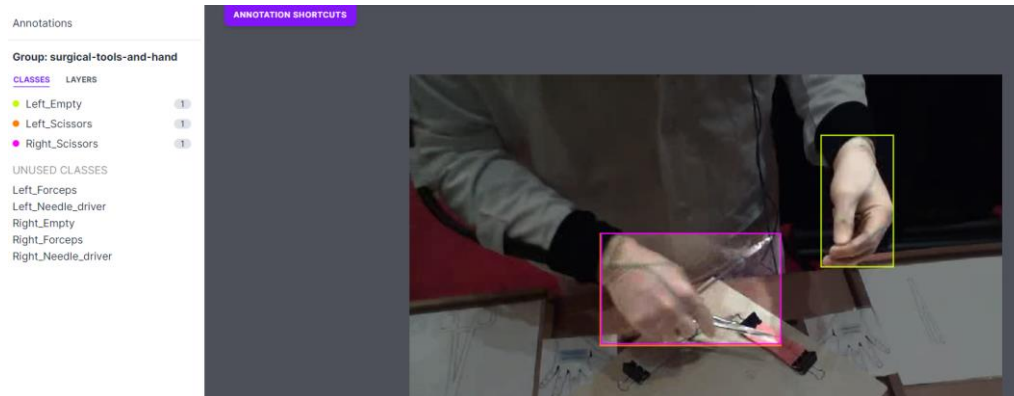## Appendix 1 - Fixing labels:

After exploring the dataset, and running experiments 1-10 we returned to the dataset and performed the following fixes:
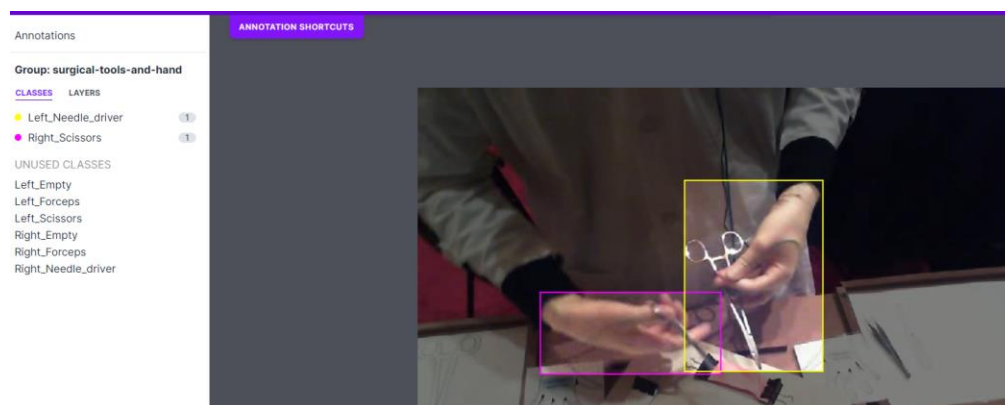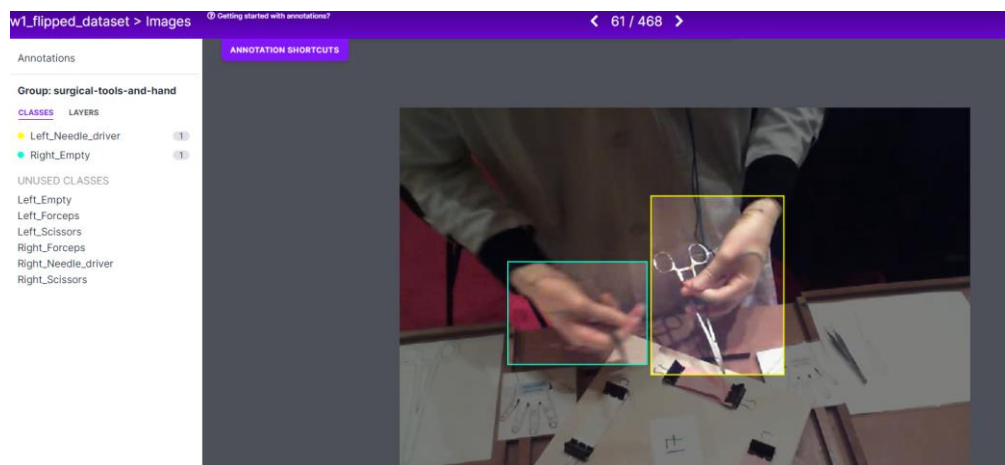
1. TWO labels for one hand:

To keep with the HW assignment, we decided to keep one label for each hand, even if it appears that the right hand hold 2 tools.

