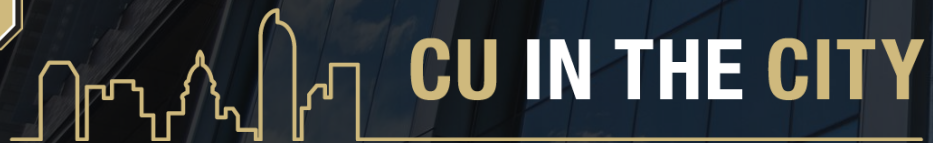




University of Colorado **Denver**



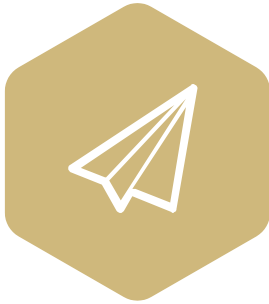
College of Engineering, Design and Computing



CEDC CAPSTONE EXPERIENCES

ABOUT CAPSTONE

The College of Engineering, Design and Computing (CEDC) Capstone Design Program is a signature program across all departments in the college. Each engineering student takes the Capstone Course during their senior year. In this course they design, build, analyze, prototype, test and provide documentation for a product that they have developed for their sponsor.



DESIGN



BUILD AND TEST



PROTOTYPE

THE DIFFERENCE

- Culmination of a design-centered educational experience
 - Teams of 3-5 students and a faculty mentor
 - Interdisciplinary
 - Utilize state-of-the-art Design Innovation (DI) process
 - “Agile - Sprint” cadence to enhance project deliverables
 - Active engagement (co-creation) with sponsors and stakeholders
 - Projects have extensive engineering analysis and simulation
 - Create prototypes to demonstrate feasibility
-

