Mathematics

Electric bikes usually have 250w -> 350w for leisurely drives
∴ we can use different power modes to conserve battery while still having a very high top speed which can be an extra benefit.

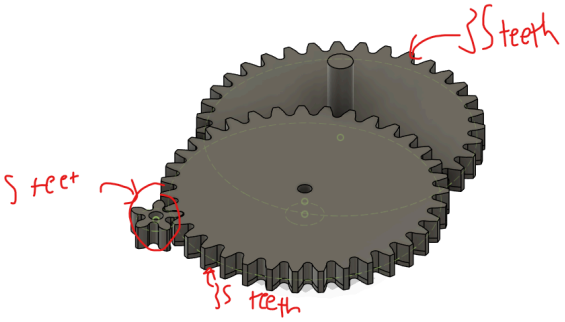
About 1000 W are wanted so we are going to use a 60A ESC and a 22.2V battery.
(ESCs have an 80% power efficiency)
48A*22.2V = 1065.6 W

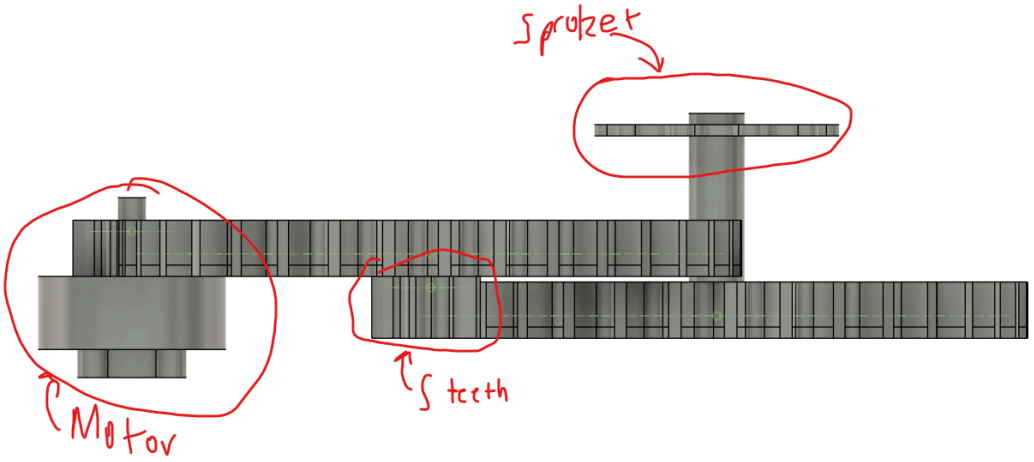
Torque can be calculated using the formula: $T=\frac{P*9550}{RPM}$ (T is torque in Nm and P power in kV)
RPM can be obtained using the kV of our motor, in this scenario it is 0.353
(0.35261538461)Nm
Yamaha's Sport motor has 70Nm of torque and 300W of power. Bikes can go as low as 30 Nm. Gear ratios can be used to increase torque so we have to create a gear ratio of 1:98 (Two gears that convert it to 1:49 (1:7 each) and then chains 1:2).

