

# Jack Kolb

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<b>Summary</b>	My research develops adaptive autonomous systems that to enhance the performance, fluency, and capabilities of human-AI teams by personalizing to end users. My work has spanned numerous operational domains – including smart homes, autonomous vehicles, aerospace, and household robotics – and has been published in leading robotics conferences. I have a strong background in project management and am looking for an industry role that can leverage my strengths in machine learning, systems engineering, computer vision, and robotics to develop consumer-facing products.	
<b>Tools, Languages &amp; Skills</b>	Git, HuggingFace, LangChain, Linux, OpenCV, PyTorch, ROS, scikit-learn, Unity3D C++, C#, Go, HTML/JS, Java, Python Computer Vision, Foundation Models, Human Factors, Machine/Deep Learning	
<b>Education</b>	<b>Georgia Institute of Technology</b> , Atlanta, GA <i>PhD in Robotics</i> 2020 - 2025 ( <i>est.</i> ) <i>MS in Computer Science</i> 2023 Advisor: Karen Feigh Committee: Julie Adams, Sonia Chernova, Harish Ravichandar, Alan Wagner  <b>University of California at Riverside</b> , Riverside, CA <i>BS in Mechanical Engineering (Cum Laude, Honors)</i> 2020	
<b>Work Experience</b>	<b>Gatik AI</b> Mountain View, CA <i>Robotics Engineer (Intern)</i> May 2022 - Aug 2022 <ul style="list-style-type: none"><li>Designed and prototyped a novel graph neural network architecture for forecasting surrounding vehicle trajectories, tailored to Gatik’s operational design domain.</li><li>Identified business-competitive research opportunities for Gatik’s platform (autonomous vehicles for short-haul middle mile deliveries).</li><li>Conducted a literature review and presented design recommendations for Gatik’s surrounding vehicle prediction module via a company-wide talk.</li></ul> <b>NextGen Assistive Technologies</b> Petaluma, CA <i>Software Engineer</i> May 2020 - Aug 2020 <ul style="list-style-type: none"><li>Developed the complete minimum viable product for a sensor-based smart home remote caregiving system, deployed in 100+ homes and producing \$500k/yr ARR.</li><li>Integrated sensor event intake, video conferencing, and event resolution, enabling each caregiver to support 10+ clients via remote monitoring and interactions.</li></ul> <b>UC Riverside Marine Robotics (RoboSub)</b> Riverside, CA <i>Project Lead</i> ('18-20) Sept 2016 - Aug 2020 <i>Mechanical Team Lead</i> ('17-18) <i>Mechanical Team Member</i> ('16-17) <ul style="list-style-type: none"><li>Led 25+ members in the development of two autonomous marine robot platforms for aquatic navigation and interaction tasks.</li><li>Researched and implemented systems for underwater autonomy, navigation, vision, mission control, and object interaction.</li><li>Designed and manufactured physical hardware and systems architectures, wrote field test plans and procedures, and managed relationships with sponsors.</li><li>Competed in the international RoboSub competition (2018, 2019, 2020).</li><li>Awarded “Best Large-Scale Student Project” by UC Riverside (2019).</li></ul>	

Research Experience	<b>Cognitive Engineering Center</b>		<i>Georgia Tech</i>
	<i>Graduate Research Assistant</i>		Sept 2022 - present
	<ul style="list-style-type: none"> <li>• Investigating how household robots can estimate a co-located user's world belief state to intelligently support user queries and construct a shared mental model.</li> <li>• Applying LLMs and vision models to reason over estimated user belief states and summarize state information in task-driven collaborative human-AI teams.</li> <li>• Researching generative image manipulation of poses using text-guided instructions.</li> <li>• Developing autonomous aircraft wingmen using deep reinforcement learning and constrained control to support human pilots in collaborative high-risk missions.</li> <li>• Explored structuring shared human-AI decision-making processes to enhance user situational awareness and decision outcomes.</li> <li>• Wrote and awarded an \$80k grant from Amazon Consumer Robotics (Lab126).</li> <li>• Wrote papers accepted to leading robotics conferences – IROS, RO-MAN.</li> </ul>		
	<b>Robot Autonomy and Interactive Learning Lab</b>		<i>Georgia Tech</i>
	<i>Graduate Research Assistant</i>		Sept 2020 - May 2022
	<ul style="list-style-type: none"> <li>• Applied machine learning to predict user teleoperation task performance and inform role assignment, improving team performance by 24%.</li> <li>• Structured human demonstrations with offline training in “pick-and-place” robot manipulation, improving .</li> <li>• Wrote quarterly reports and presented research talks to grant sponsors.</li> <li>• Wrote papers accepted to leading robotics conferences – IROS, RO-MAN.</li> </ul>		
	<b>Sundararajan Venkatadriagaram Research Group</b>		<i>UC Riverside</i>
	<i>Undergraduate Research Assistant</i>		Mar 2018 - June 2020
Awards	<ul style="list-style-type: none"> <li>• Designed and prototyped an IOT sensor network to record and analyze vibrations of electric motors to classify motor damage and predict mechanical failure.</li> <li>• Tried system on university campus ventilation and water infrastructure, worked with university to commercialize system.</li> </ul>		
	<b>Amazon Consumer Robotics Grant (\$80k), 2022</b>		
	<i>Awarded to support my dissertation research to make robots estimate a user's belief state in household human-robot teaming domains.</i>		
	<b>IEEE RO-MAN – Best Student Paper Finalist (3/237, 1.2%), 2022</b>		
	<i>For my work on applying user cognitive skills to inform role assignment for robot teleoperation tasks.</i>		
	<b>HackGT – Winner, 2021</b>		
	<i>Awarded for RoboVR: a multi-user platform for teleoperating 10+ real-world robots in virtual reality.</i>		
	<b>UC Riverside – Best Large-Scale Student Project, 2019</b>		
	<i>Accepted on behalf of UCR Marine Robotics, for our work in designing and developing autonomous underwater vehicles.</i>		
	<b>CutieHack – Best UI/UX Award, 2019</b>		
Conference Proceedings	<i>Awarded for Schedulio: a collaborative platform for large-scale projects to schedule meetings and visualize availability.</i>		
	<b>CitrusHack – Winner, EquipoVision's Choice, 2018</b>		
	<i>Awarded for BlindSight: a hat that enabled “feeling” the proximity of surrounding objects through localized and directioned haptic vibrations.</i>		
	14.	<b>Constructing Team Mental Models in Human-Robot Teams</b>	
		J. Kolb, A. Garg, N. Warner, K. Feigh.	
		<i>Under review.</i>	