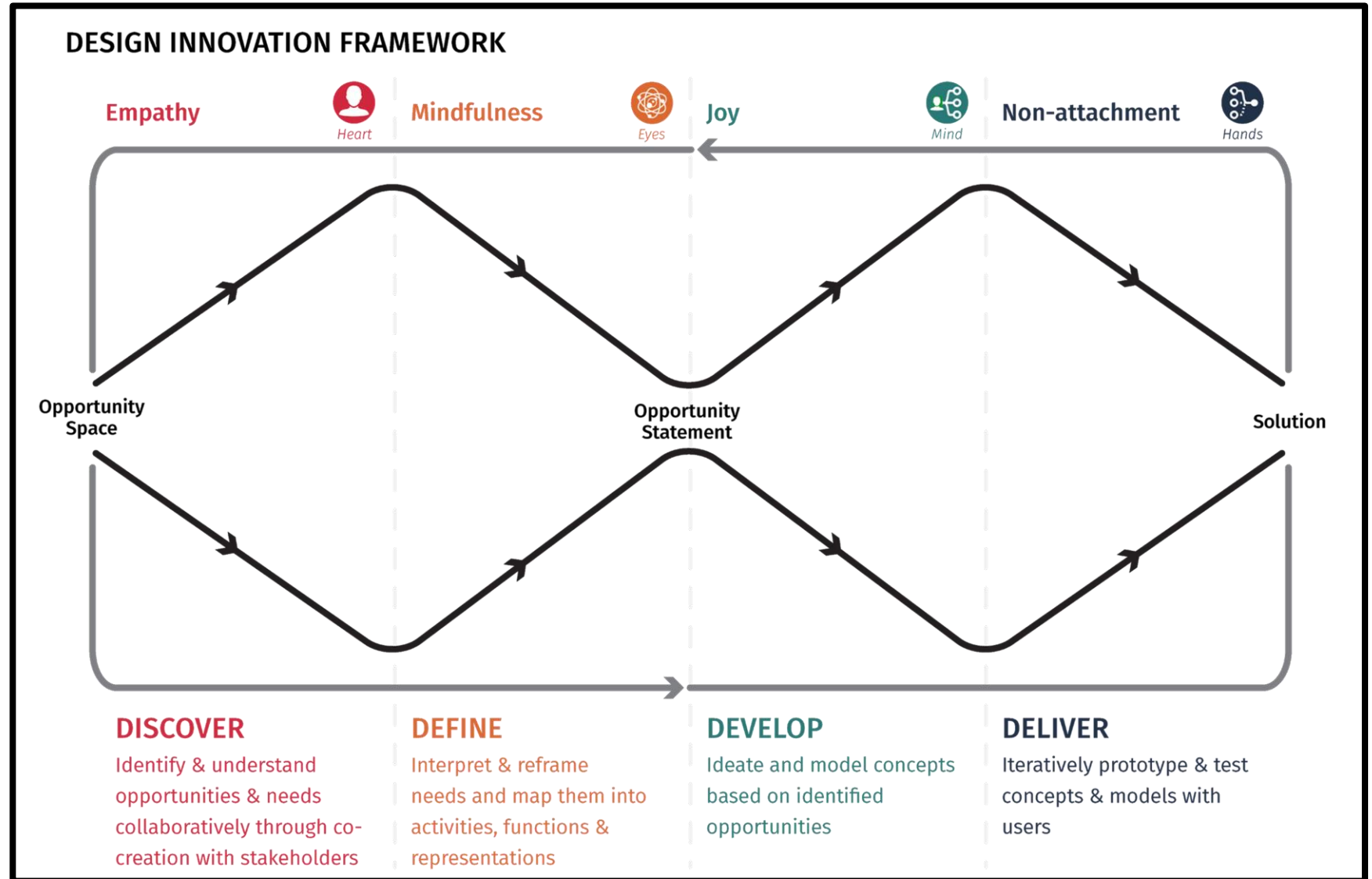




WHY THIS MATTERS TO OUR STUDENTS YOUR FUTURE EMPLOYEES

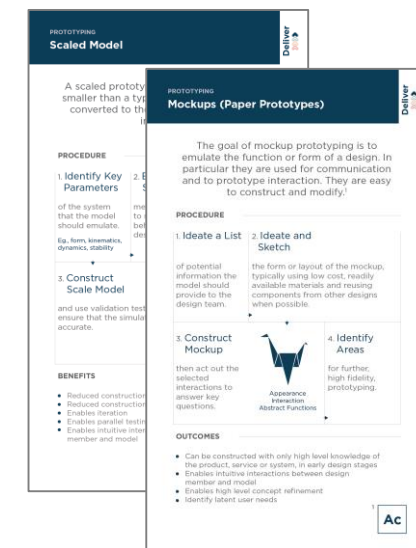
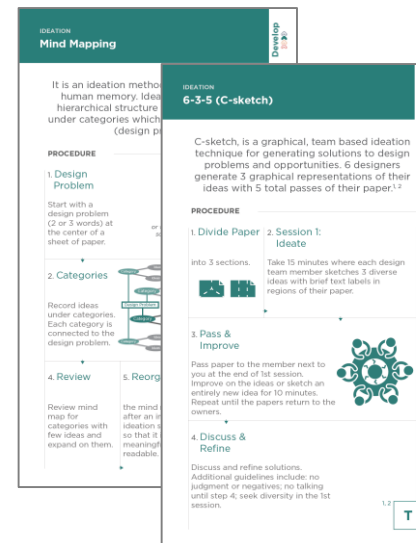
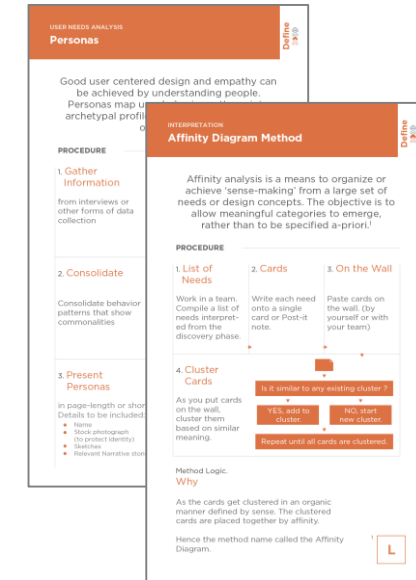
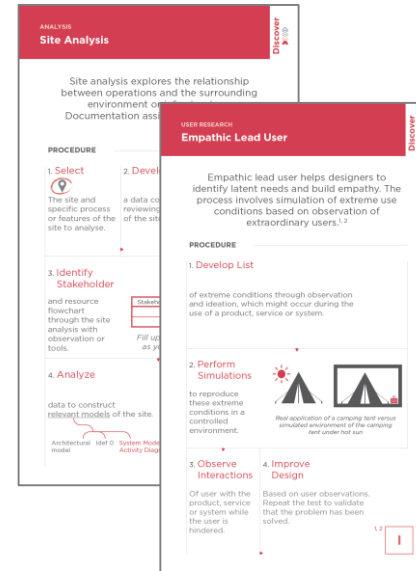
- Helps develop student professional skills
 - Exposure to Design Innovation (DI)
 - Increases visibility for student work and outcomes
 - Connects students and sponsors for employment opportunities
 - Promotes cutting edge-design pedagogy
 - Enables interdisciplinary projects
 - Builds industry engagement across CEDC departments
-

DESIGN INNOVATION FRAMEWORK



Design Cards

- The Design Innovation cards are references for the design methods that are part of the DI process.
- The cards represent bite-sized yet complete representations of a broad array of both advanced technical engineering methods for design, as well as empathic user-centered approaches.
- The Design cards were created at the Singapore Univ. of Technology & Design as part of the International Design Center

