

# CAPSTONE DESIGN EXPO

Fall 2019

**12.02.19**

McCamish Pavilion  
Atlanta, Georgia

## CAPSTONE DESIGN EXPO

The Capstone Design Expo is one of the largest student design expos in the United States, showcasing Georgia Tech's projects designed and built during the Capstone Design Course. Students work in teams to solve industry problems, develop innovative tools to assist researchers, or work on their own entrepreneurial ideas.

Past expos have produced projects that have yielded significant results for industry sponsors, saving them upwards of millions of dollars in research and development costs. The networking experience for students gives them the opportunity to make a lasting first impression on potential employers; some have walked away with an invitation to visit a potential employment opportunity with some of the sponsors.

<http://mecapstone.gatech.edu/>

Dear Capstone Design Expo Judges and Guests:

Georgia Tech opened its doors in 1888 with mechanical engineering being its only degree-granting program during the Institute's first eight years. Mechanical Engineering (ME) grew from the original shop or trade culture to a world professional curriculum with experimental laboratories and multi-disciplinary challenges. Today, with almost 3,000 students, the Woodruff School is the largest mechanical engineering program in the US, graduating over 600 bachelor's degrees, 200 master's degrees, and 65+ doctoral degrees each year. From its early beginning and throughout our history, one thing has always remained constant: excellence in creating and building products, devices, and systems that make the world a better place!

As part of our relentless drive for excellence, the Woodruff School embarked on an ambitious journey to create a renaissance in engineering education and make its undergraduate program among the very best in the world. Part of this initiative was to reintegrate and supercharge the "create-innovate-design-build" stem of the curriculum. Since over a decade, the Woodruff School has encouraged and enabled all its students to engage in hardware prototyping for validation of their Capstone Design projects. The School continues to provide a variety of resources, including access to state of the art machines, expertise, and assembly space to all its students, through the newly renovated Flowers Invention Studio, the Montgomery Machining Mall, the ME Electronics Shop, and the IDEA Lab – all housed in a contiguous space on the second floor of the MRDC building. This state-of-the-art facility has helped foster the maker culture on campus and support numerous collaborative cross-disciplinary design and innovation projects. Given these facilities, it is not surprising that the Woodruff School also leads the drive for multi-disciplinary Capstone teams, and we can point with pride to strong partnerships with Industrial Design, Computer Sciences, Biomedical Engineering, Electrical & Computer Engineering, and Material Sciences & Engineering.

The Capstone Design Expo, which was started by Woodruff School over a decade ago, is now held twice per year and attracts several thousand attendees to Georgia Tech to evaluate and celebrate our students' accomplishments. The Fall 2019 Expo will feature 143 teams from 9 different schools. Of those, ME has the largest number of teams (31) in addition to the 24 other interdisciplinary teams that have ME students. More than half of the teams have an external sponsor in form of a company, entrepreneur or non-profit organization supporting their project. A special CREATE-X section focused on supporting entrepreneurial teams has more than 10 teams who will all pitch their startup ideas at the expo.

Going forward we seek to build on our vision and proven record of accomplishment to advance engineering education and to significantly enhance the quality of our graduates as they enter the workforce. We thank you profoundly for joining us on this journey and your continuous support to educate mechanical engineering graduates who will have tremendous impact and provide positive change in our world. Come see for yourself and let me welcome you to the GT Capstone Design Expo!

