

# 2016 CITRIS SEED FUND AWARDS

In 2016, CITRIS and the Banatao Institute received 54 highly competitive proposals from the four CITRIS campuses at UC Berkeley, UC Davis, UC Merced and UC Santa Cruz. Ten teams will receive a one-time award, averaging \$57,000 each, for interdisciplinary work meant to lead to larger research programs and extramural grant proposals. Winning proposals incorporate sensors, drones, and data analytics to advance cultural heritage preservation, online learning, and applications in health care, energy and agriculture.



## Analyzing large corpora of code submissions to generate actionable hints for code correctness and style

We use machine learning and software analysis to generate immediate, customized, actionable feedback on the correctness and quality of students' computer code with minimal instructor intervention, by using structural similarities between different students' code submissions as the basis of targeted hints to help the students improve their code.

Principal Investigators:  
Armando Fox (UC Berkeley)  
Premkumar Devanbu (UC Davis)



## Avoiding Unnecessary Cesarean Section Deliveries: Informing the Decision via Transabdominal Fetal Oximetry

The project aims to develop a non-invasive trans-abdominal fetal brain oxygenation measurement system. The system will help obstetricians to easily distinguish between normal and critical drops in fetal heart rate during labor contractions, and thus, will enable patients and clinicians to avoid unnecessary Cesarean section surgeries.

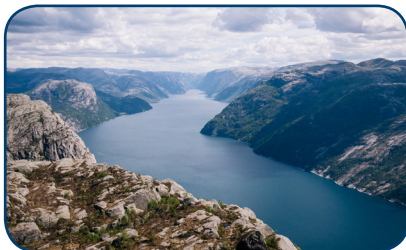
Principal investigators:  
Soheil Ghiasi, Andre Knoesen (UC Davis)  
Neil Ray (UC Davis Medical Center)



## A Biosensor for Early Detection of Increased Risk of Necrotizing Enterocolitis in Premature Infants

This project proposes development and testing of a multivariate biosensor pod to measure expelled gases from premature infants and to correlate these gases with the fecal microbiota. The ultimate goal is an early detection system for intestinal dysbiosis which precedes a common and devastating disease of premature infants: necrotizing enterocolitis.

Principal investigators:  
Mark Underwood (UC Davis Medical Center)  
Andre Knoesen, David Mills (UC Davis)



## Bodie Digital Community: Connect with your Past

This project is an augmented reality application for mobile devices created in collaboration with California State Parks. This app promotes public engagement in heritage preservation, fosters connection among visitors, and generates useful data that improve the management and preservation of California natural and cultural resources.

Principal Investigators:  
Nicola Lercari, Marcelo Kallman (UC Merced)  
Arnav Jhala (UC Santa Cruz)



## Enabling robots to express emotions based on human demonstrations

The goal of this project is for robots to leverage "body language" to express their state of awareness, hesitation, excitement, disappointment, etc. The project is a collaboration between roboticists, computer graphics experts and professional dancers. The team will develop and test methods for transferring motion capture data of a human dancer expressing emotions to a robot arm in a manner that preserves the emotional content of the motion. Experiments will use the PR2 and Kinova arm to evaluate these methods with human subjects via the Amazon Mechanical Turk platform.

Principal investigators:  
Anca Dragan, Lisa Wymore (UC Berkeley)  
Marcelo Kallmann (UC Merced)



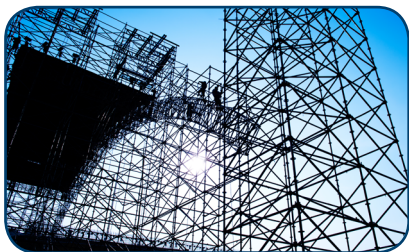
## Low-Cost Carbon Uptake Remote Sensing System and Training Module

This project is a collaboration between the UCSC S-lab and UC Davis D-lab to build a low cost web-enabled remote sensor system and training module, based on the arduino platform, that locally monitors carbon uptake by plants. This system can be widely deployed by students from around the world to monitor carbon dioxide and water uptake by plants in their communities in order to facilitate sound land management practices that reduce the negative impacts of environmental and climate change.