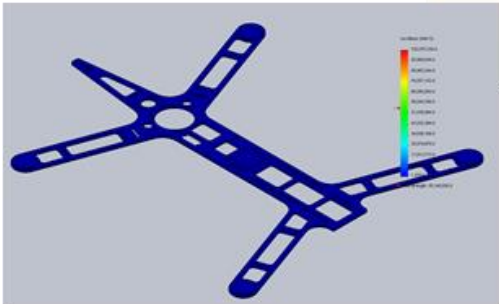


Example Project: Innovative Flying

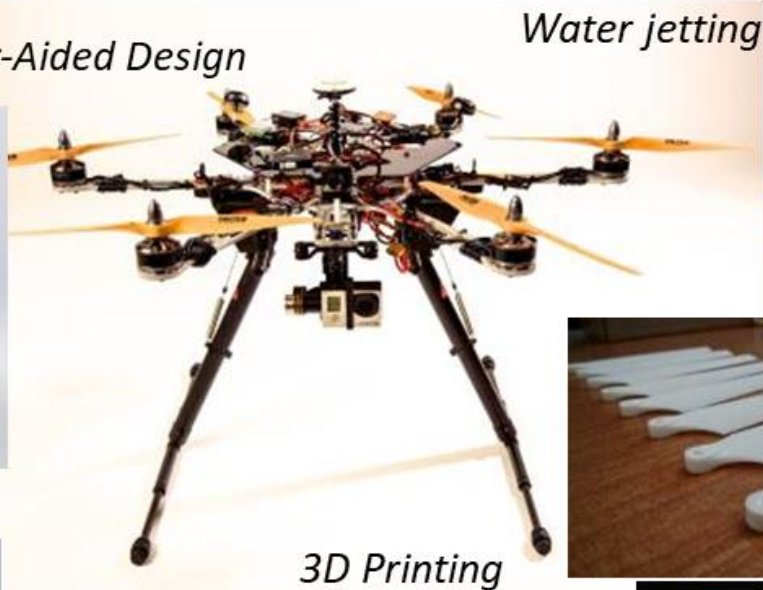
DESIGN



FEM/FEA Stress Analysis



Computer-Aided Design



3D Printing

Water jetting



CONTROL

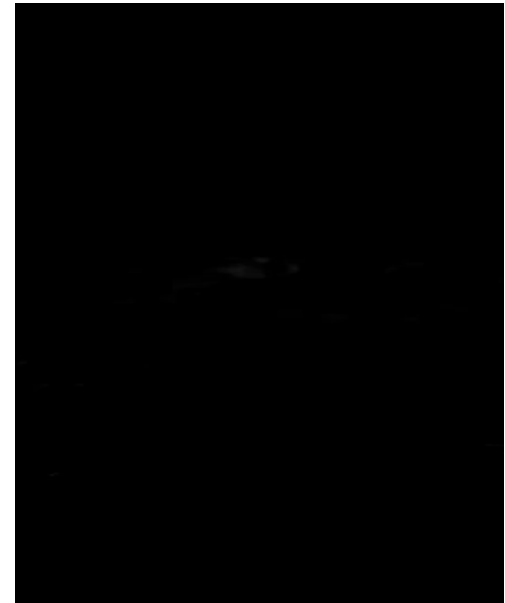
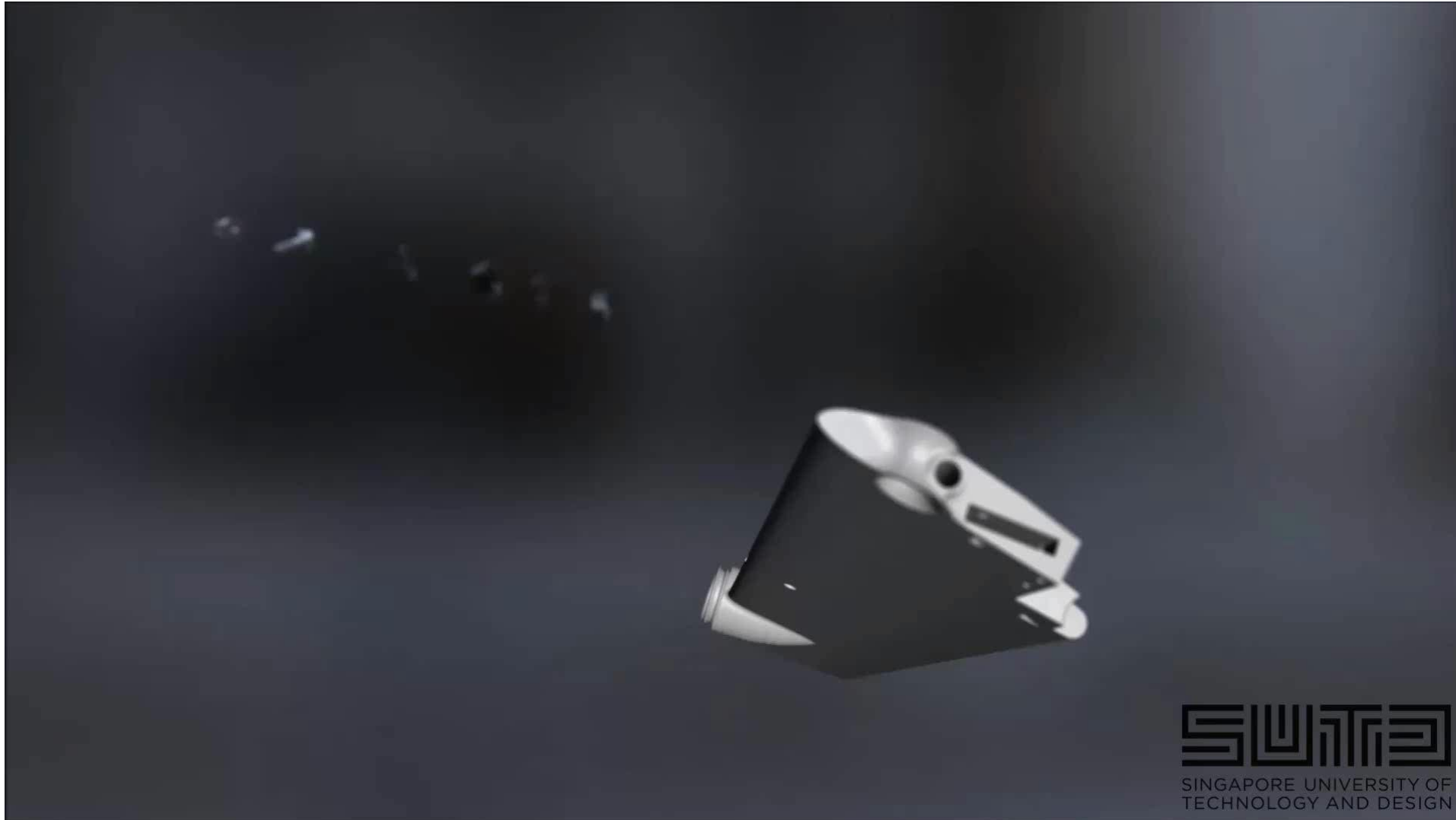


