JACK KOLB

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EDUCATION

Ph.D. *Robotics — in progress* *Aug 2020 - present*
Advisor: Karen Feigh
Georgia Institute of Technology (Georgia Tech)
Dissertation Topic: Applying user cognitive state in human-robot teams for predictive and adaptive interactions.

M.S. *Computer Science* *Aug 2020 - May 2023*
Georgia Tech

B.S. *Mechanical Engineering (cum laude)* *Sep 2016 - Jun 2020*
University of California at Riverside (UC Riverside)
Capstone Title: "An Autonomous Robot Capable of Scaling a Self-Built Structure."

RESEARCH EXPERIENCE

Cognitive Engineering Center, *Georgia Tech* *Sep 2022 - present*
Measuring and applying real-time user cognitive state for adaptive human-robot interactions.
- Investigating how household robots can estimate user world state understanding to intelligently support user queries, construct a shared mental model, and improve interaction fluency.
- Investigating how shared human-AI decision-making processes can be restructured to enhance user situational awareness and overall decision outcomes.
- Investigating the use of physiological sensors for objectively estimating user workload in human-robot collaborations; targeting applications of adaptive autonomy for aircraft autopilot systems.

Robot Autonomy and Interactive Learning Lab, *Georgia Tech* *Sep 2020 - May 2022*
Considering heterogeneous agent capabilities as predictive measures in multi-human multi-robot teaming.
- Investigated the predictive effect of human cognitive skills on teleoperation task performance.
- Applied cognitive skills to role assignment to improve multi-human multi-robot teaming.
- Applied machine learning and reinforcement learning techniques for "pick-and-place" robot manipulation.
- Published and presented research at two international research conferences.
- Contributed to quarterly progress reports and regularly presented to sponsors (Army Research Lab).

Sundararajan Venkatadriagaram Research Group, *UC Riverside* *Mar 2018 - Jun 2020*
Predicting electric motor failure by analyzing motor vibrations.
- Designed and prototyped an intelligent sensor network to record and analyze the vibrations of electric motors to identify motor damages and predict mechanical failure.
- Trialed system on university campus ventilation and water infrastructure, slated for commercialization.

TECHNICAL SKILLS

Programming Languages: Python, C#, C++, HTML/CSS/JavaScript

Frameworks & Tools: ROS1, ROS2, PyTorch, OpenCV, Flask, WeBots, Gazebo, Azure, Heroku, Firebase/GCP, CAD, Unity3D, Git, MATLAB/Simulink, *nix

Coursework: Intelligent Control, Human-Robot Interaction, Reinforcement Learning, Natural Language Processing, Human Factors, Machine Learning, Interactive Robot Learning, Robot Kinematics and Planning, Computer Vision

PUBLICATIONS

Jack Kolb, Divya Srivastava, Karen M. Feigh. “The Effects of Inaccurate Decision-Support Systems on Structured Shared Decision-Making for Human-Robot Teams” *IEEE Int. Conference on Robot & Human Interactive Communication,* 2023.

Pierce Howell, **Jack Kolb***, Yifan Liu*, Harish Ravichandar. “The Effects of Robot Motion on Comfort Dynamics of Novice Users in Close-Proximity Human-Robot Interactions.” *IEEE Int. Conference on Intelligent Robots and Systems*, 2023.

Jack Kolb, Harish Ravichandar, Sonia Chernova. “Leveraging Cognitive States in Human-Robot Teaming.” *IEEE Int. Conference on Robot & Human Interactive Communication*, 2022. **[Best Student Paper finalist!]**

Jack Kolb, Mayank Kishore, Kenneth Shaw, Harish Ravichandar, and Sonia Chernova. "Predicting Individual Human Performance in Human-Robot Teaming." *IEEE Int. Conference on Robot & Human Interactive Communication*, 2021.

Abhineet Jain*, **Jack Kolb***, and Harish Ravichandar. "Safe Dexterous Manipulation Using Geometric Boundary Constraints." *Safe Reinforcement Learning Workshop at IJCAI ‘22,* 2022.

WORK EXPERIENCE

Gatik AI

Robotics Engineer (intern) *May 2022 - Aug 2022*

Autonomous vehicle platform for short-haul middle mile deliveries.

- Conducted a literature review on surrounding vehicle trajectory prediction algorithms.
- Prototyped a novel graph neural network architecture specific to Gatik’s operational design domain.
- Presented design recommendations for improving Gatik’s prediction module to company leadership.

NextGen Assistive Technology

Software Engineer (intern) *Jun 2020 - Sep 2020*

Sensor-driven remote caregiving to support communities with developmental disabilities.

- Developed a sensor-based smart home remote caregiving system, now deployed in over 100 homes.
- Integrated video conferencing and event resolution, enabling each caregiver to support 10+ clients.
- Leveraged Microsoft Azure’s Event Grid, Power Apps, and IOT Hub platforms for IOT capabilities.

UC Riverside Autonomous Underwater Vehicles (UCR RoboSub)

Project Lead (‘18-’20), *Mechanical Team Lead* (‘17-’18), *Mechanical Team* (‘16-’17) *Sep 2016 - Aug 2020*

Marine robots to autonomously complete aquatic naval tasks in international competitions.

- Led 25+ members in the development of two autonomous marine robot platforms for RoboSub ‘18-’20.
- Researched and implemented systems for autonomy, navigation, vision, mission control, object interaction.
- Awarded “Best [Large-Scale Student] Project” (2019) by UC Riverside’s College of Engineering.

EXTRACURRICULARS

RoboGrads*, Georgia Tech*

Robotics PhD VP (‘23-’24), *President* (‘22-’23), *Treasurer* (‘21-’22) *May 2021 - present*

Professional and community development for Georgia Tech’s robotics graduate students.

- Supported graduate students by hosting student-led research seminars, mock qualifying exams, academia and industry panels, new student orientations, career and academic Q/A panels, and community socials.
- Developed industry partnerships to support Georgia Tech’s robotics research and facilitate access to the robotics student talent pool.
- Represented graduate student interests to the robotics institute’s administration and faculty.