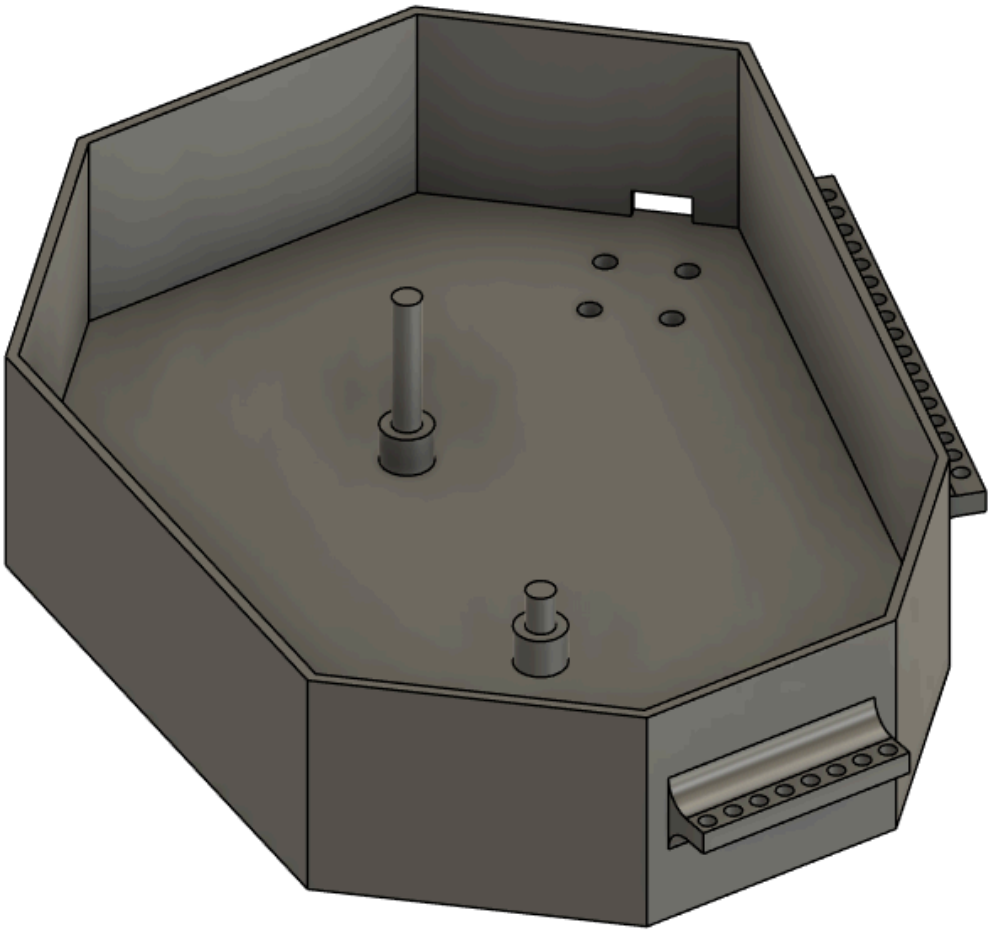
Parts

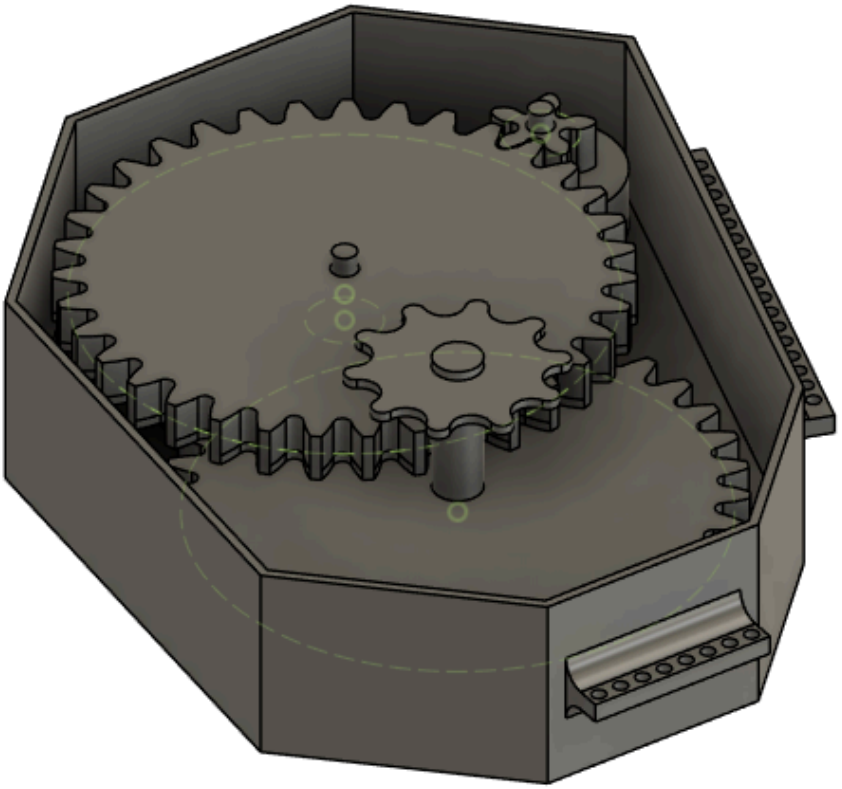
Motor
ESC
Battery
Arduino Nano

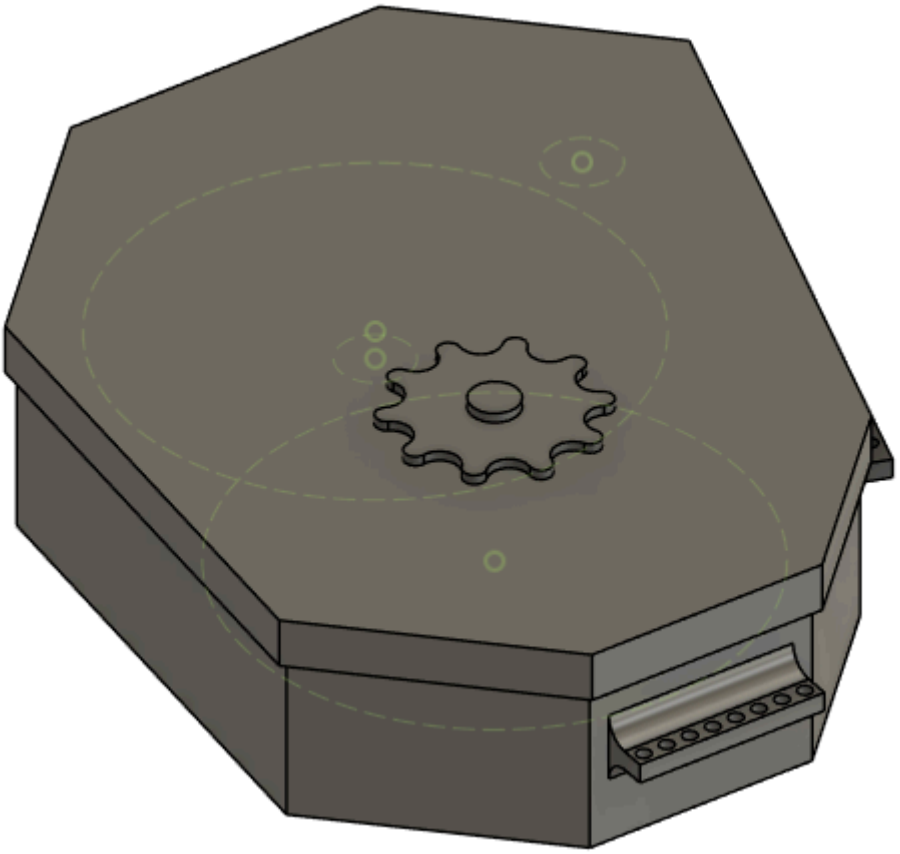
Gearbox + motor