Advanced Gesture Control

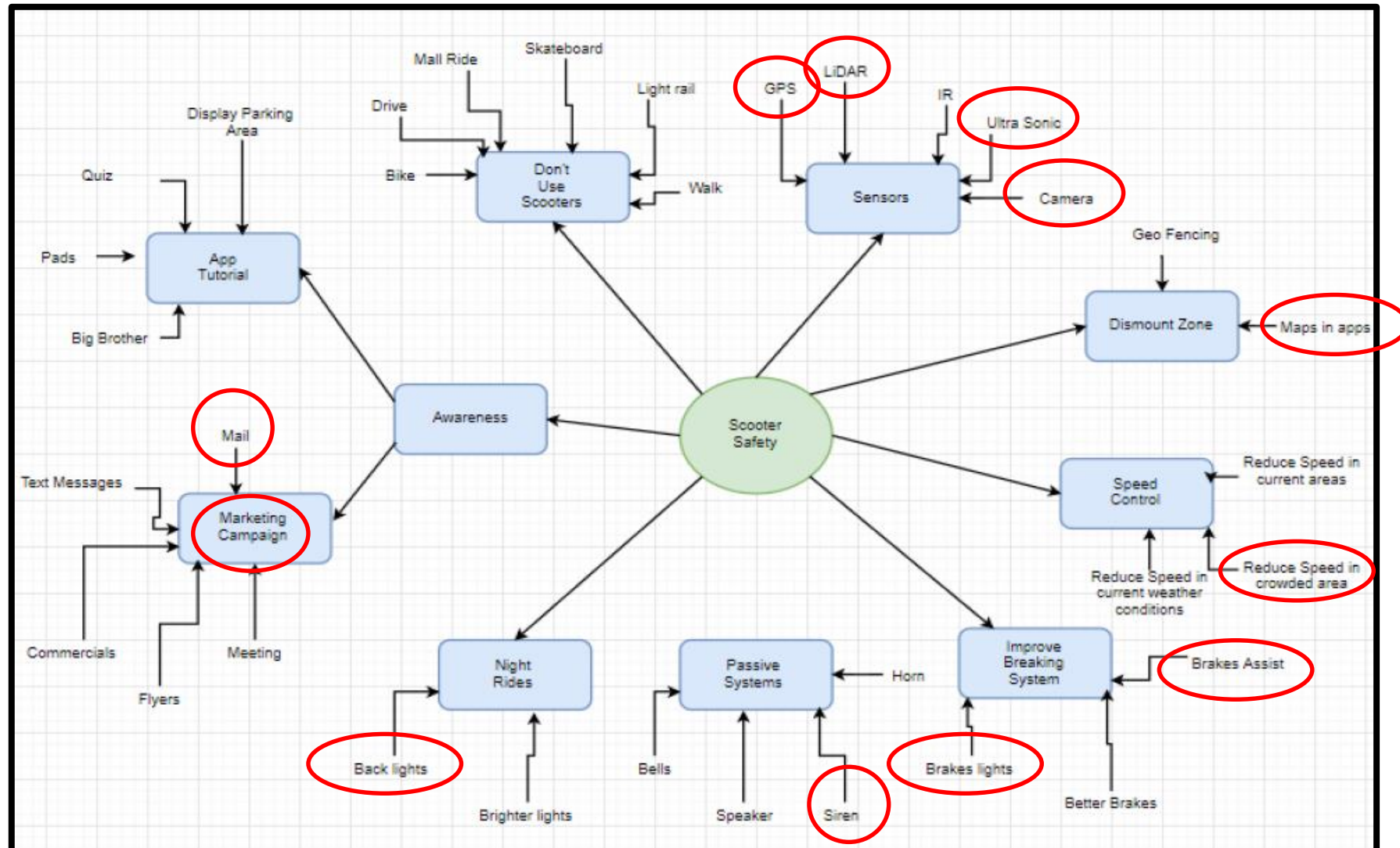


MANUFACTURING

Example Project: Nature (Bio) Inspired Flying



Current Project: MIND MAP FOR SCOOTER SAFETY PROJECT



Current Project: SCOOTER SAFETY

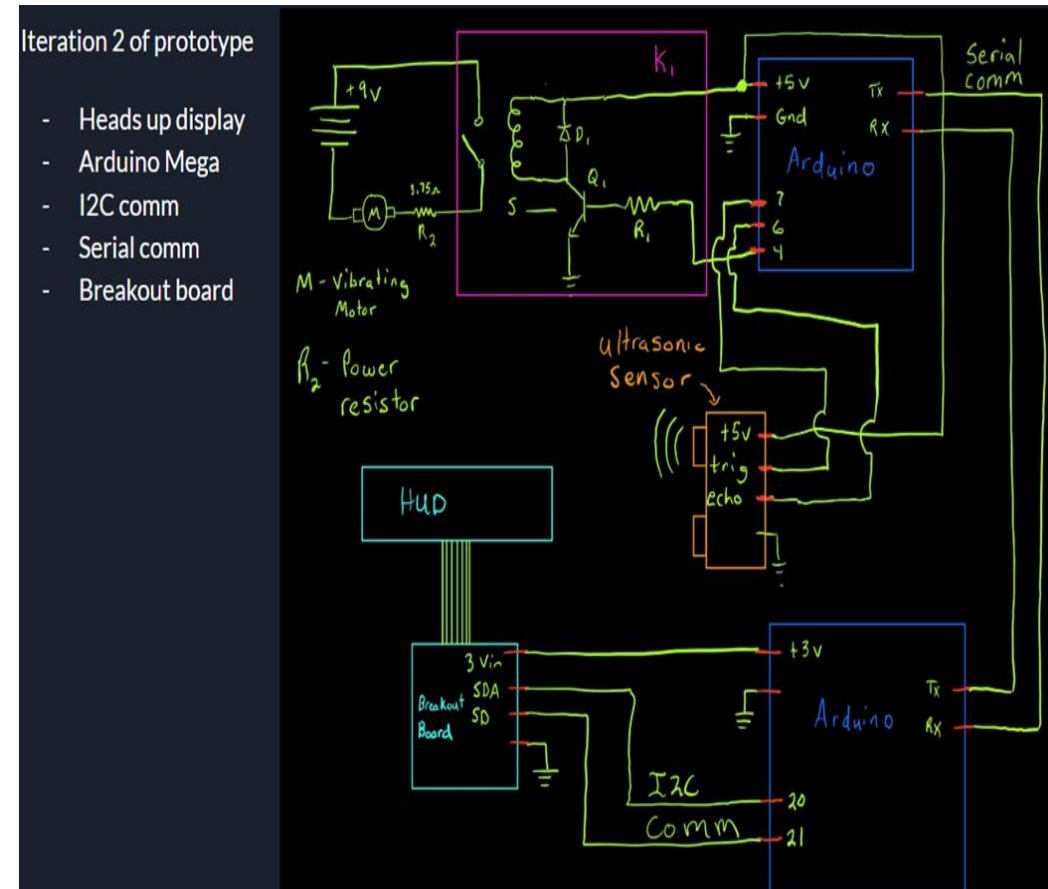


Original Opportunity: How might we create technology to improve electric scooter safety?

Customer Co-Creation: “Device with sensors in helmet is a good idea – but I probably won’t wear the helmet.”

Pivoted (Reframed) Opportunity:
How might we motivate the user to wear the helmet?

HEADS-UP DISPLAY + CAMERA WITH DOWNLOADS TO FACEBOOK (or other social media)



