# DeepLabCut workshop demo section 2

Mackenzie & Alexander Mathis
Harvard University

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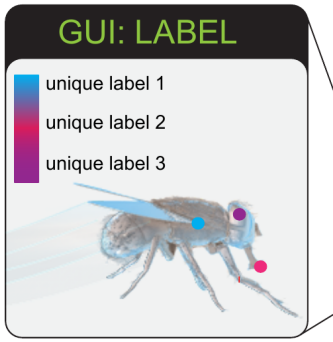
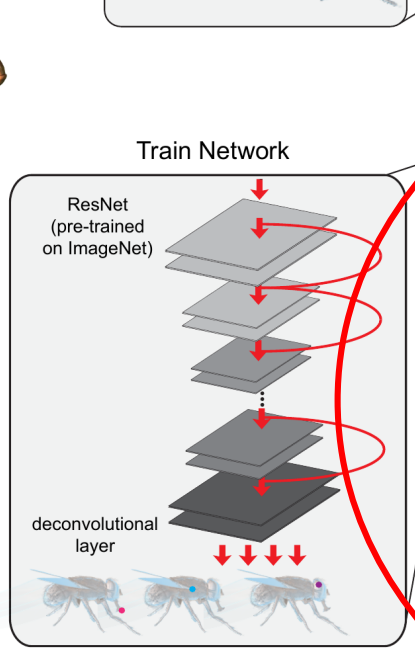
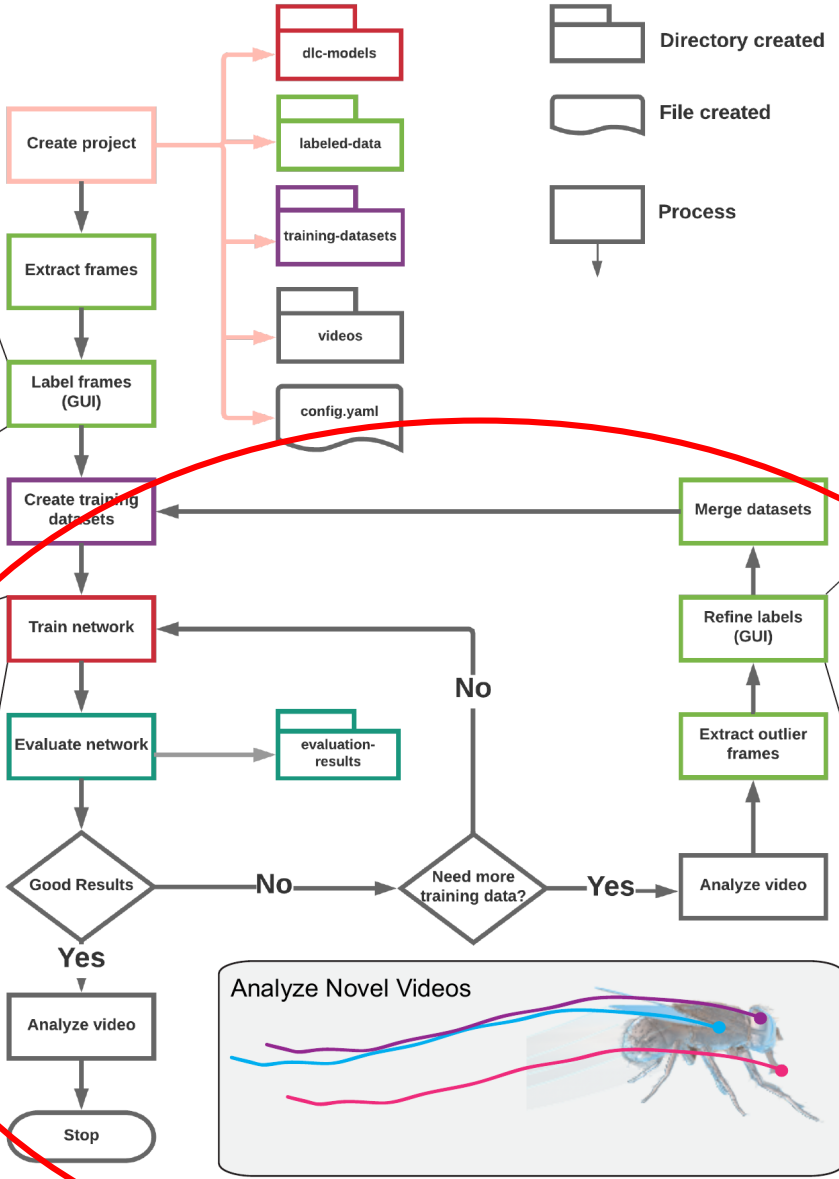
DeepLabCut Workshop - Cambridge

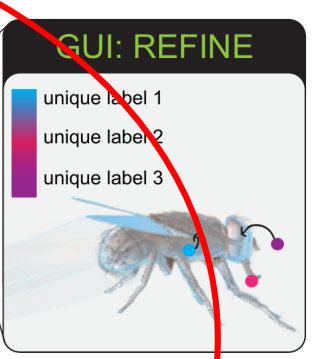
# DeepLabCut 2.0 workflow

Frames extracted from video
(any species can be used)