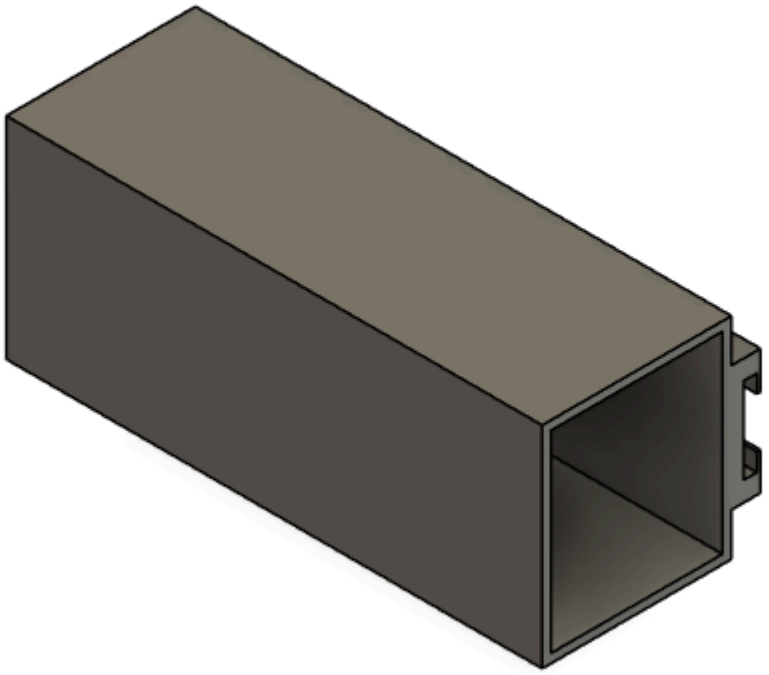


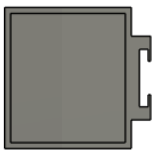


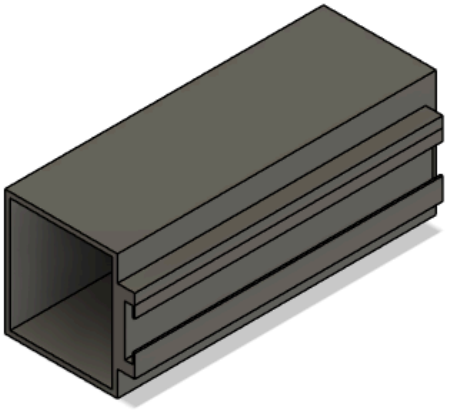


Battery case

Holds batter (surprising). Weight could be reduced.