Example Project: HAND REHABILITATION



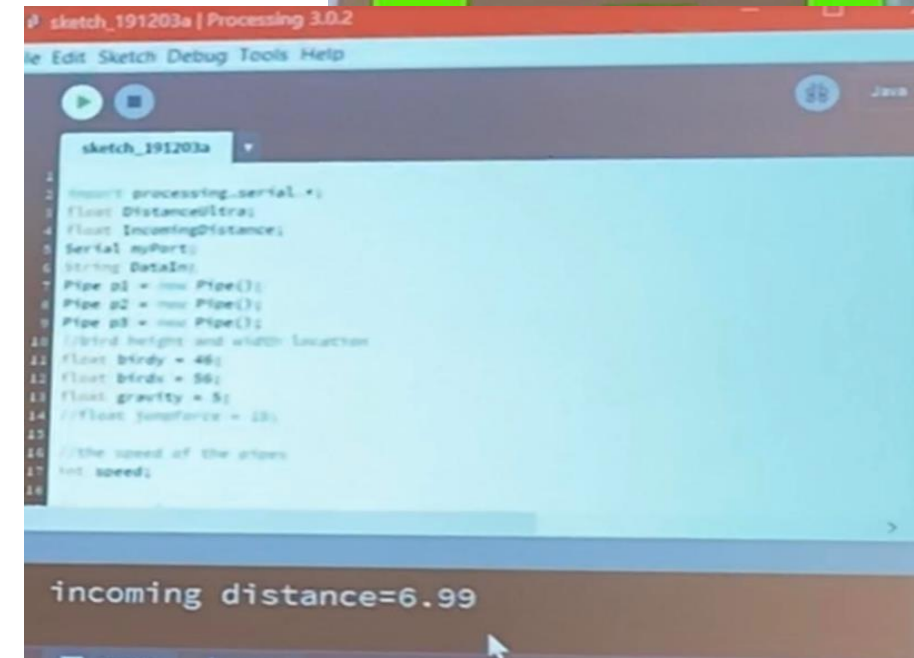
Original Opportunity: How might we create a feedback device for assisting in hand rehabilitation for those with arthritis?

Customer Co-Creation: “Device works great – but not sure I’d use it for the amount of time prescribed by my physical therapist.”

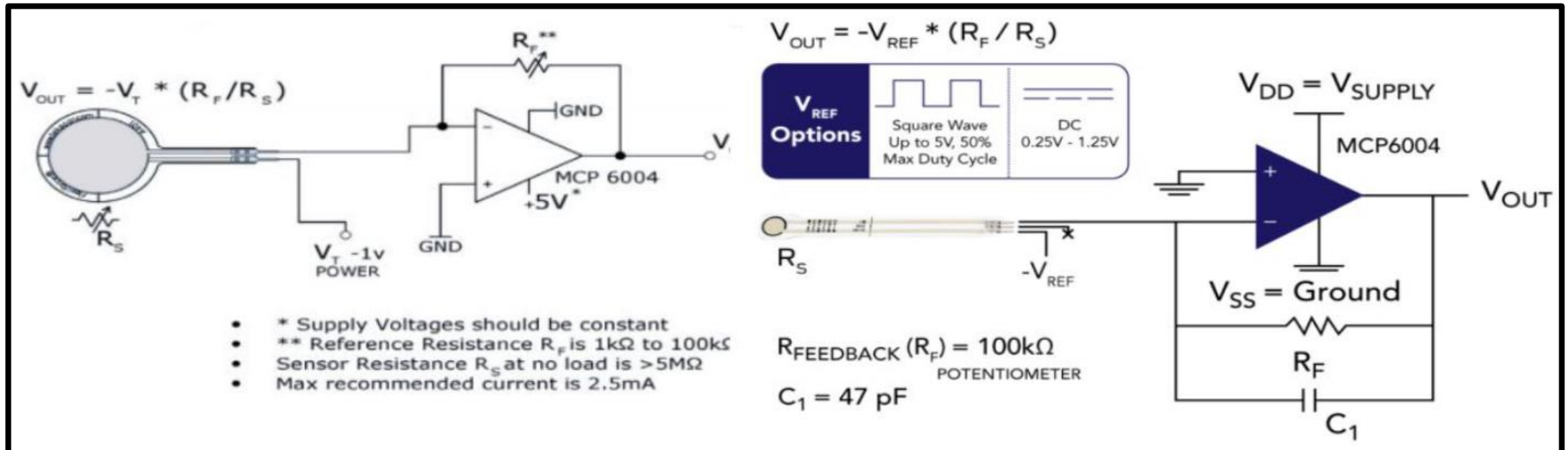
Pivoted (Reframed) Opportunity: How might we motivate the user to maintain their PT regiment for the needed time?

Being piloted at UC Medical. Patent(s) in the works.

