, K. (accepted, 2025). How well do we rely on reliance? On the under-utilization of reliance-based metrics towards studying human response to automation assistance. *Advancements in Human Agent Teaming Research Infrastructure: Testbeds, Metrics, and Concepts. Editors Erin K. Chiou, Douglas S. Lange, Jason H. Wong, Julie Marble. CRC Press, Taylor & Francis.*

WORKSHOP PROCEEDINGS

- **Narayanan, R.,** & Feigh, K. M. Influence of Human-AI Team Structuring on Shared Mental Models for Collaborative Decision Making. *In Proceedings of Workshop on Theory of Mind in Human-AI Interaction at ACM CHI 2024.*

TECHNICAL SKILLS

- **Programming:** Python, R, MATLAB
- **Tools:** Pytorch, Tensorflow, Keras, Huggingface, OpenCV, Scikit-learn, Pandas, Spacy, SciPy, OpenAI Gym, Git
- **Big Data:** AWS(EC2, S3, Bedrock)
- **Simulation & Other Toolkits:** Simulink (MATLAB), VREP
- **Research Methods:** Statistical modeling & large-scale data analysis, Causal Inference, Human-subjects Experimental Design, Data Visualization, Survey and Interview design, Mixed-methods (quantitative & qualitative analytics)
- **AI/ML:** Machine Learning (supervised and unsupervised learning), Deep Learning, Computer Vision, Generative AI (LLMs, VAEs, GANs), Reinforcement Learning, Natural Language Processing, Transfer Learning, Model fine tuning

HONORS & AWARDS

- **IEEE CogSIMA 2025 - Best Student Paper Award** For the conference paper on "Human Assessment of AI Errors and its Impact on Hybrid Teaming for Decision Making".
- **VISIGRAPP 2025 - Nominated for Best Paper & Best Student Paper Awards** For the conference paper on "Impact of Team Models in Hierarchical Human-Agent Decision Making Teams".
- **Georgia Tech Student Government Association (2025):** Travel Grant ($1000).
- **Career, Research, and Innovation Development Conference (CRIDC) Poster Competition Winner, Georgia Institute of Technology (2024)** For my poster on Shared Mental Models for Human-AI Teaming.
- **INSPIRE Fellowship (2015):** Government of India.

REVIEWING

- **Book** Advancements in Human Agent Teaming Research Infrastructure: Testbeds, Metrics, & Concepts.
- **Journals** International Journal of Human Computer Interaction
- **Conferences** ACM Conference on Human Factors in Computing Systems (ACM CHI), Human Factors and Ergonomics Society (HFES)

Public Speaking and Academic Presentations

- **Presentation** "Human Assessment of AI Errors and its Impact on Hybrid Teaming for Decision Making" at the IEEE Conference on Cognitive and Computational Aspects of Situation Management (CogSIMA), Duisburg, Germany, 2025.
- **Presentation** "Impact of Team Models in Hierarchical Human-Agent Decision Making Teams" at the International Conference on Human Computer Interaction Theory and Applications (HUCAPP, VISIGRAPP), Porto, Portugal, 2025.
- **Presentation** "Influence of Human-AI Team Structuring on Shared Mental Models for Collaborative Decision Making" at the Workshop on Theory of Mind in Human-AI Interaction at ACM CHI 2024, Honolulu, Hawaii, May 2024.
- **Presentation** "Development of Mental Models in Decision-Making Tasks" at the 67th Human Factors and Ergonomics Society Annual Meeting, Washington D.C., United States, October 2023.

Teaching Experience: Graduate Teaching Assistant

- **Graduate Teaching Assistant – Georgia Institute of Technology, Atlanta**   Fall 2021, Spring 2022
  - **Courses:** *Feedback Control Systems (ECE 3550, Undergraduate), Circuit Analysis (ECE 2040, Undergraduate)*
  - Assisted in delivering lectures, labs, or discussion sections to undergraduate students.
  - Held office hours to provide one-on-one academic support and clarify course material.

- **Graduate Teaching Assistant- University of Pennsylvania, Philadelphia**   Spring 2021, 2020
  - **Courses:** *Engineering Electromagnetics (ESE 112, Undergraduate), Feedback Control Systems (ESE 505, Graduate), Linear, Non-Linear and Integer Optimization (OIDD 910, Graduate)*
  - Created grading rubrics and evaluated homework, projects, quizzes, and exams fairly and consistently.
  - Provided constructive written and verbal feedback to help students improve performance.
  - Maintained accurate records of student grades and progress.

- **Teaching and Mentorship at Inspirit AI**   Remote, Summer 2021
  - **Course:** *AI and Computer Vision*
  - Guided high-school students in applying theoretical AI/ML concepts to practical problems.
  - Contributed to the development of course content, slides, and supplementary resources.
  - Conducted workshops and training sessions with students for Python coding on a need-by-need basis.

Professional Service

- **Contributor in Social Action Research at Georgia Institute of Technology (Fall 2025):** Successfully completed a social action research program involving deep inquiry, qualitative observation, and real-world evaluation. Collaborated with a research team to identify opportunities to enhance the graduate student experience at Georgia Tech and developed actionable recommendations aimed at creating positive campus-level social impact.
- **Conference Session Chair** for presentation track "Innovations in Research Methods" at the ASPIRE, 69th International Annual Meeting of the Human Factors and Ergonomics Society (HFES), Chicago, USA 2025.
- **Panel Discussion Moderator** ASPIRE, 69th International Annual Meeting of the Human Factors and Ergonomics Society (HFES), Chicago, USA 2025.
- **Alumni Interviewer, University of Pennsylvania:** Interviewer for incoming candidates of undergraduate students for academic years 2021-22 & 2022-23

References

- **Prof. Karen Feigh (Thesis Advisor):** karen.feigh@gatech.edu
- **Prof. Nancy J Cooke (Thesis Committee Member):** nancy.cooke@asu.edu
- **Prof. Samuel Coogan (Thesis Committee Member):** sam.coogan@gatech.edu