2. Inconsistent labels between following frames + Blurry frames:

made it difficult to decide on the correct ground truth based on single frame, but when using context of before/after, the real label is clear:
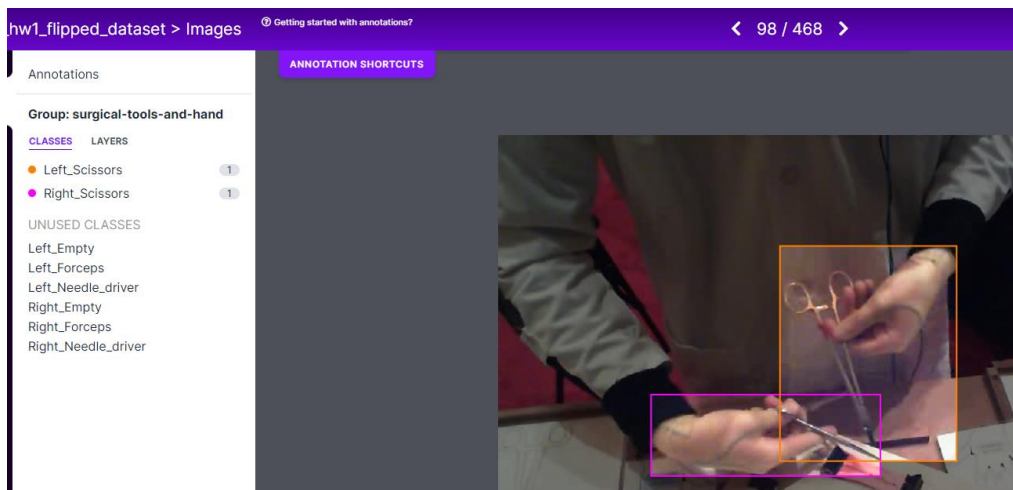
3. <u>Both hands use same tool:</u>

