

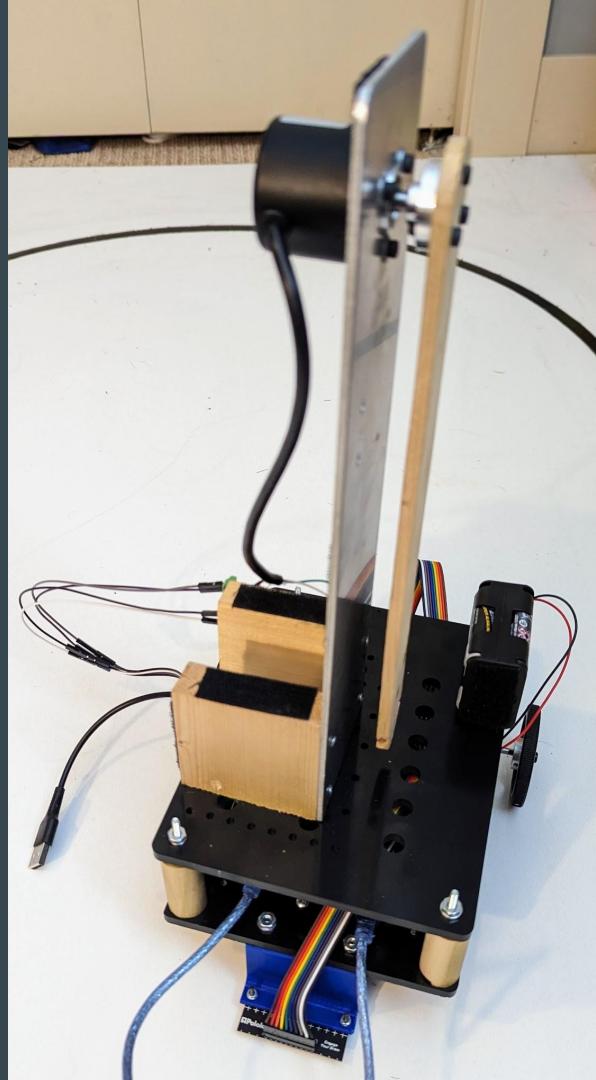
# Attaching the Pendulum to the Cart

...

EGR 345

# Step 1: Disconnect Pendulum from old Chassis

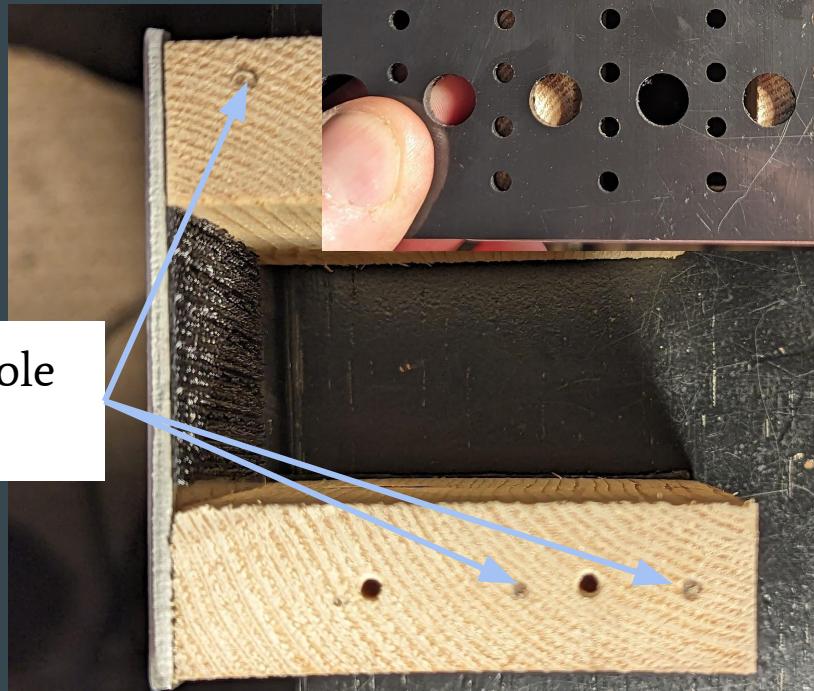
- We are going to reuse the two small wooden blocks that hold the aluminum piece vertical
- If your pendulum is still attached to the old, wooden chassis bottom, flip the chassis over
  - unscrew the screws that go through chassis bottom into the small blocks