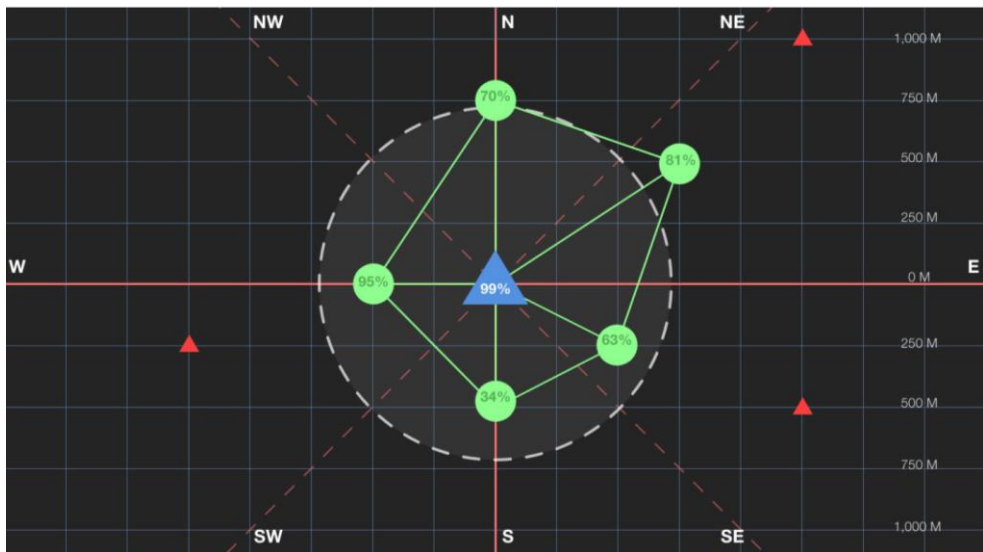
Game motivates therapy



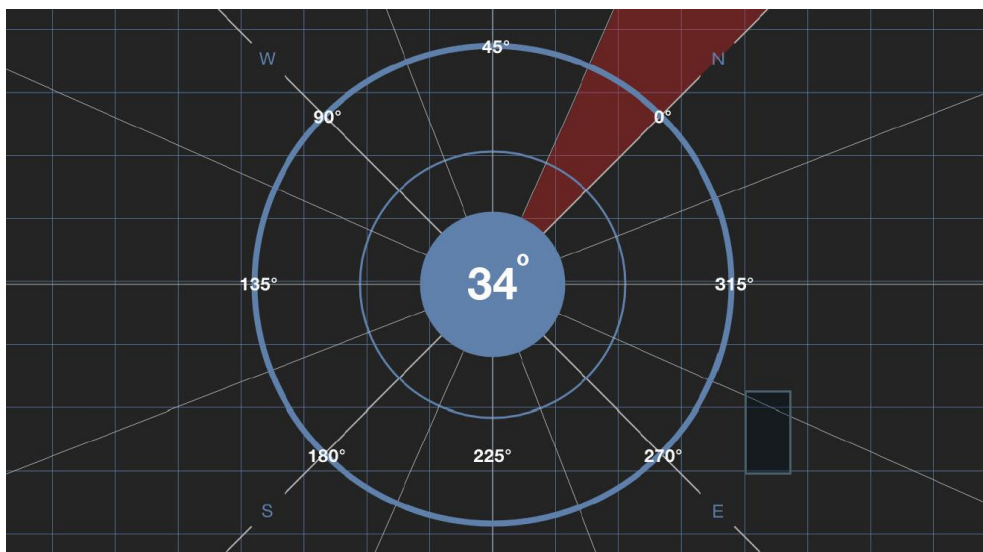
ENGINEERING ANALYSIS MODEL FOR HAND REHABILITATION PROJECT



Current Capstone Project: Infrasound



5 UAV-based sensors detect I-sound



Matlab code detects direction of I-sound source

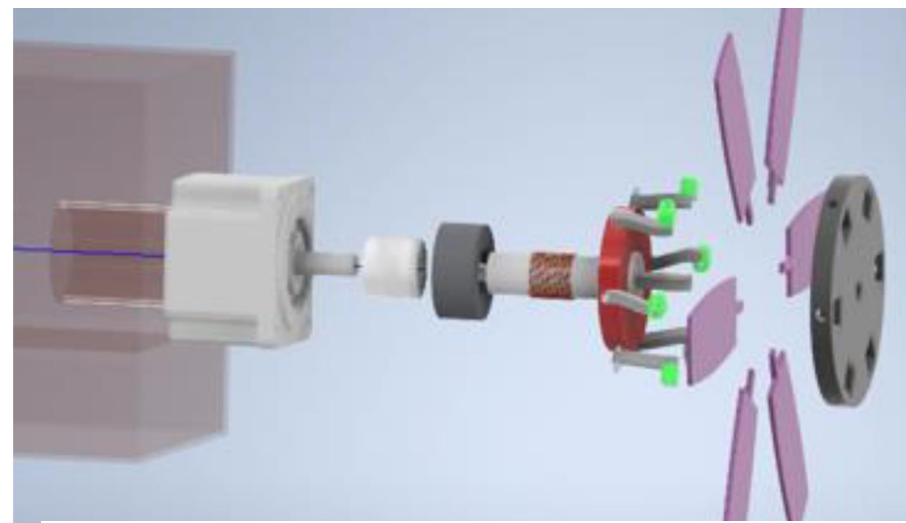
Infrasound is < 20 Hz acoustic waves

- Travels huge distances with little attenuation
- I-sound signals are created by nuclear detonation and missile launches (among other sources)

Original Opportunity: How might we locate sources of I-sound?

Pivoted (Reframed) Opportunity: How might we generate I-sound and use it for GPS denied navigation by measuring Doppler effect?

