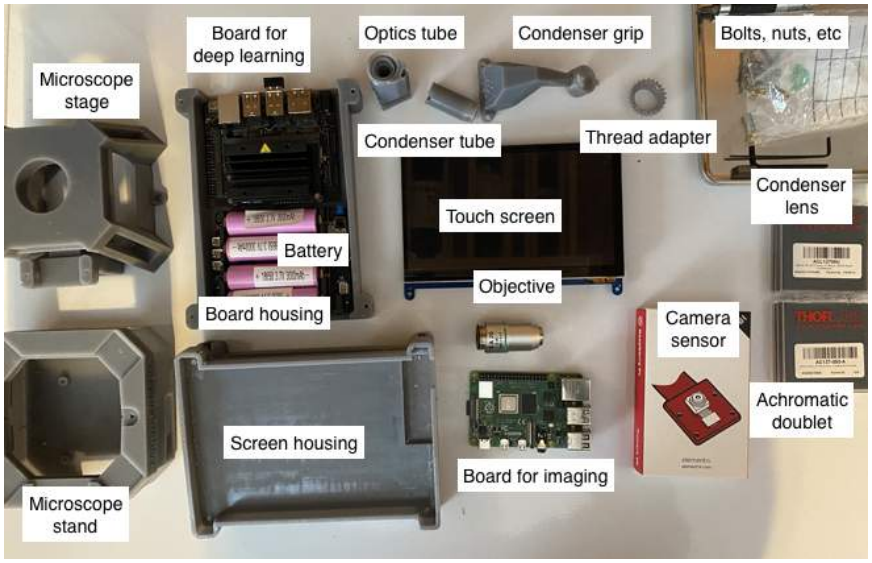
Supplement - Assembly Instructions

Parts list

- Printed parts
- Computing hardware
    - NVIDIA Jetson Nano
    - Raspberry Pi 4
- Imaging and optics components
    - Raspberry Pi Camera Module V2
    - Achromatic doublet (12.7 mm diameter, 50 mm focal length)
    - Condenser lens (12.7 mm diameter, 8 mm focal length)
    - Finite conjugate microscope objective with RMS threads (20x used in images below)
- LED parts (not shown in image below)
    - 5 mm white LED
    - 330Ω resistor
    - Electric wire (with female socket header for GPIO pin connection. Note that all LED parts can be purchased in a basic LED kit.)
    - Tape
- Nuts and bolts (not shown in image below)
    - 2 M2 screws
    - 8 to 16 M2.5 screws
    - 6 M3 nuts
    - 2 M3 x 8 mm screws
    - 1 M3 x 10 mm screw
    - 4 M3 x 12 mm screws

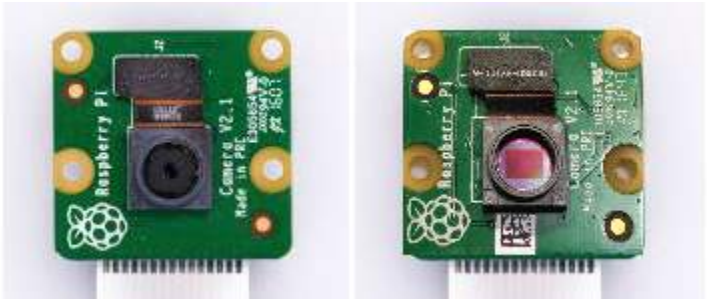


Assembling the optics components

1. Push the achromatic doublet into the optics tube, with the less convex side facing into the tube (make sure that the doublet is as flat as possible in the slot). See right below for the cross section view (doublet shown in blue).

2. Insert an M3 nut into the slot at the top, then twist an M3 x 10 mm screw into the nut (note that there will be intended empty space between the screw cap and the optics tube).

3. Twist and remove the built-in lens of the sensor. Take extra precaution to prevent dust from gathering on the sensor surface.



