Introductory Research Experience in Autonomy and Control Technologies (REACT) - Summer REU Program

The Center for Autonomy at the Oden Institute for Computational Engineering and Sciences hosted a summer undergraduate research program named the Introductory Research Experience in Autonomy and Control Technologies (REACT). This Research Experience for Undergraduates (REU) program was a collaborative effort led by Dr. Meeko Oishi from the University of New Mexico, Dr. Zhao Sun from Hampton University, and Dr. Ufuk Topcu from The University of Texas at Austin. Funded through NASA's University Leadership Initiative in Safe Aviation Autonomy, REACT provided a unique two-week research immersion experience for engineering, computer science, mathematics, and statistics students, aiming to prepare participants for cutting-edge research and enhance their science communication skills.

On July 30th, participants were introduced to the Center for Autonomy by Dr. Fridovich-Keil, an assistant professor whose research spans optimal control, dynamic game theory, learning for control, and robot safety.

During the rest of their summer tenure in the Center for Autonomy, students were exposed to autonomous systems research, gaining hands-on experience on the following problems.

1. **Real-time Computer Vision Models (mentor: Po-han Li).** Students fine-tuned real-time computer vision models, honing their skills in image classification, object detection, and segmentation. Their work was crucial in optimizing model selection based on computing constraints.
2. **Translating Linear Temporal Logic Formulas (mentor: Jean-Raphaël Gaglione).** Students bridged logic and language by translating temporal logic formulas into English sentences through a combination of human-designed rules and AI integration.
3. **Secure Multi-party Computation Techniques (mentor: Yunhao Yang).** Students explored secure multi-party computation techniques to preserve user data privacy while maintaining classification accuracy in machine learning models.
4. **Curriculum Design's Impact on Reinforcement Learning Agents (mentors: Cevahir Koprulu and Xindi Gong).** Students examined how curriculum design affects reinforcement learning agents, experimenting with learning methods for agent performance and visualizing learning trajectories.
5. **Autonomous Robotic Navigation in GPS-denied Environments (mentor: Jake Levy).** Students addressed challenges in GPS-denied environments by devising algorithms for autonomous robotic navigation using LiDAR readings, crucial for scenarios like search and rescue missions.
6. **Multi-Agent Motion Planning (mentor: Jihoon Suh).** Students devised multi-agent motion planning algorithms, focusing on real-world applications using Crazyflie quadcopters.


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