Principal investigators:  
Kurt Kornbluth (UC Davis)  
Sue Carter (UC Santa Cruz)

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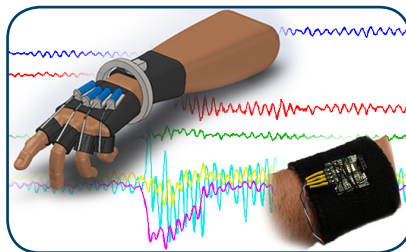
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## Putting the Feedback Cycle in High Gear: Community-sourced, Data-driven Approaches for Sustainable Transportation Infrastructure

Stymied by the complex and opaque process involved in improvements to physical infrastructure? Tired of multiple trips to City Council? Distrustful of assumptions behind consultant projections? We will improve the planning process by collecting ongoing data using smartphones, and allowing cities to prototype changes and measure their impact before finalizing.

Principal investigators:  
Randy Katz (UC Berkeley)  
Lise Getoor (UC Santa Cruz)



## Robotic Exoskeleton For The Stabilization Of Tremors (RST) In the Hand and Wrist

Current treatment options fail to adequately support the millions of Americans living with Parkinson's Disease or Essential Tremor. This collaboration between the UC Davis School of Medicine and UC Santa Cruz College of Engineering proposes a novel solution that achieves hand, wrist, and arm stabilization through a non-intrusive robotic exoskeleton.

Principal investigators:  
Lin Zhang (UC Davis)  
Gabriel Hugh Elkaim (UC Santa Cruz)



## Smart Infrastructure in Affordable Housing

UC Merced and Cabrillo College (Santa Cruz County) are developing smart "Tiny Row Houses" (TRHs) that can address the need for affordable housing in Northern California urban areas and Central Valley rural areas. These structures will be equipped with integrated smart systems to minimize resource inputs and operational consumption.

Principal investigators:  
Ronnie Lipschutz (UC Santa Cruz)  
Elliott Campbell (UC Merced)



## Under-Canopy Robots for Biofuel Plant Phenotyping Research

This project is developing a miniature high-throughput phenotyping robot to help plant breeders automate the measurement of plant architecture they require to accelerate the creation of more efficient energy crops that are better adapted to climate change and can be produced on marginal land without displacing food crops.

Principal investigators:  
David C. Slaughter, Stavros Vougioukas,  
Julin Maloof, Neelima Sinha (UC Davis)  
Peggy Lemaux (UC Berkeley)

# 2016 CITRIS SEED FUND AWARDS

## CITRIS-ITESM Seed Funding for 2016

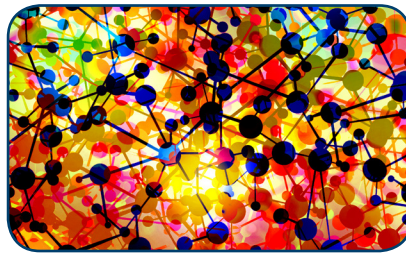
Three inventive projects have been selected to receive collaborative research grants in the second annual seed funding program sponsored by **Tecnológico de Monterrey (ITESM)** and CITRIS. The winning proposals represent the fields of healthcare, water management and smart manufacturing—topics of pressing concern to both California and Mexico. The program offers an opportunity to develop and test ideas while positioning researchers to apply for large-scale grants from national and private funders in each country.



### **A Decision-Support System for Water Resources Management: An Application to Monterrey, Mexico**

This project integrates water-use data and socioeconomic information into a water management decision-support system. The researchers will develop long-term hydrologic and socioeconomic scenarios; model a large, metropolitan water system using hydro-economics; and identify promising water management strategies for use by city managers in times of both floods and drought.