## Step 2: Pilot Holes into Small Wooden Blocks

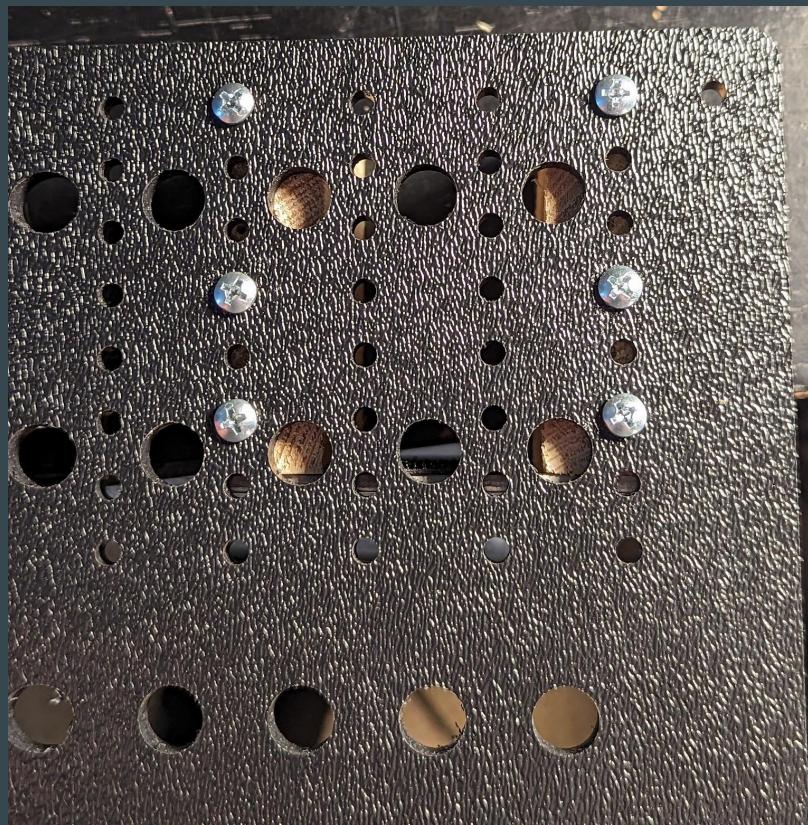
- It is very important that we do not crack the small wooden blocks
- Please use the chassis top plate as a pattern to mark spots for tiny pilot holes