Being sponsored by AFRL



Rotary Sub-woofer for I-sound generation

BENEFITS FOR SPONSORS



The IP generated belongs to the sponsor



Obtain a “feasibility demonstration level” prototype with documentation



Generates approximately a person-years’ worth of engineering design & analysis work



Vast variety of new ideas and approaches



Often leads to collaboration in research or future designs



Opportunity to be co-authors on peer-reviewed papers developed as part of the project



A unique opportunity for recruiting new graduates



Option to engage Design Innovation training for sponsor



Privilege of mentoring the next generation of technical leaders

LOGISTICS

Financial: Sponsors provide up to \$15,000 per project to support the work.

Mentorship: Sponsors provide a point of contact (mentor) that works with the students' design team; interacting approximately monthly with the team and attending design briefs.

Technical Focus: Projects can be associated with a specific academic department (Civil, Mechanical, Biomedical, Electrical or Computer Science) or the project can be interdisciplinary.

Sensitive Information: Teams can sign NDAs to protect sponsor's information when needed.

Number of Projects: 40-50 projects can be accepted by CEDC each year.

Project selection: Projects with a healthcare or urban focus and an innovation orientation will be given priority.



PROJECT TIMELINE



SPRING SEMESTER Accepting Sponsor submissions throughout the year, finalizes in JUNE.



AUGUST Students submit project preferences and project teams are formed. Students meet with project team to finalize project scope. Sponsorship is funded.



FALL TERM Team co-creates with sponsors/stakeholders- refining project statement and generating multiple concepts to address the opportunity.



Meeting/communication pattern with sponsor is set.



DECEMBER A major design review is held with the sponsor and stakeholders.



SPRING TERM Sponsors continue to meet with team and track progress during fabrication and testing. Team continues to solicit feedback from stakeholders.



MAY Sponsors are invited to attend a Final Design Review and Capstone Design Expo. Final report and any IP documentation or technical papers are produced.

DELIVERABLES

- Design teams formed based on a process that increases success
- Extensive, well-documented understanding of the needs of the stakeholders
- Models that show interaction of the user with the product, process or service
- A large number of innovative ideas to address the design opportunity
- A logical, documented down-select of these ideas
- Initial low cost, very quick prototypes to show feasibility
- Risk modeling and associated engineering analysis or simulation
- Prototypes that show the feasibility of the final solutions
- Design reviews with the sponsor
- Business case analysis (when appropriate)
- Invention disclosures potentially leading to patents (when appropriate)
- Design briefs and design report
- Research paper(s) related to either the design or the educational experience (when appropriate)

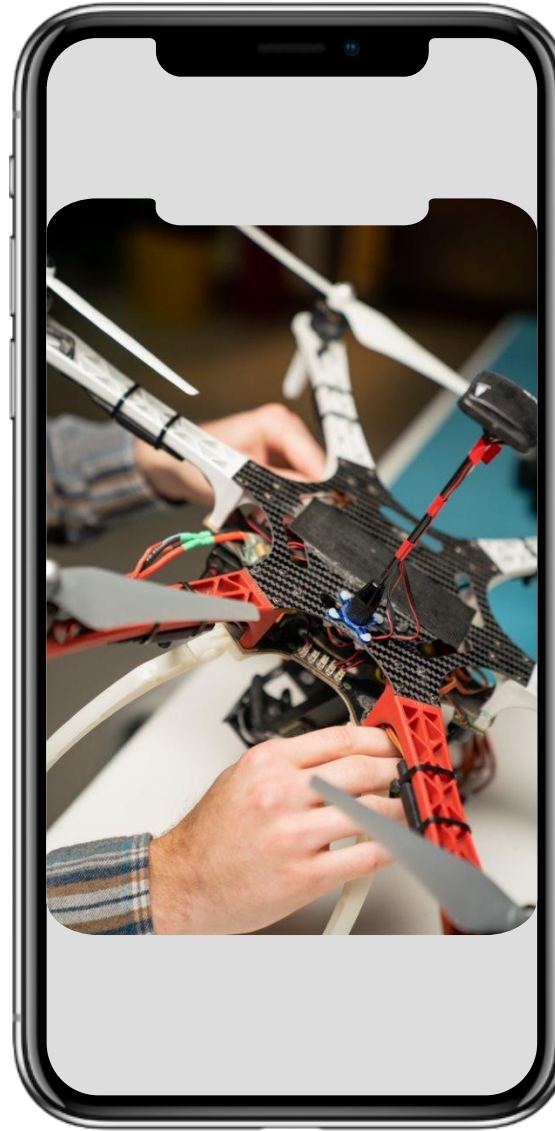


FAST TRACK
YOUR INNOVATION



SENIOR DESIGN EXPO

In May, all capstone teams showcase their designs at the CEDC Design Expo. Sponsors are also showcased at this event. Awards are given for innovation, quality of the new product and impact of the design.



Collaboration Opportunities



Capstone Projects

Training in Design Innovation
(1-3 day workshops)

Mentorship / Co-designing with you

Internships

Hiring streams for our top graduates

Research with Faculty or Graduate Students

Contact us

Where engineering meets innovation and prepares students to be leaders and societal change makers.



Lary Speakman

Director of Multidisciplinary Sponsorships

Phone: 303-315-7170

Email: lary.speakman@ucdenver.edu