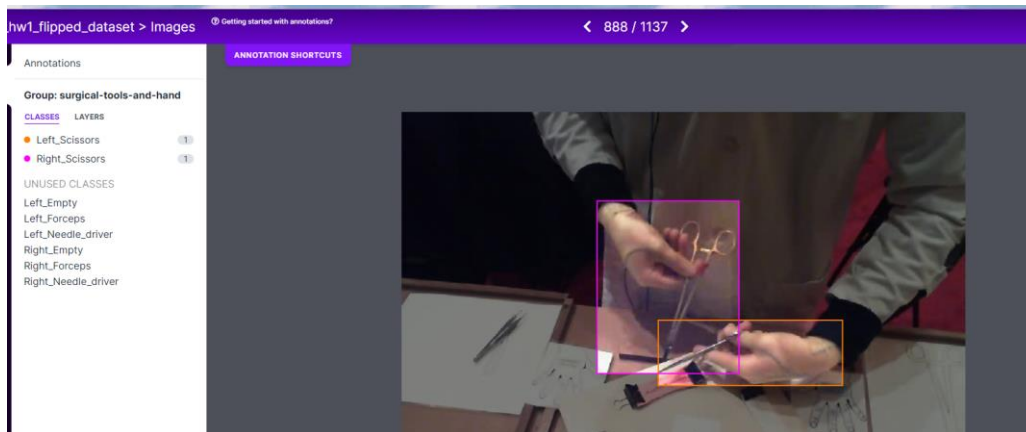
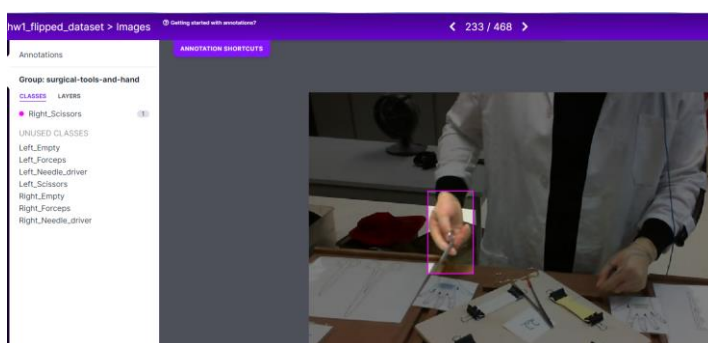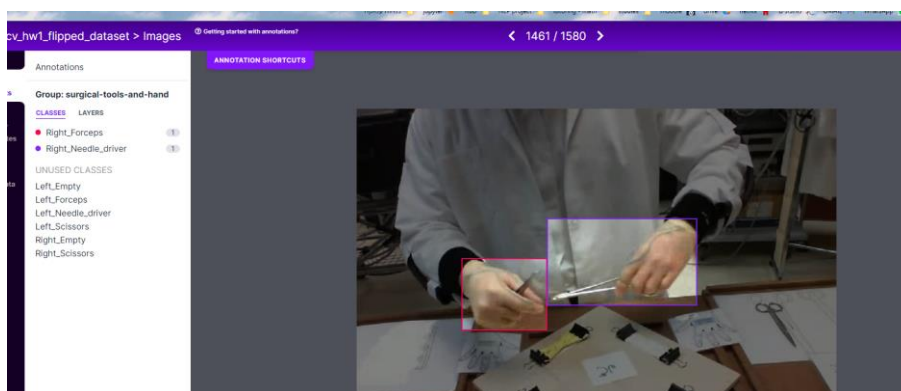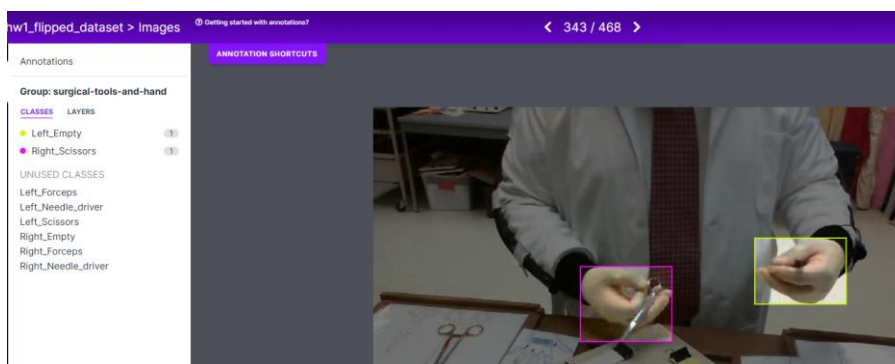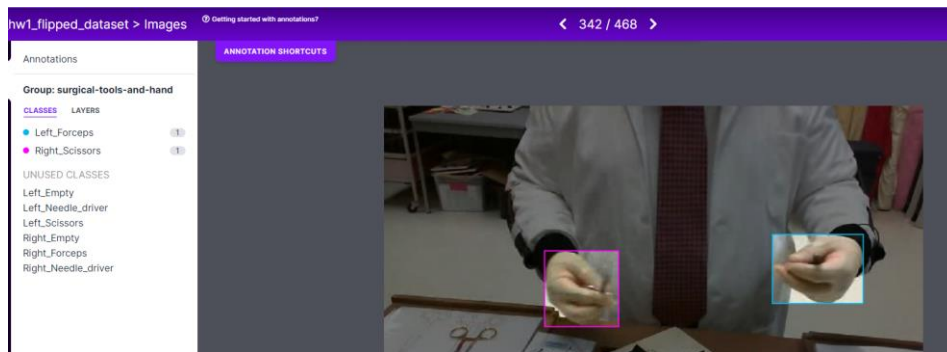*Figure 1 here it is not possible that we have 2 scissors!*

Figure 2 It is actually pretty clear why the mistake - it is pretty hard to distinguish between needle driver and scissors
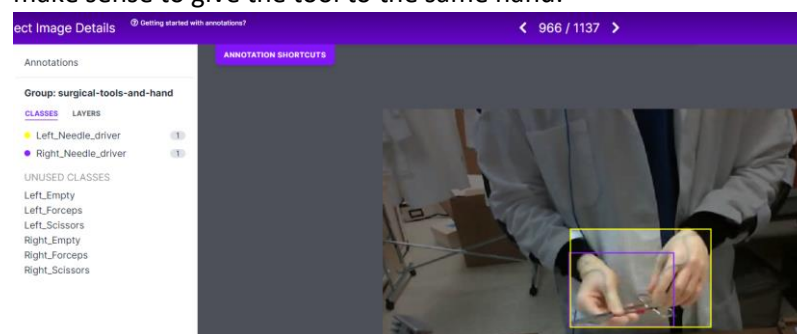
4. <u>Single label</u>, when there were clearly 2:

