Final Projects
• Find something that fits your specific interests and strengths

• We may be able to help you find resources
  https://engineering.cmu.edu/techspark/index.html
Example Projects
• whiskers
• task and motion planner for manipulation
• mixed soft / rigid hand design
• measuring success of canonical grasps on benchmark tasks
• building a hand with nonlinear passive compliant joints
• building a hand for supporting large weights
• learning to push in simulation with a soft hand
• optimizing hand design for robust translation / rotation
... and some more

• grasping scanned objects in the real world
• building hand plus force based behaviors
• building soft hand and exploring synergies for dexterous tasks
• developing mathematical models of soft gripper behavior
• exploring whether synergies can assist in learning to manipulate in simulation using OpenAI Gym
• labelling human manipulation tasks
Ideas / Themes
Make a hand

• Yale OpenHand project  https://www.eng.yale.edu/grablab/openhand/

• Soft Robotics Toolkit  https://softroboticstoolkit.com/

• follow a published paper

• 3D print and test a simple soft hand

• Build a sensor mitten
Simulation ideas

• Create and test a simulation model of the human index finger (muscles, tendons, bones...)

• Manipulation learning with Gymnasium
  https://github.com/Farama-Foundation/Gymnasium

• Contact capture, tracking, and modeling
Simulators to check out

- MuJoCo  https://mujoco.org/
- SOFA  https://www.sofa-framework.org/
- Klamp’t (IROS 2016 Simulation Manipulation Challenge)  http://motion.cs.illinois.edu/klampt/
- DART  https://dartsim.github.io/
- IPC (large deformation dynamics)  https://github.com/ipc-sim/IPC
- Box2D
Other ideas

• Planning and/or control

• Hands in computer graphics / VR

• Sensor design, development, testing

• Human subjects studies (dexterous manipulation “in the wild”)

• “Area” studies (more like a very detailed research report with suggestions for future research)
Final Thoughts

• What question do you want to answer?

• What idea do you want to test?

• What area do you want to explore further/understand better?