**Amit S. Jariwala**  
Director of Design & Innovation

# LIST OF PROJECTS

## AEROSPACE

**Boom Brigade** | Universal Offloading System, [B29](#)

**Team Uno** | Aircraft Wire Harness String Tie Tool Development, [Y26](#)

**Team Blue** | Aircraft Wire Harness String Tie Tool Development, [Y4](#)

**Team Powerhouse** | Reaction Chamber Design for CubeSat Propulsion, [G17](#)

## BIOMEDICAL/BIOENGINEERING

**Bari Pickers** | Bariatric Patient Transfer, [R50](#)

**Fully Loaded** | Bio-mechanical Testing Load Frame, [Y9](#)

**Find Your Flow** | Kidney Transplant Monitoring Solution, [G30](#)

**TempTEC** | Peltier Cooler, [R45](#)

**Train to Nowhere** | Steerable Sheath for Mitral and Tricuspid Valve Repair, [R42](#)

**Leave No TRAYce** | Overbed Table Alternative for Hospital Meal Tray Delivery, [B9](#)

**Healthy Hawks** | SmartSlam, [G2](#)

**The Daring Dinosaurs** | Automated CPR Device for Infants, [G3](#)

**parakit** | Improved Paracentesis Kit for Liver Disease Patients, [B25](#)

**GoodProjectOnlySolutions** | Rapid Response X-Ray Platform, [R13](#)

## COMMUNITY SUSTAINABILITY

**Ekwangineers** | Ekwang Wrapper, [R40](#)

**Team Sustainability** | Sustainable Wheelchair Design, [G13](#)

**The Better Bitter Group** | Better Bitter, [R38](#)

**Fellowship of the Engineers** | Bitter Begone, [R36](#)

## CONSUMER PRODUCTS

**WWICK** | Camelbak: Families in the Outdoors, [Y12](#)

**CamelJakets** | CamelBak: Encouraging Families Outdoors, [Y23](#)

**Georgia Tech University** | Smart Water Management System Via Connected Manifold, [B19](#)

**H2Woah** | Smart Water Management System, [B21](#)

**First Response Fire Brigade** | Residential Autonomous Fire Fighting Robot, [B10](#)  
Smart Home System

**Graduation...Pending** | Industrial Pill Dispenser, [B13](#)

**Drink and Thrive** | BAC Car Key Lock, [G9](#)

**Orion Grill** | Design of a Unique Gas Grill, [R33](#)

## ENERGY SUSTAINABILITY

**Windward Solutions** | Small Modular Wind Turbines for Off-Grid Applications, [R43](#)

**Helluva Engineers** | Piezoelectric Crosswalk, [G20](#)

**Trash Treasurers** | Small-Scale PET Plastic Repurposing, [G35](#)

**World Wide Winners** | C14-Heat Pump Water Heater with Increased Efficiency, [G33](#)

**Super Seniors** | Solar Powered Golf Cart, [G29](#)

**Hole In Sun** | Solar Powered Golf Cart, [G31](#)

## ENTERPRENURIAL

**Tam's** | Adjustable-Focus Glasses, [Y14](#)

**StinkyKids** | UV Clothes Freshener, [B32](#)

**ME 17** | Watchdog, [B6](#)

**WarmUps** | WarmUps: Heated Gaming Gloves, [R44](#)

**Untitled 7** | The MyPen System, [B12](#)

**voltswagen** | Smart Outlet, [R9](#)

## INDUSTRIAL TOOLING/MANUFACTURING

**Rotordynamics** | Manipulation and Transportation of Gas Turbine Discs, [R29](#)

**OnTrack** | Railroad Inspection Vehicle, [R37](#)

**The Victory Lap** | Reduction of Dissolved Oxygen in a Double IPA, [G23](#)

**Metal Benders** | Southwire NM Paper Feed, [B26](#)

**Stressed, Fractured, Failure** | Tri Axial Test Stand to Validate Additive Manufacturing (Metal 3-D Printing) Components, [R21](#)

