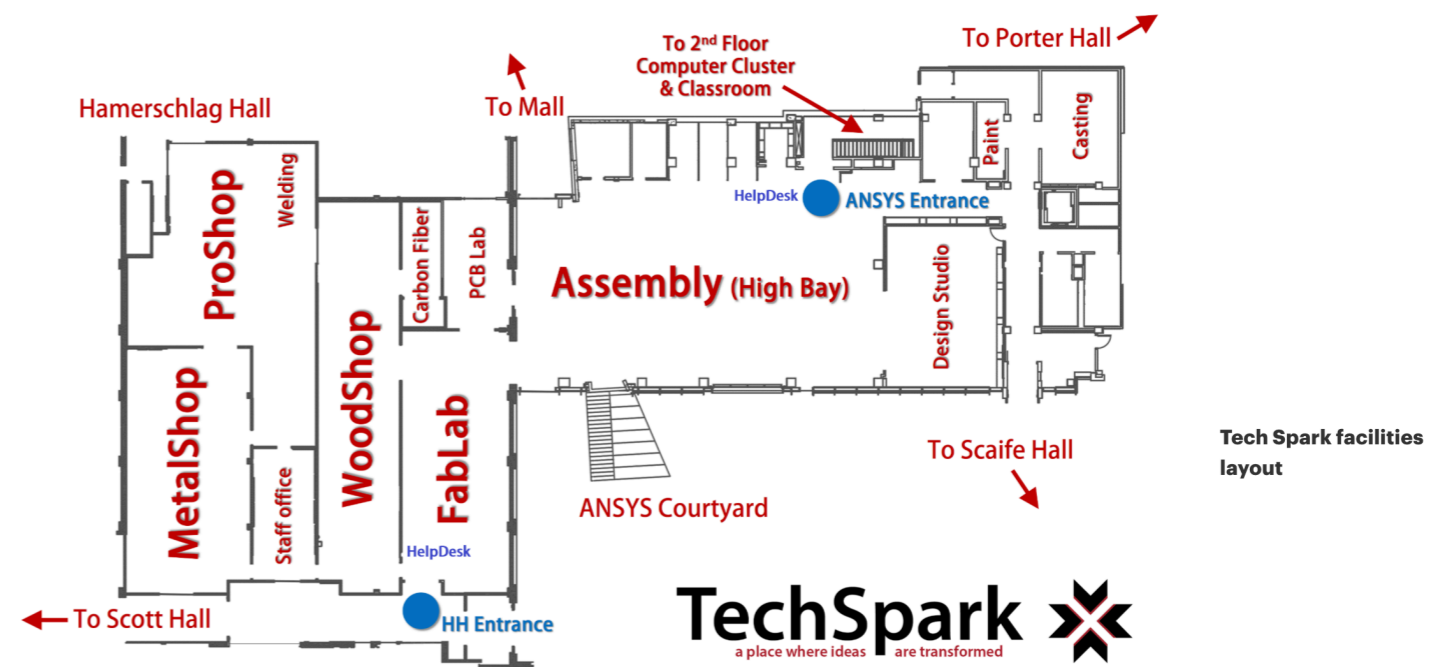


# Final Projects

- 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>

## Facilities layout



# 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/>
- Isaac Sim <https://developer.nvidia.com/isaac-sim>
- 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?