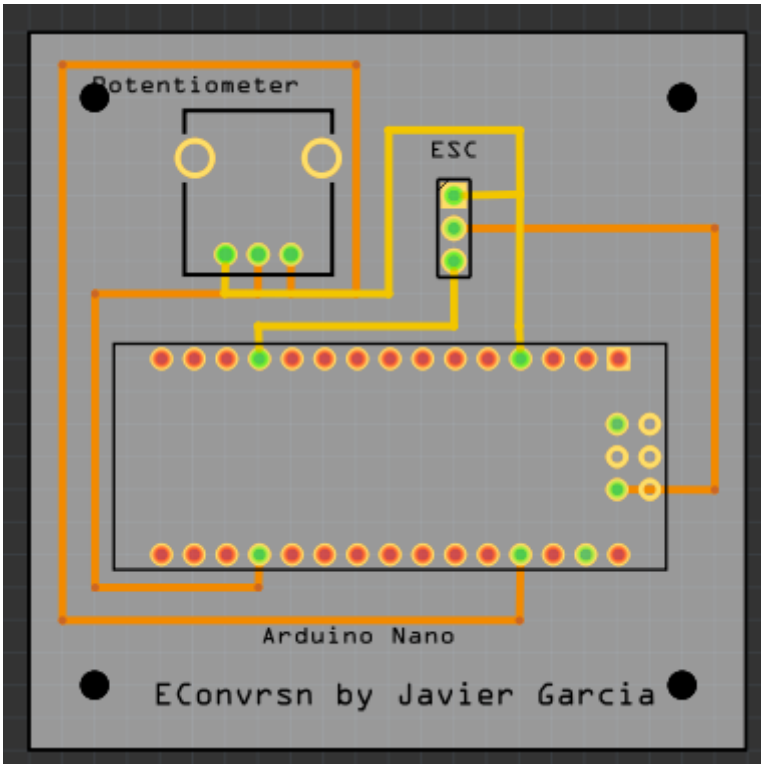






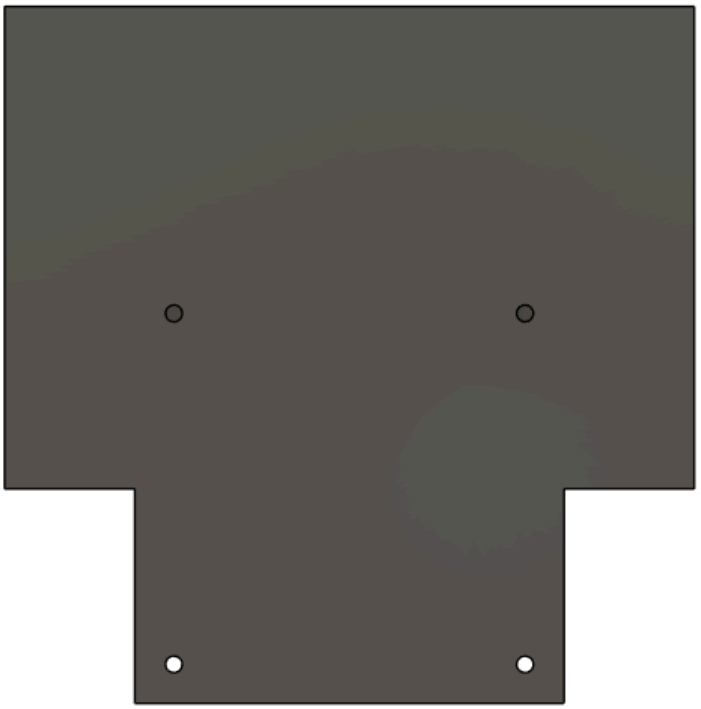
PCB

The Ebike uses a simple custom PCB that holds an Arduino Nano and soldering holes for the potentiometer and the ESC connections. The PCB was designed using fritzing.