13. **Human-AI Interaction in Autonomous Medical Evacuation Helicopters**  
S. Doda, R. Agbeyibor, C. Cortes, **J. Kolb**, J. Magalhaes, K. Feigh.  
*Under review.*
12. **Investigating Human-AI Team Fluency in Autonomous Medical Evacuation: A Study of Novice Aviator Cognitive States and Human-AI Interface Design**  
S. Doda, R. Agbeyibor, C. Cortes, **J. Kolb**, J. Magalhaes, K. Feigh.  
*Under review.*
11. **Learning Complex Non-Rigid Image Edits from Multimodal Conditioning**  
N. Warner, **J. Kolb**, M. Hahn, J. Huang, I. Essa, V. Birodkar.  
*Under review.*
10. **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.*
9. **Inferring Belief States in Partially-Observable Human-Robot Teams**  
**J. Kolb**, K. Feigh.  
*IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2024.*
8. **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.*
7. **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.*
6. **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.*
5. **Impact of Abstraction Levels of Context Information on AI-Advised Decision Making for an Entry Descent and Landing Task**  
D. Srivastava, **J. Kolb**, K. Feigh.  
*AIAA SciTech Forum and Exposition, 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	4. <b>A Framework for Inferring Belief States in Partially-Observable Human-Robot Teams</b> <b>J. Kolb</b> , K. Feigh. <i>40th Anniversary of the IEEE Conf. on Robotics and Automation (ICRA@40), 2024.</i>	
	3. <b>Safe Dexterous Manipulation Using Geometric Boundary Constraints</b> A. Jain*, <b>J. Kolb*</b> , H. Ravichandar. <i>Safe Reinforcement Learning Workshop at the International Joint Conference on Artificial Intelligence (IJCAI), 2022.</i>	
	2. <b>Evaluating the Effectiveness of Corrective Demonstrations and a Low-Cost Sensor for Dexterous Manipulation</b> A. Jain*, <b>J. Kolb*</b> , J. Abbess, H. Ravichandar. <i>Machine Learning in Human-Robot Collaboration Workshop at the International Conference on Human-Robot Interaction (HRI), 2022.</i>	
	1. <b>Predicting Individual Human Performance in Human-Robot Teaming</b> <b>J. Kolb</b> , M. Kishore, H. Ravichandar, S. Chernova <i>Workshop Your Study Design Workshop at the International Conference on Human-Robot Interaction (HRI), 2021.</i>	
Professional Activities	<b>Teaching</b> <i>Teaching Assistant.</i>	
	• CS6476: Computer Vision (Graduate Level)	Sp2024, Fa2024, Sp2025
	• CS6262: Network Security (Graduate Level)	Su2024
	<b>Reviewing</b>	
	• HFES ASPIRE (conference)	2023, 2024
	• IEEE BioRob (conference)	2024
	• IEEE/ACM HRI (conference)	2024
	• IEEE ICRA (conference)	2025
	• IEEE RO-MAN (conference)	2024
	<b>Advising</b> <i>Formal mentoring of students on research projects.</i>	
	• Ryan Bowers (MS at GaTech) <i>Using deep reinforcement learning for controlling autonomous wingmen.</i>	2024 - Present
	• Alagappan Swaminathan (MS at GaTech → PhD at GaTech) <i>User belief state estimation for human-swarm command &amp; control.</i>	2023 - Present
	• Richard Agbeyibor (PhD at GaTech) <i>Adaptive autonomy for human-AI systems and autonomous wingmen.</i>	2022 - Present
	• Sanya Doda (PhD at GaTech) <i>Real-time cognitive workload assessment from biometric sensors.</i>	2022 - Present
	• Rohan Shrivastava (BS at Duke) <i>Identifying misinformation at internet-scale for computational anthropology.</i>	2024
	• Pranav Gopalabhatla (BS at Purdue) <i>Predicting asthma prevalence from air quality and environmental factors.</i>	2023
	• Sia Godika (BS at MIT) <i>Predicting malaria incidence in underdeveloped regions.</i>	2023
	• Mayank Kishore (MS at GaTech → Founder at Mirage ML) <i>Virtual human-robot command &amp; control tasks.</i>	2021 - 2022