## MECHATRONICS

**CDC Automated Food Preparation Device** | CDC Automated Food Preparation Device, **R6**

**ArboRobotics** | Mechanical Tree Pruning Apparatus to Replace Traditional Climbers, **G37**

**ChockBot** | ChockBot, **G5**

**Tune Squad** | Automatic Tension Tuner, **G32**

**Spot Buddies** | Bench Press Spotting Machine, **B8**

**Roboquarium** | Swarming Aquabots, **R27**

## MOBILITY/AUTOMOTIVE

**Calibration Nation** | Optimization of ADAS Sensor Calibration Process, **R39**

**EnableAll** | Wheelchair Sensor & Stabilization Device, **B16**

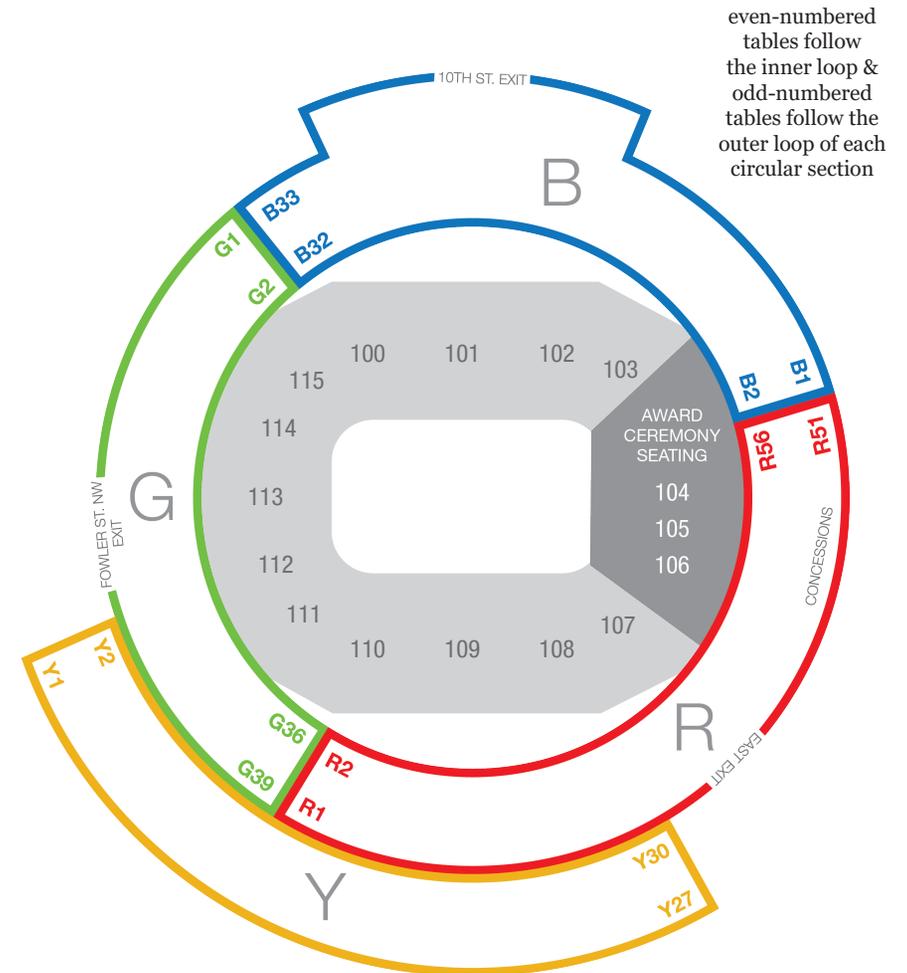
**WheelCare** | Power Assisted Wheelchair Attachment, **B31**

**Last Mile** | The Future of Package Delivery, **G25**

**e.g. Road Warriors** | Design Of A Shuttle Caddy In Vehicles, **G4**

**TnC Golf Carts** | Reduction of NVH in a Gas-Powered Golf Cart's Intake, **G27**

## EXPO LAYOUT MAP



the yellow zone is on the second floor, above the Callaway Club

## UNTITLED 7

The MyPen System



### » Entrepreneurial

An entrepreneurial project, this tool involves using any regular pen or pencil on any surface. It tracks all movements made and stores them digitally, consequently uploading the information to any program. The team summarizes that it “extends what you can do with pen and paper into the virtual environment.” This tool will significantly improve sketching and technical drawings, while preserving the natural feel of writing and drawing. It eliminates lost notes and the need to carry heavy files. The completed project turned out successfully and works as expected, tracking the movements done by the user and uploading to all computer programs. Team comprises of students from majors in Mechanical and Electrical Engineering.

**SPONSOR**  
N/A

**ADVISOR**  
Dr. Todd Sulchek

**MEMBERS**  
Sartaaj Gill  
Aditya Gupta  
Abhirav Joshi  
Rafay Khan  
Davis Rider  
Shrivathsav Seshan

## CAMELJAKETS

CamelBak: Encouraging Families Outdoors



### » Consumer Products

Sponsored by CamelBak, this group is looking to expand the traditional brand and go beyond hydration into products that encourage families outdoors. The focus of family interaction develops CamelBak’s brand, and is allowing the team to explore a wide range of new and creative possibilities. The team enjoys the innovation, and has developed a small backpack aimed at children, which can be easily attached to a large backpack, aimed at parents. The team aspires to bring the whole family together by allowing children to customize and independently carry their own bag, while offering a practical solution to parents for the longer hikes. The team presents a cardboard prototype showcasing the attaching mechanism, as well as the different features of the product. Team comprises of students from majors in Mechanical Engineering and Industrial Design.