5. <u>Forceps VS Empty:</u>
   conflicting labels regarding forceps or empty, thus we decided to stick with empty, as the forceps doesn't appear to be in use:
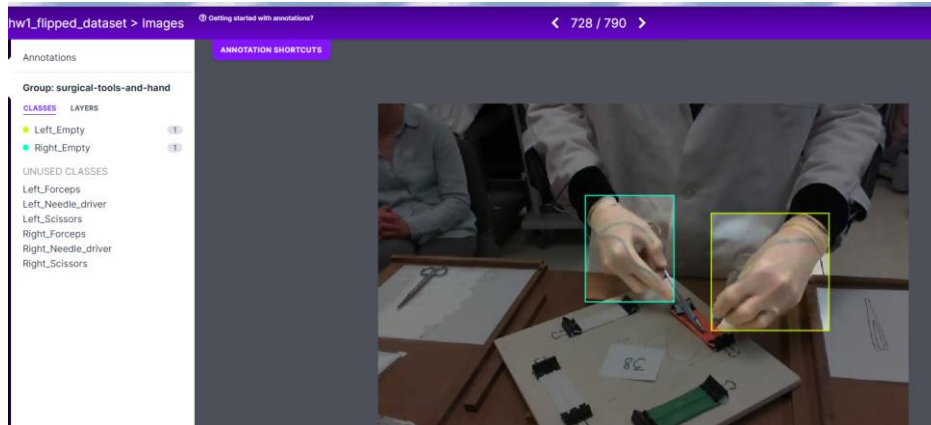

6. <u>Intermediate transition of tool from one hand to another:</u>
   There were also scenarios where the tool is moved from one hand to the other, but it still doesn't make sense to give the tool to the same hand:
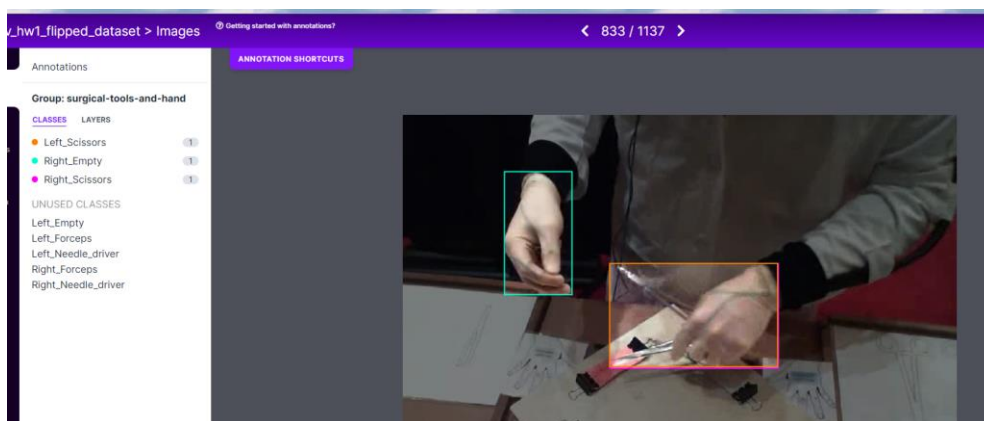
7. Labeling mistakes:
   Usually involved assigning the label empty when there was actually a tool in one/two of the hands.

8. *TWO tools in one hand:*

***Comments**:*

- *The changes above were performed using Roboflow platform.*

- *There still may be mistakes and conflicting labels, but we believe that they are now less prominent.*

- *If we needed to make changes to the dataset, we probably would have added intermediate labels, as during the procedure – "holding a tool" and actually "using it", can be interpreted differently between different annotators.*

  - *This would especially have helps differentiating between 'empty' and 'forceps', as it was common for the subject to hold the tool in their hand, and it may seem confusing even for the human annotator.*

  - *For example: define an intermediate label 'left_forcept_rest'.*