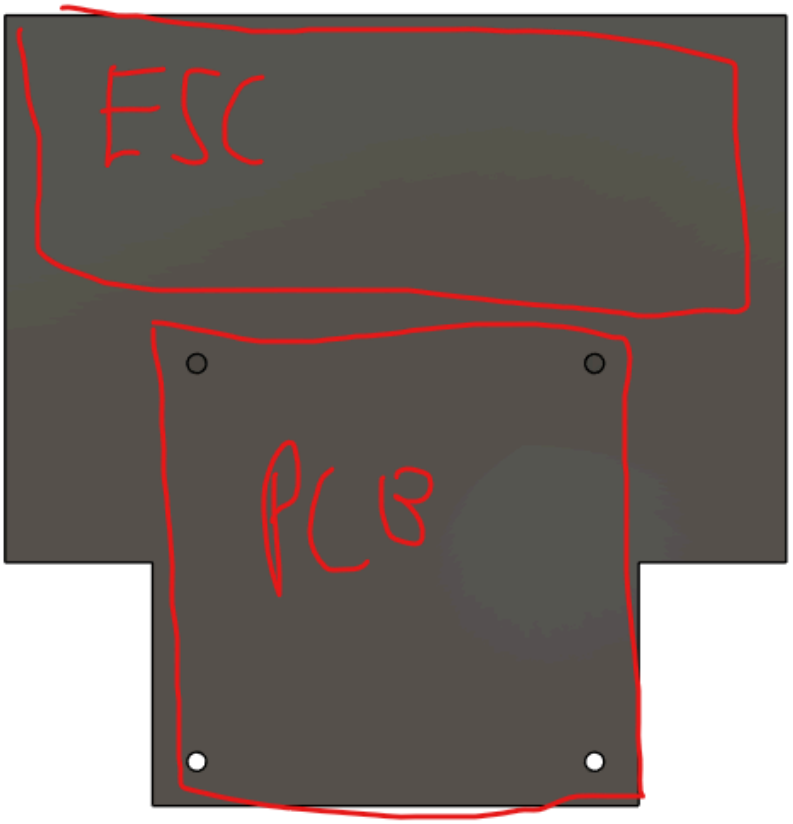


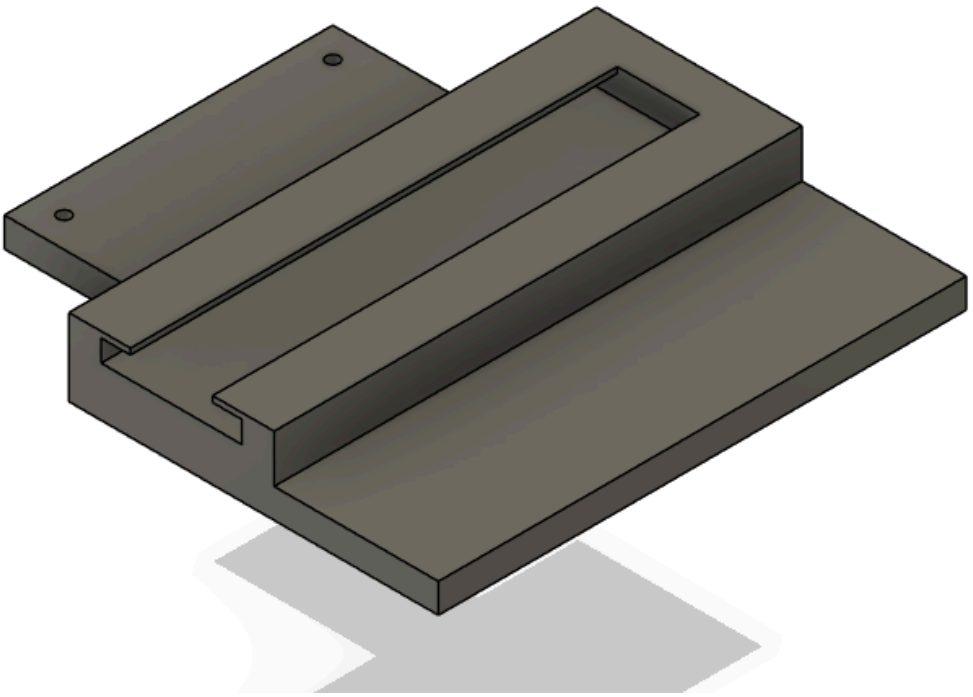
The arduino's digital 9 port and analog 0 ports are being used.