**SPONSOR**  
CamelBak

**ADVISOR**  
Dr. Wayne Li

**MEMBERS**  
Shiwen Jiang  
Sarah Kim  
Martina Lo  
Emily Sheppard  
Belinda Zhang

G13

## TEAM SUSTAINABILITY

Sustainable Wheelchair Design



### » Community Sustainability

With a target of providing wheelchairs for developing nations, this team is one of two working towards the same goal. This team is focused on the design aspect, while the second team works on the feasibility of production methods. The design involves using PET as the primary material for the wheelchair, making it lightweight, portable and recyclable. The aim is to 3D print the parts on site, making it local and embedded in the community. The latest Generative Design tool available within Autodesk's Fusion 360 product was used in the development of the wheelchair, with the iterative design process being extremely helpful to the team.

#### SPONSOR

Humberto Garcia-Sjogrim,  
Scot Hollonbeck,  
Vincenzo Piscopo

#### ADVISOR

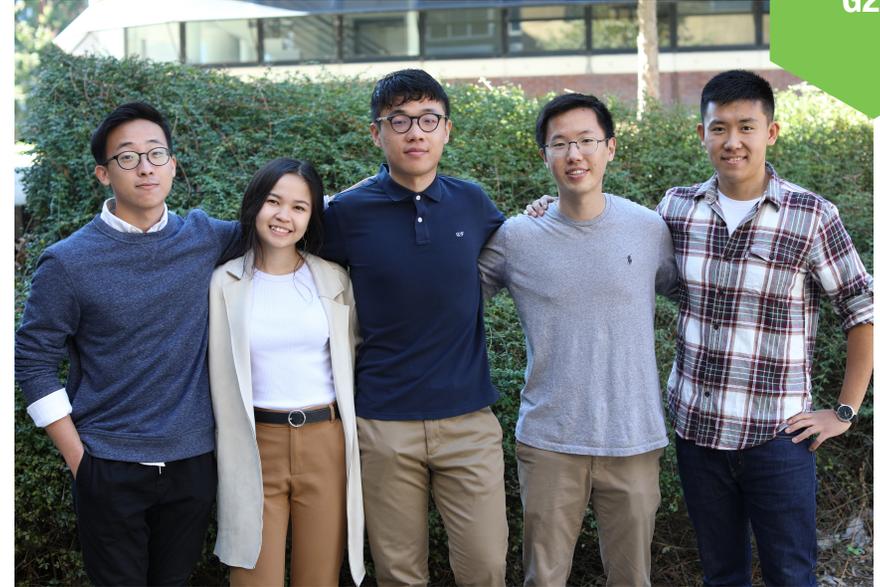
Dr. Yan Wang

#### MEMBERS

Shweta Bhat  
Uma Kaladi  
Michael Nappier  
Adam I'jaaz Shah  
Joanne Tamayo  
Alexander Zabaldo

## LAST MILE

The Future of Package Delivery



G25

### » Mobility/Automotive

Consulting with Amazon, UPS and FedEx, this team is developing a product to decrease delivery time. The product is an automated level 4 vehicle, and is aimed at improving the last mile in the delivery process. It will increase efficiency and accuracy for the driver, and eliminate human error. The team interviewed drivers as well as the CIO of UPS, and enjoyed getting a variety of feedback. The multiple viewpoints engaging in the project allowed the team to gain a deep understanding of the topic, and apply it in the development of the design. The full scale product is prototyped, and reflects a re-organized truck interior. A virtual reality presentation demonstrates how the product functions. Team comprises of students from majors in Mechanical Engineering and Industrial Design.