New pilot hole markings



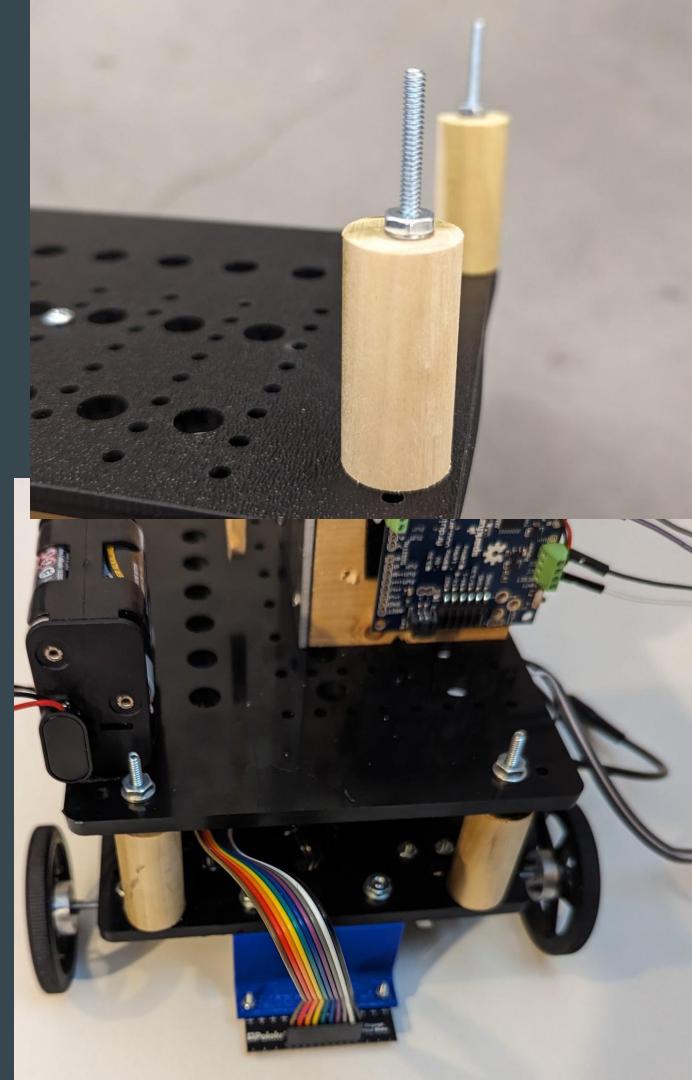
# Step 3: Screw Small Wooden Blocks to Chassis Top Plate

- Please be very careful not to over drive the screws and strip out the pilot holes



# Step 5: Install Spacers

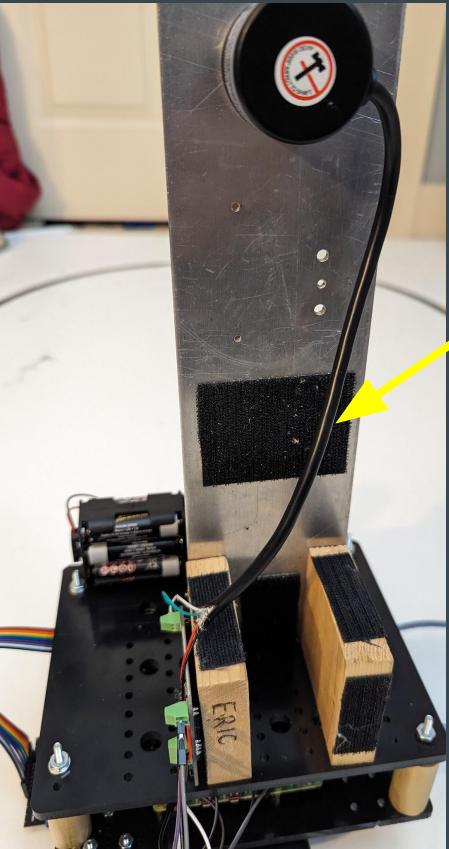
- the chassis top and bottom plates need to be separated by 1.5" spacers
  - there are 3 styles: wooden dowels, white nylon, and black nylon
- use 2 inch long #2 machine screws
- use two sets of nuts: one on top of the spacer and one on top of the top plate
  - this will make it easier when you need to remove the top plate to work on things
- note that the back of the top plate has two sets of holes for the spacer screw
  - use the inboard one to avoid running into the motor mount screws