PCB + ESC Holder



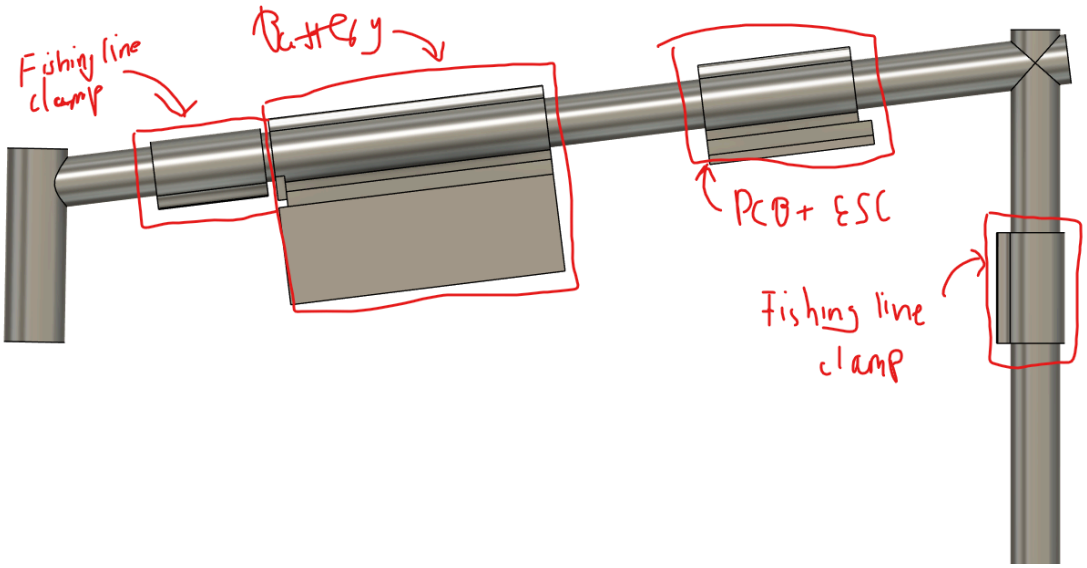
PCB is held by screws, ESC has no clear way fo being attached so it is clamped down by multiple ruber bands