#### SPONSOR

N/A

#### ADVISOR

Dr. Wayne Li

#### MEMBERS

Seunghyun Choe  
Francis Lin  
Uyen My Tran  
David Xu  
Kai Zhang

# FELLOWSHIP OF THE ENGINEERS

Bitter Begone

R36



## » Community Sustainability

This team is one of two working on the Bitter Leaf Plant from West Africa. This is a community service based project and is used to improve lives in the developing world, and consequently many students are invested in it. This team is creating a manually powered device to prepare the Bitter Leaf. The tool will reduce the time and effort taken to prepare the plant, with two main components which are aimed at improving speed and efficiency. Inspiration was drawn from known food processors, with one final machine prototyped. Machine movements are based on traditional West African preparation techniques, making the machine intuitive and comfortable to operate.

**SPONSOR**  
Isaac Zama

**ADVISOR**  
Dr. Yang Wang

**MEMBERS**  
Samuel Nelson

# THE BETTER BITTER GROUP

Better Bitter

R38



## » Community Sustainability

Healthy and green, the Bitter Leaf Plant is a traditional West African food. This team is two of two working on this plant, aiming to eliminate the physically tiring and time consuming preparation process. With sponsors from West Africa, the team was able to learn about the different culture and lifestyle, as well as taste the Bitter Leaf Plant for themselves. The goal is to have a less strenuous method which does not require power, and so allows preparation to take place within the community, and be done by locals. Serve-Learn-Sustain (SLS) at Georgia Tech provided valuable resources to the team, as well as the Industrial Design Design Lab and Flowers Invention Studio. The team presents several prototypes to present their concepts.

**SPONSOR**  
Isaac Zama

**ADVISOR**  
Dr. Stephen Sprigle

**MEMBERS**  
Glover Beasley  
Taylor Carter  
Roderick Cummings  
Spencer McCray  
Maggie Parsons

# CALIBRATION NATION

Optimization of ADAS Sensor Calibration Process



R39

## » Mobility/Automotive

The interdisciplinary team comprising of students from Mechanical, Electrical and Computer Engineering is looking to automate the physical process involved with calibrating the ADAS (Advanced Driver Assistance Systems) sensors. Eliminating the manual measurements that are currently necessary will lead to a safer and more efficient process. Sponsored by Cox Automotive, the team has their own workspace at the local Manheim site, and have been able to utilize the maintenance hub, as well as see first-hand the intricate nature of automated driving systems. The team enjoys brainstorming and discussing a diverse range of ideas, and consequently researching new, applicable technologies. Since it is impractical to present a full size car, the team presents a video detailing the features of their product.

### SPONSOR

Cox Automotive

### ADVISOR

Dr. Michael West

### MEMBERS

Beatriz Dias  
Caroline Eckrote  
Eric Hsieh  
Lionel Jones  
Alex Schwartz  
Oguzhan Yilmaz

# ADDITIONAL TEAMS

## » Aerospace

### BOOM BRIGADE | B29

Universal Offloading System

This team of students from Mechanical Engineering worked with Ball Aerospace to design an adaptable and easily reconfigurable Deployable Boom Assembly (DBA) Offloader to simulate the zero-g environment. It will be capable of accommodating different size and types of booms up to 6 ft and 50 Lbs, with scalable components to larger size.

## » Biomedical/Bioengineering

### HEALTHY HAWKS | G2

SmartSlam

Athletic programs and athletes currently utilize weighted medicine balls as a training tool by slamming it against a wall or the ground in strength and/or for rehabilitation training. Existing products like smart medicine balls can track forces, speeds, and accelerations. However, these solutions have major drawbacks particularly in durability and accuracy. The accelerometers inside the current smart medicine balls have a short lifespan before they break. In addition, the readings from these devices yield unreliable, inconsistent results that are of the utmost importance to sports trainers and, specifically for this project, the client, the Atlanta Hawks. Team comprises of students from majors in Mechanical, Material Sciences and Computer Engineering.

## » Aerospace

### TEAM UNO | Y26

Aircraft Wire Harness String Tie Tool Development

Lockheed Martin manufactures C-130 aircraft for use by the US military. They currently utilize small, manually tied string knots (a clove hitch) in order to hold and organize bundles of electrical wire within the C-130 during production. The goal of this project is to create a prototype handheld tool that can tie a clove hitch knot automatically to reduce wear on technicians and increase consistency of knots.

**Georgia Tech**  **George W. Woodruff School  
of Mechanical Engineering**