Principal investigators:  
Aldo Ramirez-Orozco (ITESM)  
Josue Medellin-Azuara (UC Davis)



### **Diagnosis and Control of Diabetes Mellitus for Latin American Population using Data Science and Big Data**

This project will develop data mining and data science tools to analyze data from diabetes patients in Latin America. The platform will integrate numerous variables such as epidemiological, financial, social, geographic, biochemical, biological and clinical data to improve understanding of the most important factors correlated with the disease and assist physicians and policy makers with prevention.

Principal investigators:  
Neil Hernandez Gress (ITESM)  
Ramakrishna Akella (UC Santa Cruz)



### **S3 Microfactory (Sustainable, Smart & Sensing) to Support the Maker Movement**

The researchers will develop a S3-Microfactory (Sustainable, Smart & Sensing) that includes the characteristics of an intelligent manufacturing enterprise. The instrument will provide students with an active learning experience by offering practical exercises and experimentation. Students will be able to simulate real-life problem scenarios and propose innovative solutions to design their products, manufacturing processes and manufacturing production systems.

Principal investigators:  
Jhonattan Miranda, Arturo Molina (ITESM)  
Paul K. Wright (UC Berkeley)

# 2016 CITRIS SEED FUND AWARDS

## CITRIS-UC Riverside Seed Funding for 2016

We are delighted to announce the inaugural **CITRIS & UC Riverside Seed Funding Program** and grant awardees. As part of CITRIS's annual seed funding process, we partnered this year with UC Riverside to broaden collaboration across University of California campuses on research projects that apply information technology for social impact.

Nine highly competitive proposals from principal investigators at the four CITRIS campuses (UC Berkeley, Davis, Merced, Santa Cruz) and UC Riverside were submitted. Four projects were selected for one year of seed funding, each receiving \$60,000 for a total of \$240,000 in interdisciplinary research funds. Winning proposals include work that will use sensors, drones, and data analytics to advance the future of natural resource management, preservation of cultural heritage, and security in human-robot interaction.



### **Integrated Data Management of Micro-Synchrophasors and Behind-the-Meter Sensors for Sustainable Electricity Distribution Systems**

This project will co-analyze data from micro phasor-measurement-units with data from behind-the-meter sensors at a real-world test site to enhance situational awareness in power distribution systems. An integrated data management system will be developed to support inter-operability and remote access to enable data verification, calibration, and event-cause identification.

Principal investigators:  
Hamed Mohsenian-Rad, Sadrul Ula  
(UC Riverside)  
Alexandra von Meier (UC Berkeley)



### **Integrating Electrically Conducting Membranes as In-Situ Sensors in Autonomous Water Treatment Systems**

We will develop membrane-based systems that couple electrically conducting membranes with open-source hardware and software. The system will produce an autonomous water treatment technology that can adjust operating conditions to respond to changes in feed water quality, as well as initiate cleaning and maintenance operations without the need for human intervention.

Principal investigators:  
David Jassby (UC Riverside)  
Mark Matsumoto (UC Merced)



### **Secure Algorithms for Cloud-Robotics**

This project will develop control-theoretic tools for cloud-connected autonomous robots interacting with humans to guarantee security and operability in the face of cyber and physical failures, and malicious tampering. This novel human-robot paradigm will ensure dependable performance in complex applications, such as search and rescue, and autonomous surveillance.

Principal investigators:  
Fabio Pasqualetti (UC Riverside)  
Ricardo Sanfelice (UC Santa Cruz)



### **Drones for Cave Archaeology and 3D Mapping**

This project advances human/drone interactions in 3D mapping of archaeological cave sites. Using existing technology, the project will develop the capabilities of drone mapping in caves and human-robot co-supervised lighting and ground-truthing protocols. This promises to increase speed, accuracy, and quality in mapping archaeological sites, with reduced costs.

Principal investigators:  
Holley Moyes, YangQuan Chen (UC Merced)  
Karl Taube (UC Riverside)