ESC
PCB

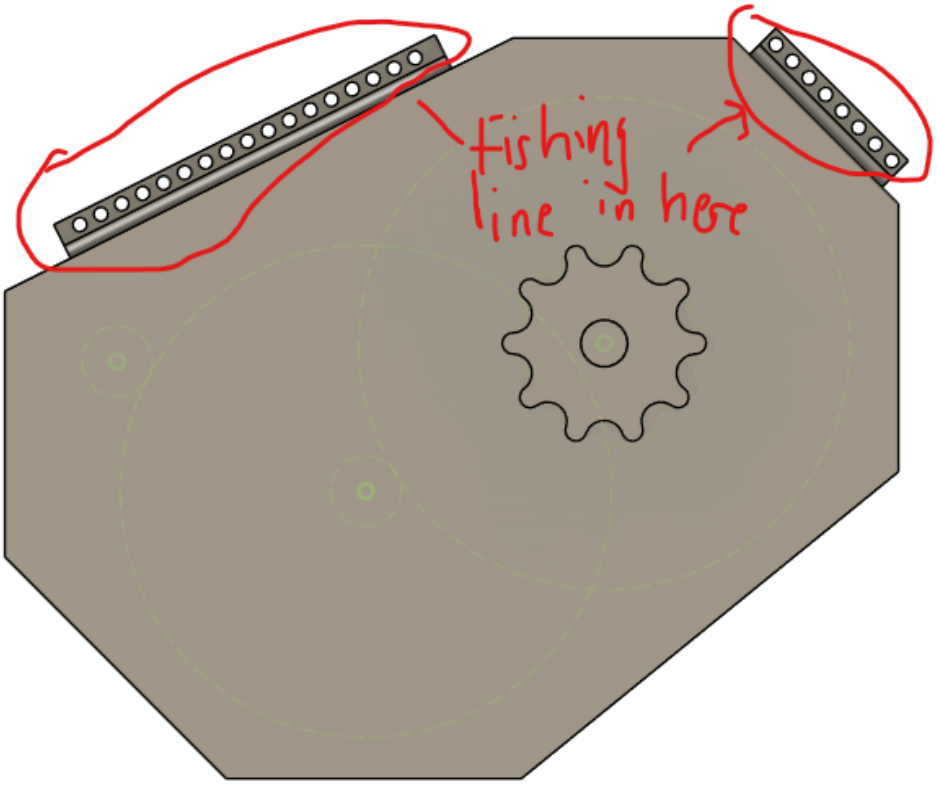


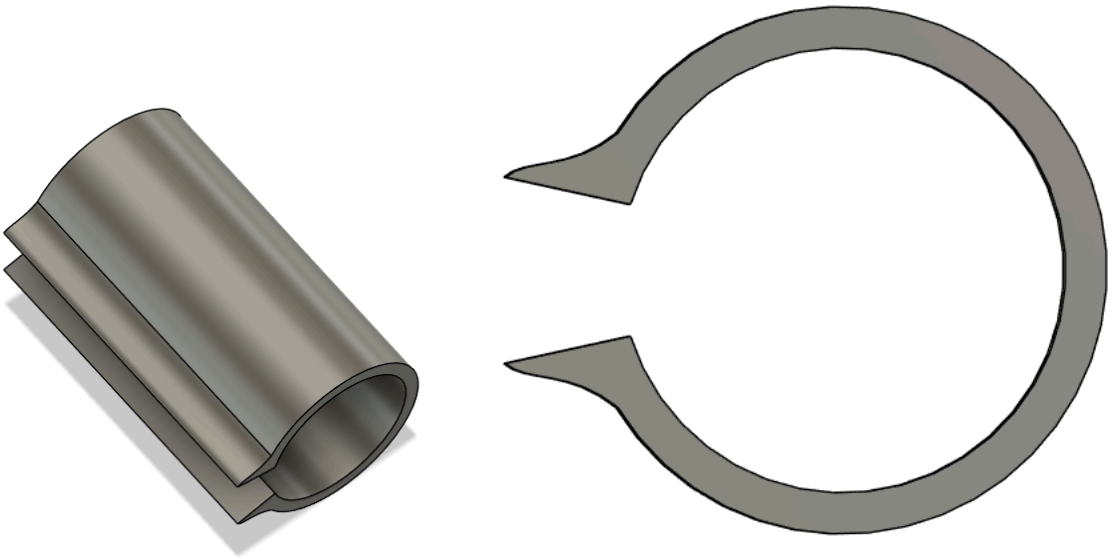
Holding the pieces

This section is dedicated to holding everything in place, the holders and the gearbox + the motor.
This is done through a system of friction-based attachments to CIRCULAR bike beams. 2 circular bike beams are needed.

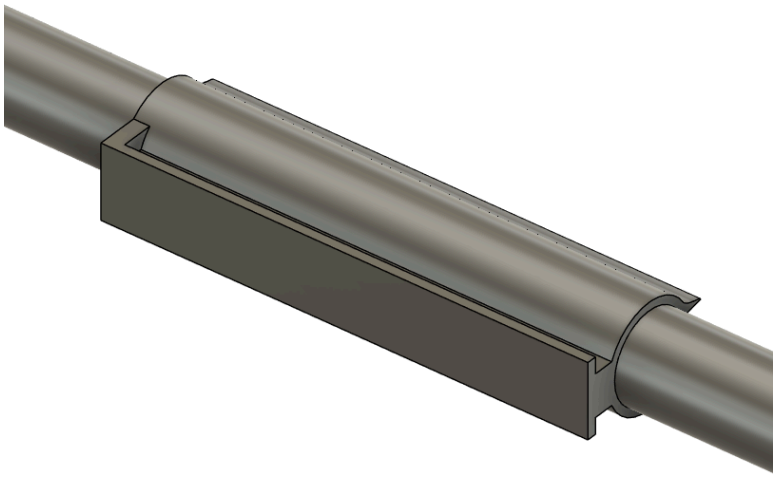


2 fishing line clamps are needed which then are connected via the fishing line to the gearbox + motor. Holes also need to be drilled in the clamps.





For both the holders for the batter and the ESC a rail system is used
Battery:



PCB + ESC: