1. Personal Introductions - **1:05**
2. Process & Background: Challenge Overview - **1:10**
3. Process & Background: Concept Phase - **1:13**
4. Process & Background: Testing Phase - **1:16**
5. Technical Details: Mechanical Design - **1:20**
   1. Are you counting for the force of the ellipsoid? Are you compensating for that? So that the force x-y is the same
      1. Yes - in the controls we try to compensate the jacobian
   2. Are singularities possible? We are close to it at the bottom of the screen, but so far no singularities possible
   3. Tensioning and using slot - use a rig to help positioning - ensure consistency of height
   4. How do we avoid collision of magnets - since our pucks are large, it helps us reduce potential of collision, but if we have the arms cross it could happen - tho we are trying to have a software solution, as in the robot won’t allow the arms to collide aka will stop the user
6. Technical Details: Magnets - **1:35**
   1. How did we arrive at 6N? We did some qualitative testing until we reached the “feels good” state
7. Technical Details: Electronics - **1:45**
   1. Position vs torque control - we are using position because not much difference
   2. What commutation are we using? Trapezoidal, sinusoidal.. But it seems that it is the default of the o-driver. We are doing field oriented control but we don’t control the algorithm
   3. Is there noise between the O-drive and the microcontroller? How would we address the noise between the two?
   4. Why do we have the STM32 when we have the Jetson? Could just remove the STM32 and use the Jetson for everything? We have the STM32 because that’s what we had originally but then needed to add the Jetson for an HDMI port to get touch screen positions
   5. Could just use a bus system for everything? Don’t need to point to point for everything
   6. How is calibration between tracking and pixel happening?
8. Technical Details: Control System - **1:50**
9. Demonstration - **2:00**
   1. Are the bearings pressed up against the plastic housing? Does this add friction? Are the bearings even spinning?
   2. Where is the friction added into the system?
10. Beta Thoughts - **2:10**
    1. Try to avoid non-linear optimization if possible when calibrating. Just get a big table of data during calibration that allows us to linearly interpolate between positions
    2. Watch out for noise in the wires
    3. Combine the controllers if possible, could be adding a bit of a time delay
    4. Wire management!

Professor ideas:

* Electromagnet
* **Weaker magnet - assuming the friendly users**
* Repulsion - Opposing magnets on the robot that show up only when you try to leave the wall
* **WHAT IF we get rid of the magnets and put acrylic arms on top of the screen?**

**Steps:**

* **Have robot drag you in a circle**
* **Try weaker magnets**