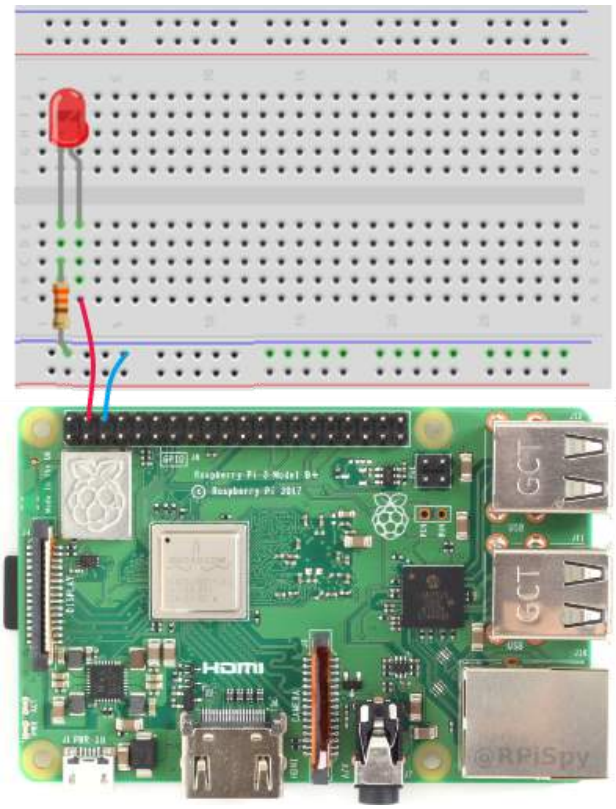
4. Fix the sensor to the bottom of the optics tube using 2 M2 x 6 mm screws


5. Push the condenser lens into the condenser tube

6. Connect the objective lens with the thread adapter

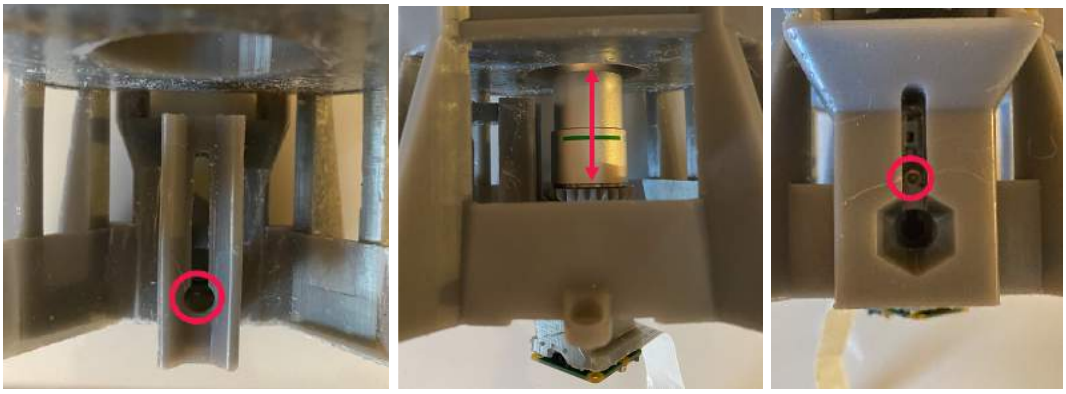
7. Connect the thread adapter with the optics tube


8. Wire the LED according to the schematic below (GPIO wiring shown here for completeness. Connect to Raspberry Pi GPIO pins in step 5 of the next part).

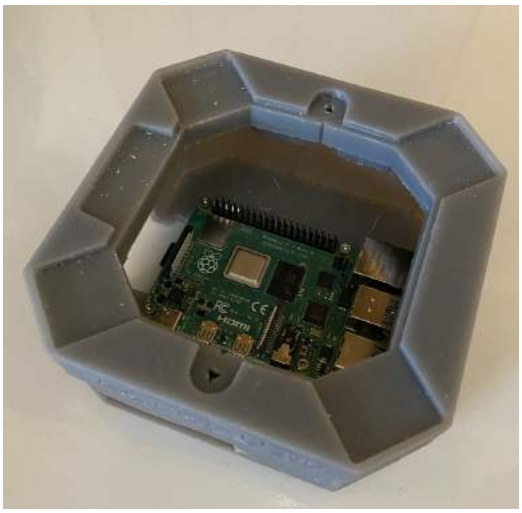


Assembling the microscope body

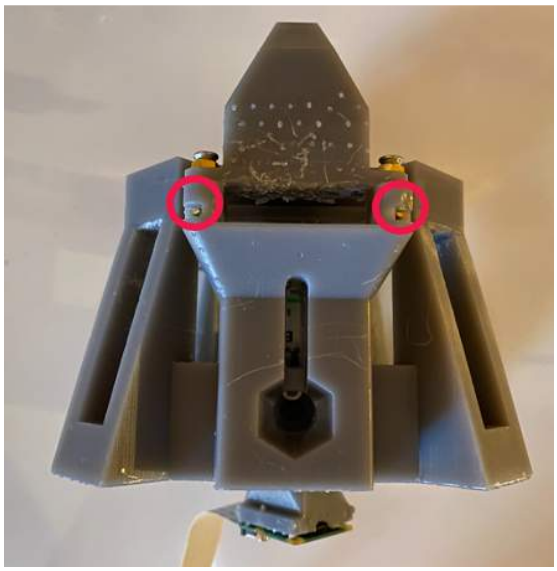
1. Fix the optics tube to the stage by inserting the screw cap into the slot opening (left image below) and move the optics tube upward (center image). Tighten the screw at a desired height through the opening slot (right image) according to the working distance of the optics system.



2. Fix the Raspberry Pi to the bottom of the stand using 2 to 4 M2.5 screws.

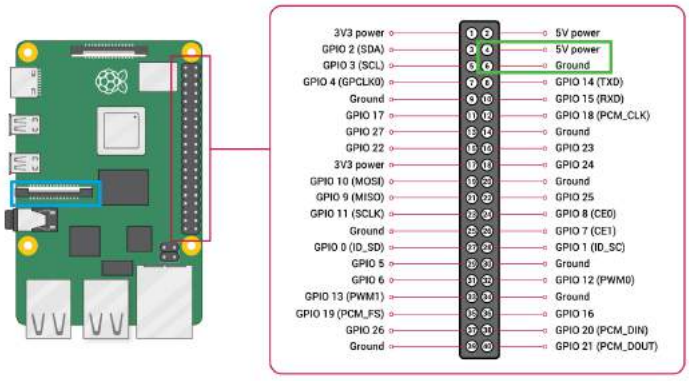


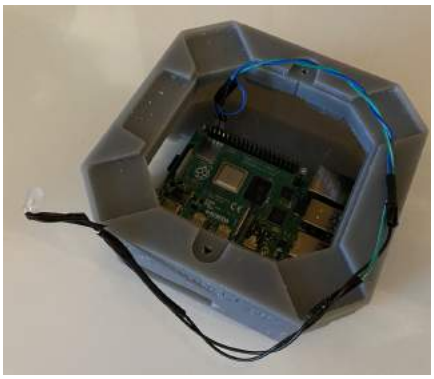
3. Place a nut in each of the 2 slots below the screw holes for the condenser grip on the stage. Screw the condenser grip to the body using 2 M3 screws.



4. Place the condenser tube in the condenser grip. Use an M2 screw to tighten the clamp if needed.

5. Connect the LED wires with the GPIO pins of the Raspberry Pi accordingly (Use GPIO 4 for 5V power and GPIO 6 for ground. See green box in the schematic below).

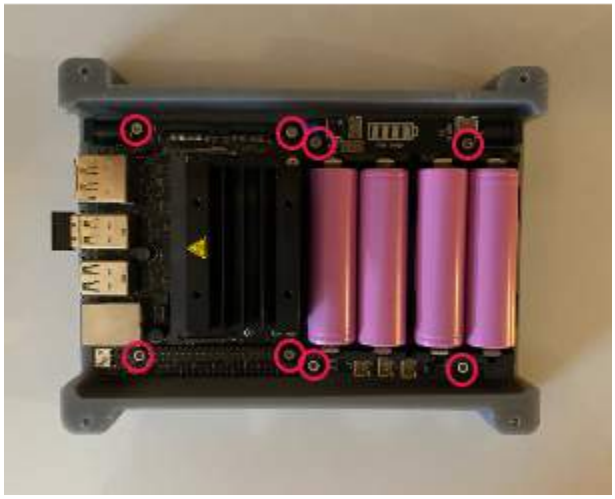




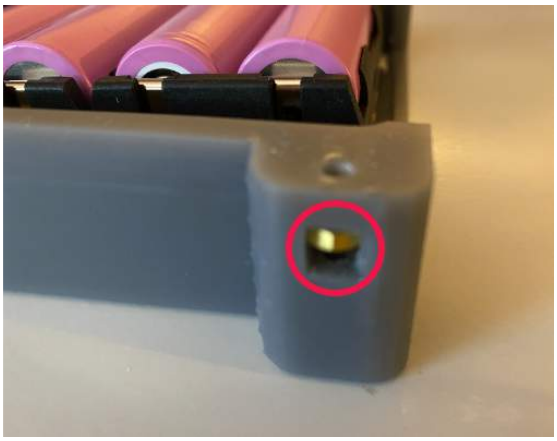
6. Tape the LED to a slot at the top end of the condenser tube (you can thread the wire through the space between the stage and the condenser grip to minimize exposed wires). Connect the camera to the camera connector of the Raspberry Pi (blue box in the schematic above). Screw the stage and the stand together using 2 M3 screws.

Assembling the deep learning components

1. Fix the Jetson Nano and battery pack to the bottom of the board housing using 4 to 8 M2.5 screws



2. Insert an M3 nut into each slot at the bottom half. Place and align the top half on top and screw together with 4 M3 x 12 mm screws.



3. Fix the touch screen to the top of the board housing using 2 to 4 M2.5 screws. Wire the hardware accordingly and assembly is now finished.