EGEC Research Labs

AT CSUF (CS 404)



BCI MACHINE LEARNING SEG Signal Computing

- Our **Tasting** team uses machine learning models to determine which of the five basic tastes such as Salty or Sweet a test subject is sampling through EEG and fNIRS signals.
- The Home Automation project works on the creation of a model for using EEG data collected from a cap to control certain home appliances, i.e., TVs, computers, ovens, and more. The idea is to create a low-level implementation, such as turning on or off devices, and then scale up to loT devices to allow more control later.
- The **Aging Studies** team researches how stress affects cognitive function in older adults! We use EEG headsets to analyze brain activity, aiming to understand the impact of stress-inducing tasks on mental health and resilience in the elderly.
- EEG Wheelchair, Robotic Arm...and More!

Brain-Computer Interfacing

WHAT IS BCI?

Brain-Computer Interfacing is the merging of human biological signals with digital computing. By interpreting brain signals such as Electroencephalography (EEG), BCIs can be used for Lie Detection, Video Game Control, Medical Applications, and more!



Underwater Robotics DIVE INTO AN OCEAN OF OPPORTUNITIES WITH OUR AUX PROJECT!

Our **AUV** project is focused on building an advanced autonomous underwater vehicle designed to make a meaningful impact on ocean exploration and conservation. Equipped with a **high-performance GPU**, Depth camera, **sonar**, and sophisticated navigation sensors, this AUV is engineered for **autonomous navigation** and **precise object detection**, allowing it to **operate independently in complex underwater environments.**



This AUV is tailored for a range of applications. **Depth Exploration** is a primary focus, enabling us to uncover and map ocean floors and monitor underwater landscapes. Additionally, **Infrastructure Monitoring** allows the AUV to inspect underwater cables and installations, maintaining essential underwater infrastructure. **Marine Conservation** is another key area, as the AUV can observe and protect delicate marine habitats.



AUTONOMOUS UNDERWATER VEHICLE

Titan AUV Let's make a splash together!

Join our **Autonomous Underwater Vehicle** (AUV) Project and help us explore the ocean's mysteries with cutting-edge technology and creativity!

Join us in one of the following exciting roles:

System Design

- Software and Firmware Development
 - Machine Learning & Al for Ocean Exploration
- Sensor Integration and Electronics
 - Modeling and Simulation
- Sensors and Electronics Integration

Smart Home Systems

SHAPING THE FUTURE OF ASSISTANCE IN LIVING SPACES

- The **Home Detection** project is designing a detection system for the elderly. Through a collection of sensors, the team can detect when someone has entered a room, and where they are. The goal of the device is entirely non-invasive monitoring for any falls or accidents.
- Our **Cooking Assistant** project uses machine learning and image recognition to actively guide a user through cooking a recipe. Installed above the stove, the assistant records the cooking pot, measuring if ingredients are cooked, or if water is boiling through a series of sensors. The connected application walks the user through every step measured and confirmed through sensor processing.
- The **Smart Pillbox System** sends reminders through a connected app when it is time for a user to take a scheduled pill. When the user is detected, pills are dispensed. Then, the system confirms that the pill has been taken.



SMART PILLBOX SYSTEM



HOME DETECTION



COOKING ASSISTANT

Read Our Publications

IEEE PUBLISHED WORK

Publications Published with Dr. Kiran George

CALIFORNIA STATE UNIVERSITY, FULLERTON

Impact of Industry Partnerships on Student Learning & Opportunities

Kiran George

Professor Electrical and Computer Engineering California State University, Fullerton



CISCO Partnership

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CISCO

Cisco — through the Silicon Valley Community Foundation — has provided a \$300,000 grant to build the College of Engineering and

Computer Science capacity in IoT, or internet of things, curriculum and project experiences. As industry grapples with the influences of new technologies, this grant will help better prepare students for the workforce by exposing them to leading companies in the IoT space and providing hands-on learning opportunities.

























CISCO Partnership

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In Good Company: Future Engineers, Computer Scientists Harness Potential of Industry Partners



IoT Based Research Projects

6 IoT Based Research Projects Were Funded (Students Impacted: 12)

• 8 IEEE Publications

• 6 Thesis

- 1 Graduate Project
- 5 Independent Studies

R. Parekh, U. Shah and **K. George**, "Experimental Study on 3D Fractal Base Antennas Design for Efficient Wi-Fi Energy Harvesting", *2021 IEEE Computing and Communication Workshop and Conference.*

M. Sreekanta, A. Sarode and **K. George**, "Error Detection Using Augmented Reality in the Subtractive Manufacturing Process," *2020 IEEE Computing and Communication Workshop and Conference*.

B. Shirke, J. Wong, J. Libut, **K. George** and S. Oh, "Brain-IoT Based Emotion Recognition System," *2020 IEEE Computing and Communication Workshop and Conference*.

J. H. Samawi, A. Govalkar, T. Tothong and **K. George**, "Morphing Quadcopters", 2020 *IEEE Information Technology, Electronics and Mobile Communication Conference*.

R. Parekh, D. Luu, K. Jain and **K. George**, "Scavenging Residual Energy from Wi-Fi Sources Using a Rectenna Circuit," *2019 IEEE Ubiquitous Computing, Electronics & Mobile Communication Conference.*

B. Shirke, J. Wong and **K. George**, "Acute Mental Stress Measurement using Brain-IoT System," 2019 IEEE International Conference on Cognitive Machine Intelligence.

R. Parekh and **K. George**, "Fractal Base Antennas Effects on Wi-Fi Harvesting Technologies," 2019 IEEE International Conference on Cognitive Machine Intelligence.

A. Zaheer and **K. George**, "Automated Dye-Sensitized Solar Cell Manufacturing System with IoT Monitoring," 2018 IEEE Ubiquitous Computing, Electronics & Mobile Communication Conference.



Mercury Systems Inc. (2019-22)

Mercury Systems Inc. has donated a \$300,000 gift to support the "Intelligent Radar System" research project, directed by Kiran George, professor of computer engineering. This project will allow the College of Engineering and Computer Science to build out capacity in artificial intelligence, including developing curriculum, advancing research and engaging students in projects.

- 20 IEEE Publications (2019-23)
- 8 Thesis

(Jaron Lin, Jordan Juliano, Alex Erdogan*, Ameya Govalkar*, Henry Lin*, Tyler Groom*, Kayla Lee* & Cesar Martinez)

• 14 Independent Studies

(Ameya Govalkar, Cesar Martinez*, Henry Lin, Tyler Groom, Kayla Lee, Illianna Izabal, Acacia Codding, Nate Ruppert*, Jake Miho, Vanessa Roque, Anthony Nguyen, Matthew Cesena & Ylicia Godinez)

- <u>Students Impacted</u>: 16
- <u>Students Employed by Mercury</u>: Alex Erdogan, Tyler Groom, Henry Lin, Acacia Codding, & Cesar Martinez



* Students who started working on the Mercury project as a sophomore, graduated with BS degree and the continued on the project as a graduate student













Autonomous Underwater Vehicle





RJE INTERNATIONAL SPECIALIZING IN MISSION CRITICAL PRODUCTS

Underwater Remotely Operated Vehicle





