Jack Kolb

jackkolb.com — kolb@gatech.edu — Google Scholar

Education

Georgia Institute of Technology, Atlanta, GA
PhD in Robotics 2025
MS in Computer Science 2023
Advisor: Karen Feigh
Committee: Julie Adams, Sonia Chernova, Harish Ravichandar, Alan Wagner

University of California at Riverside, Riverside, CA
BS in Mechanical Engineering (Cum Laude, Honors) 2020

Work Experience

Apple *Cupertino, CA*
Research Scientist, Special Projects Group June 2025 - present
- **[NDA]** Leading crossfunctional research and development projects.

Travelers *Atlanta, GA*
Data Scientist (Intern), Emerging AI & Technologies March 2025 - June 2025
- **[NDA]** Designed and prototyped methods to verify the factuality and alignment of fine-tuned LLM outputs and long-context synthetic data.

Gatik AI *Mountain View, CA*
Robotics Engineer (Intern) May 2022 - Aug 2022
- Designed and prototyped a novel graph neural network architecture for forecasting surrounding vehicle trajectories, tailored to Gatik's operational design domain.
- Identified business-competitive research opportunities for Gatik's platform (autonomous vehicles for short-haul middle mile deliveries).
- Conducted a literature review and presented design recommendations for Gatik's surrounding vehicle prediction module in a company-wide talk.

NextGen Assistive Technologies *Petaluma, CA*
Software Engineer May 2020 - Aug 2020
- Developed the complete minimum viable product for a sensor-based smart home remote caregiving system, deployed in 100+ homes and producing $500k+ ARR.
- Integrated sensor event intake, video conferencing, and event resolution, enabling each caregiver to support 10+ clients via remote monitoring and interactions.

UC Riverside Marine Robotics (RoboSub) *Riverside, CA*
Project Lead ('18-20) Sept 2016 - Aug 2020
Mechanical Team Lead ('17-18)
Mechanical Team Member ('16-17)
- Led 25+ members in the development of two autonomous marine robot platforms for aquatic navigation and interaction tasks.
- Researched and implemented systems for underwater autonomy, navigation, vision, mission control, and object interaction.
- Designed and manufactured physical hardware and systems architectures, wrote field test plans and procedures, and managed relationships with sponsors.
- Competed in the international RoboSub competition (2018, 2019, 2020).
- Awarded "Best Large-Scale Student Project" by UC Riverside (2019).

Skills

Skills Human-Centered Autonomy, Agentic Systems, Computer Vision, Foundation Models
Tools Git, LangChain, Linux, OpenCV, PyTorch, ROS, scikit-learn, Unity3D
Languages Python, C++, Go, HTML/JS, C#

Research Experience

Cognitive Engineering Center — *Georgia Tech*
Graduate Research Assistant — Sept 2022 - May 2025

- Investigating how household robots can infer and apply a person's world belief state for active assistance, team reasoning, and informed communication.
- Applying LLMs and vision models to reason over estimated user belief states and summarize state information in task-driven collaborative human-AI teams.
- Researching generative image manipulation of poses using text-guided instructions.
- Developing autonomous aircraft wingmen using deep reinforcement learning and constrained control to support human pilots in collaborative high-risk missions.
- Explored structuring shared human-AI decision-making processes to enhance user situational awareness and decision outcomes.
- Wrote and awarded an $80k grant from Amazon Consumer Robotics (Lab126).
- Wrote papers accepted to leading robotics conferences – IROS, RO-MAN.

Robot Autonomy and Interactive Learning Lab — *Georgia Tech*
Graduate Research Assistant — Sept 2020 - May 2022

- Applied machine learning to predict user teleoperation task performance and inform role assignment, improving team performance by 24%.
- Structured human demonstrations with offline training in "pick-and-place" robot manipulation, improving .
- Wrote quarterly reports and presented research talks to grant sponsors.
- Wrote papers accepted to leading robotics conferences – IROS, RO-MAN.

Sundararajan Venkatadriagaram Research Group — *UC Riverside*
Undergraduate Research Assistant — Mar 2018 - June 2020

- Designed and prototyped an IOT sensor network to record and analyze vibrations of electric motors to classify motor damage and predict mechanical failure.
- Trialed system on university campus ventilation and water infrastructure, worked with university to commercialize system.

Awards

Amazon Consumer Robotics Grant ($80k), 2022
Awarded to support my dissertation research on enabling robots to estimate a user's belief state in household human-robot teaming domains.

IEEE RO-MAN – Best Student Paper Finalist (3/237, 1.2%), 2022
For my work on applying user cognitive skills to predict user performance at robot teleoperation tasks and inform role assignment.

HackGT – Winner, 2021
Awarded for RoboVR: a multi-user platform for teleoperating 10+ real-world robots in virtual reality.

UC Riverside – Best Large-Scale Student Project, 2019
Accepted on behalf of UCR Marine Robotics, for our work in designing and developing autonomous underwater vehicles.

CitrusHack – Winner, 2018
Awarded for BlindSight: a hat that enabled "feeling" the proximity of surrounding objects through localized and directioned haptic vibrations.

Professional Activities

Teaching Assistant

- CS6476: Computer Vision (Graduate Level) — Sp'24, Fa'24, Sp'25
- CS6262: Network Security (Graduate Level) — Su'24

Reviewing

- HFES ASPIRE (conference) 2023, 2024, 2025
- IEEE BioRob (conference) 2024
- IEEE/ACM HRI (conference) 2024
- IEEE ICRA (conference) 2025
- IEEE RO-MAN (conference) 2024
- RSS (conference) 2025

Invited Talks

- Georgia Tech OMSCS Seminar Series Feb 18, 2025
  Inferring World Belief States in Human-Robot Teaming
- Exponent, Inc. Feb 4, 2025
  Unraveling the Black Box: How systems can leverage cognitive, physiological, and mental states to improve human-AI teaming.