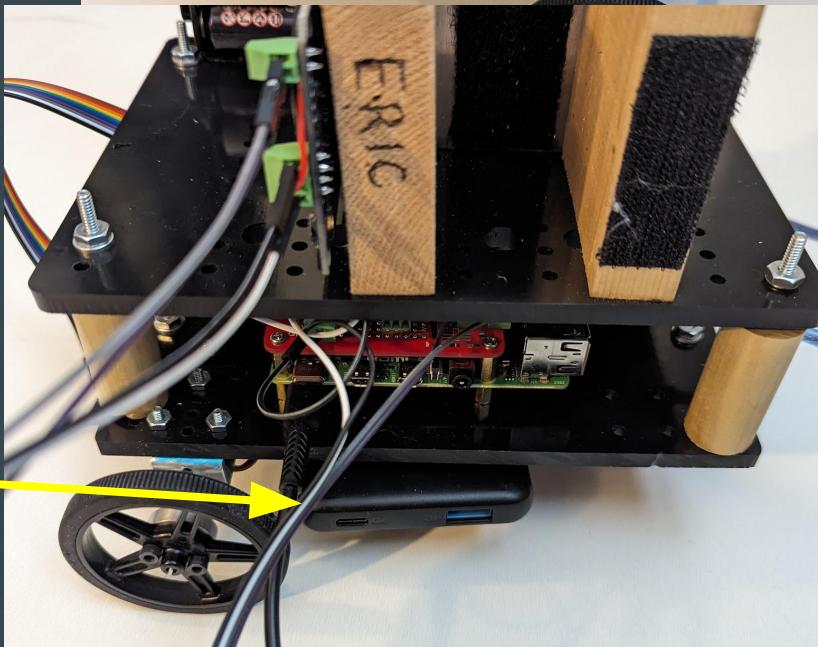
# Step 6: Uno i<sup>2</sup>c and encoder wiring

- the longest and most complicated step is figuring out where to mount the Uno and how to route the wires
- the Uno needs to connect to the pendulum and to i<sup>2</sup>c
  - i2c supports multiple secondary devices, to the Uno and Mega will connect to the same SCL, SDA, 5V, and GND terminals on the red RPi hat
  - note that the Mega will power the Uno using 5V and GND, so you do not need a USB cable running to the Uno after you have programmed it once
- the 9V battery connection for the motors needs to go around the outside of the chassis to reach the battery pack
- example wiring pictures are on the next slide
- Uno shield connections are after the example wiring pictures

# Example wiring pictures (not the only options)



battery pack  
wires

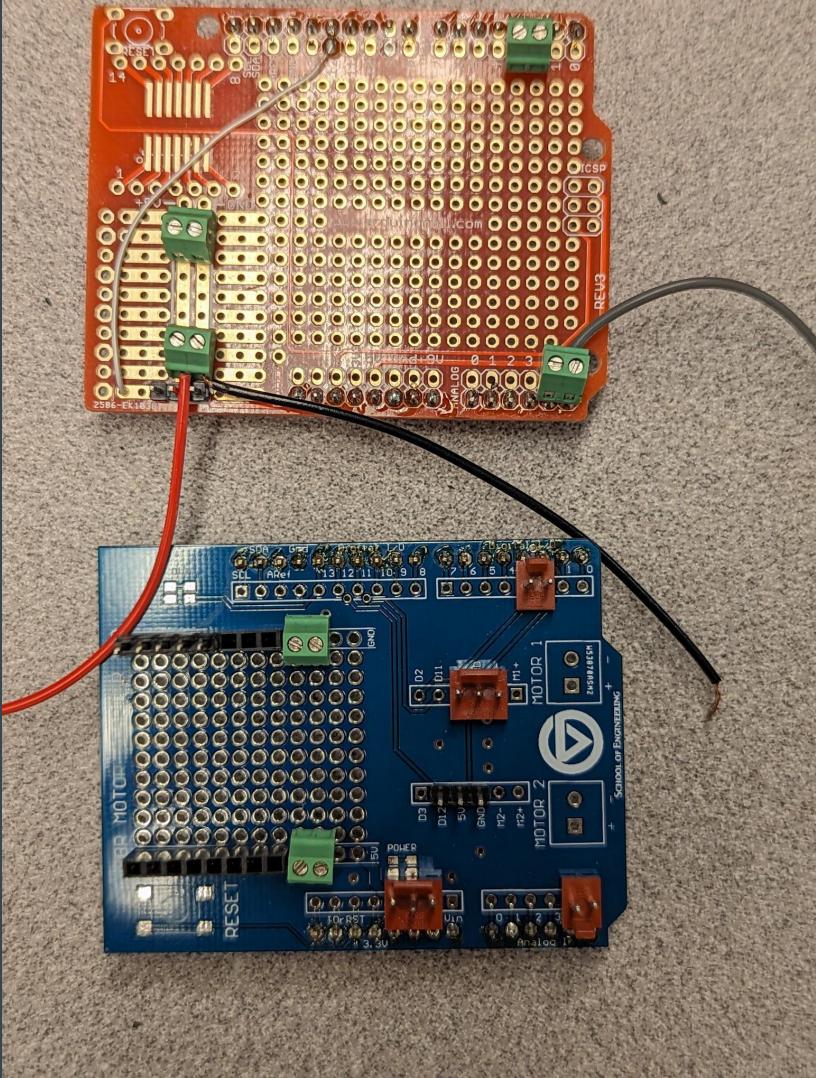


# Required Connections

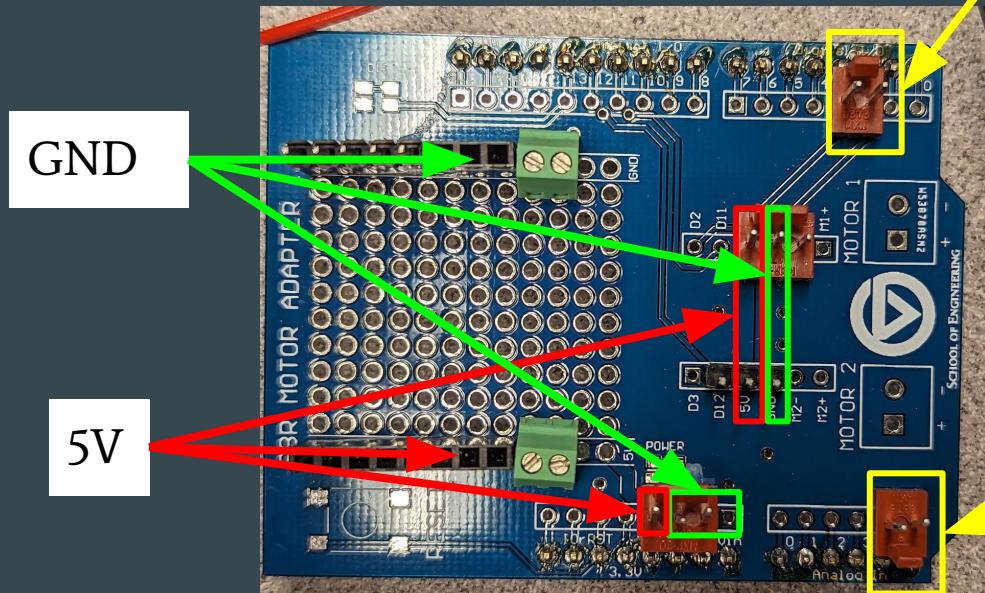
- the encoder needs to connect to 5V (red), GND (black), and pins 2 and 2 (encoder channels A and B, the white and green wires)
  - the encoder polarity will be verified later and will determine whether white and green go to pins 2 and 3 or need to be flipped
- i<sup>2</sup>c connections from the Uno to the red RPi hat include 5V, GND, SDA, and SCL
- pictures of these connections on the red or blue shields are on the next slides

# Uno i<sup>2</sup>c and encoder shield

- there are two different styles of Uno shield for connecting to the encoder and i<sup>2</sup>c
  - one is blue and looks very similar to the shield used for the motor/beam system
    - please **do not** disassemble the motor/beam systems
- these two styles are functionally equivalent and the connections are discussed on the following slides



# Blue i<sup>2</sup>c/Encoder Shield



Pin 2 and 3:  
encoder green and  
white

A4 SDA  
A5 SCL

# Red i<sup>2</sup>c/Encoder Shield