Advising

Formal mentoring of students on research projects.

- Ryan Bowers (MS at GaTech → PhD at GaTech) 2024 - 2025
  Using deep reinforcement learning for controlling autonomous wingmen.
- Alagappan Swaminathan (MS at GaTech → PhD at GaTech) 2023 - 2025
  User belief state estimation for human-swarm command & control.
- Richard Agbeyibor (PhD at GaTech) 2022 - 2025
  Adaptive autonomy for human-AI systems and autonomous wingmen.
- Sanya Doda (PhD at GaTech) 2022 - 2025
  Real-time cognitive workload assessment from biometric sensors.
- Rohan Shrivastava (BS at Duke) 2024
  Identifying misinformation at internet-scale for computational anthropology.
- Pranav Gopalabhatla (BS at Purdue) 2023
  Predicting asthma prevalence from air quality and environmental factors.
- Sia Godika (BS at MIT) 2023
  Predicting malaria incidence in underdeveloped regions.
- Mayank Kishore (MS at GaTech → Founder at Mirage ML) 2021 - 2022
  Virtual human-robot command & control tasks.

Journal Papers

2. **Inferring Teammate Belief States in Human-Robot Teams**
   J. Kolb, A. Garg, N. Warner, K. Feigh.
   Under review.

1. **Attention-Tunable Safety Barriers for Fluent Human-Autonomy Coordination in Specialized Aviation Missions**
   C. Cortes, R. Agbeyibor, **J. Kolb**, K. Feigh, S. Coogan.
   Under review.

Conference Proceedings

9. **Model Cards for AI Teammates: Comparing Human-AI Team Familiarization Methods for High-Stakes Environments**
   R. Bowers, R. Agbeyibor, **J. Kolb**, K. Feigh.
   IEEE Intl. Conf. on Robot & Human Interactive Communication (RO-MAN), 2025.

8. **Learning Complex Non-Rigid Image Edits from Multimodal Conditioning**
   N. Warner, **J. Kolb**, M. Hahn, J. Huang, I. Essa, V. Birodkar.
   IEEE International Conference on Image Processing (ICIP), 2025

7. **Inferring Belief States in Partially-Observable Human-Robot Teams**
   J. Kolb, K. Feigh.
   IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2024.

6. **Human-AI Collaboration in Autonomous Aerial Vehicles for ISR: Experience, Trust, and Perception**
R. Agbeyibor, V. Ruia, **J. Kolb**, K. Feigh.
HFES International Annual Meeting (ASPIRE), 2024.

5. **Towards Safe Collaboration Between Autonomous Pilots and Human Crews for Intelligence, Surveillance, and Reconnaissance**
R. Agbeyibor, V. Ruia, **J. Kolb**, C. Cortes, T. Mancao, S. Coogan, K. Feigh.
IEEE/AIAA Digital Avionics Systems Conference (DASC), 2024.

4. **The Effects of Robot Motion on Comfort Dynamics of Novice Users in Close-Proximity Human-Robot Interactions**
P. Howell, **J. Kolb***, Y. Liu*, H. Ravichandar.
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2023.

3. **The Effects of Inaccurate Decision-Support Systems on Structured Shared Decision-Making for Human-Robot Teams**
J. Kolb, D. Srivastava, K. Feigh.
IEEE Intl. Conf. on Robot & Human Interactive Communication (RO-MAN), 2023.

2. **Leveraging Cognitive States in Human-Robot Teaming**
J. Kolb, H. Ravichandar, S. Chernova. **[Best Student Paper Finalist]**
IEEE Intl. Conf. on Robot & Human Interactive Communication (RO-MAN), 2022.

1. **Predicting Individual Human Performance in Human-Robot Teaming**
J. Kolb, M. Kishore, K. Shaw, H. Ravichandar, S. Chernova
IEEE Intl. Conf. on Robot & Human Interactive Communication (RO-MAN), 2021.

Symposium & Workshop Proceedings (selected)

6. **Investigating Human-AI Team Fluency in Autonomous Medical Evacuation: A Study of Novice Aviator Cognitive States and HAI Interface Design**
S. Doda, R. Agbeyibor, C. Cortes, **J. Kolb**, J. Magalhaes, K. Feigh.
AIAA Aviation Forum and Exposition, 2025.

5. **Use of Simulated Mental Models and Active Replanning for Human-Robot Interaction**
J. Ren*, A. Swaminathan*, **J. Kolb**, Y. Zhao, S. Coogan, K. Feigh.
AIAA SciTech Forum and Exposition, 2025.

4. **A Framework for Inferring Belief States in Partially-Observable Human-Robot Teams**
J. Kolb, K. Feigh.
40th Anniversary of the IEEE Conf. on Robotics and Automation (ICRA@40), 2024.

3. **Run Time Assurance and Human AI Fluency in Manned Autonomous Intelligence Surveillance and Reconnaissance**
R. Agbeyibor, V. Ruia, C. Cortes, **J. Kolb**, S. Coogan, K. Feigh.
AIAA Aviation Forum and Exposition, 2024.

2. **Safe Dexterous Manipulation Using Geometric Boundary Constraints**
A. Jain*, **J. Kolb***, H. Ravichandar.
Safe Reinforcement Learning Workshop at the International Joint Conference on Artificial Intelligence (IJCAI), 2022.

1. **Evaluating the Effectiveness of Corrective Demonstrations and a Low-Cost Sensor for Dexterous Manipulation**
A. Jain*, **J. Kolb***, J. Abbess, H. Ravichandar.
Machine Learning in Human-Robot Collaboration Workshop at the International Conference on Human-Robot Interaction (HRI), 2022.