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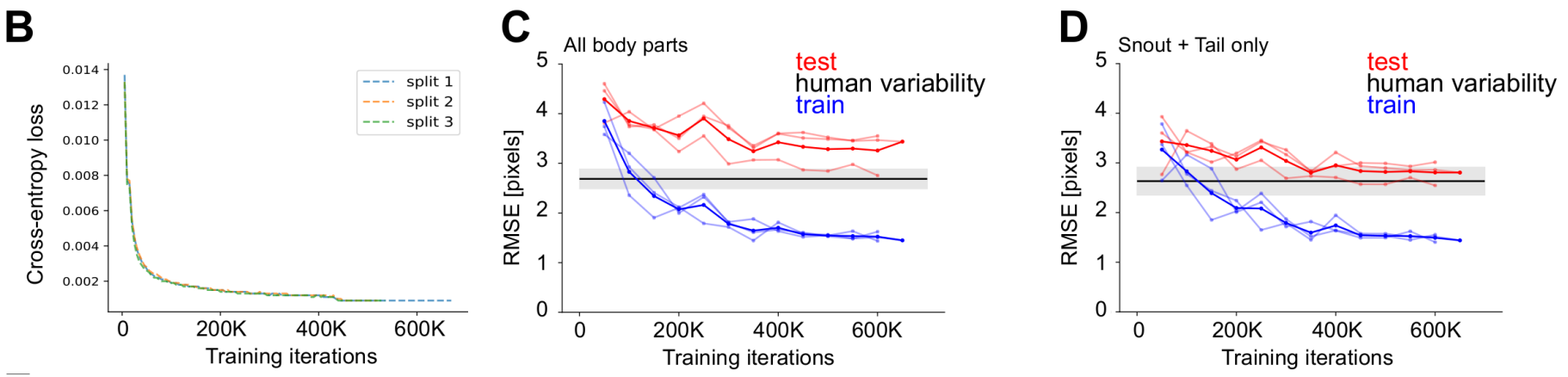
# Evaluation considerations

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# Evaluation >> look at test images!

a Example of the terminal output

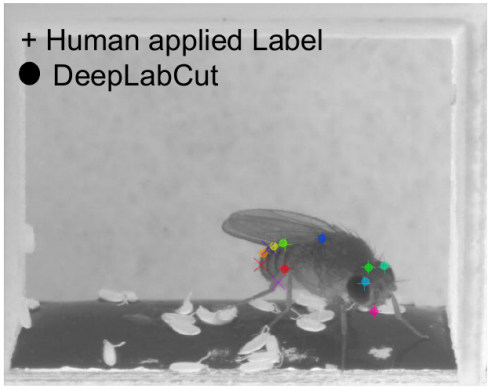
```
deeplabcut.evaluate_network('<path of the proj. config file>', shuffle = [1], plotting=True)
```

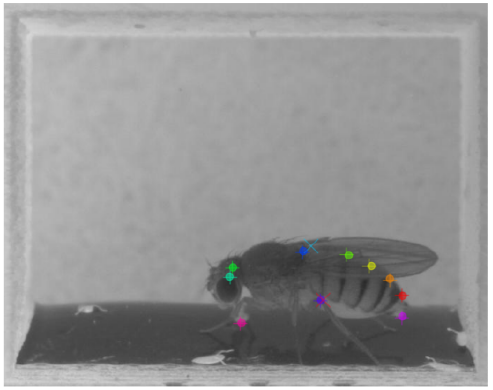
```
Assessing accuracy of shuffle #  1  with  99  % training fraction.
Found the following training snapshots:  [(200000, 0)]
You can choose among those for analyis of train/test performance.
Results for 200000 training iterations: 99 1 train error: 4.81 pixels. Test error: 7.02  pixels.
With pcutoff of 0.1  train error: 3.3 pixels. Test error: 5.2 pixels
```

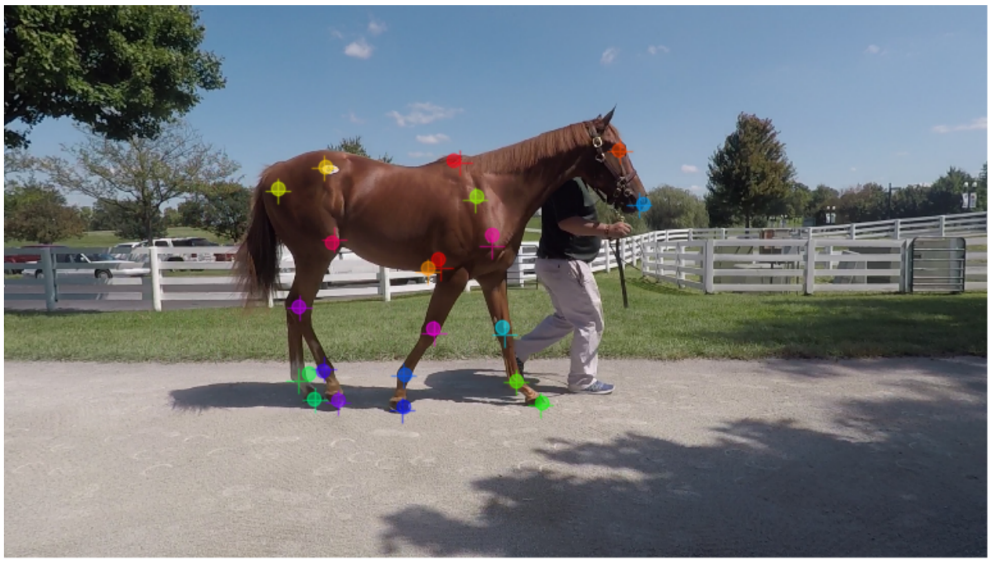
b Examples of **training images** with Human and DeepLabCut labels

c Examples of **test images** with Human and DeepLabCut labels

d Examples of **test images** with Human and DeepLabCut labels





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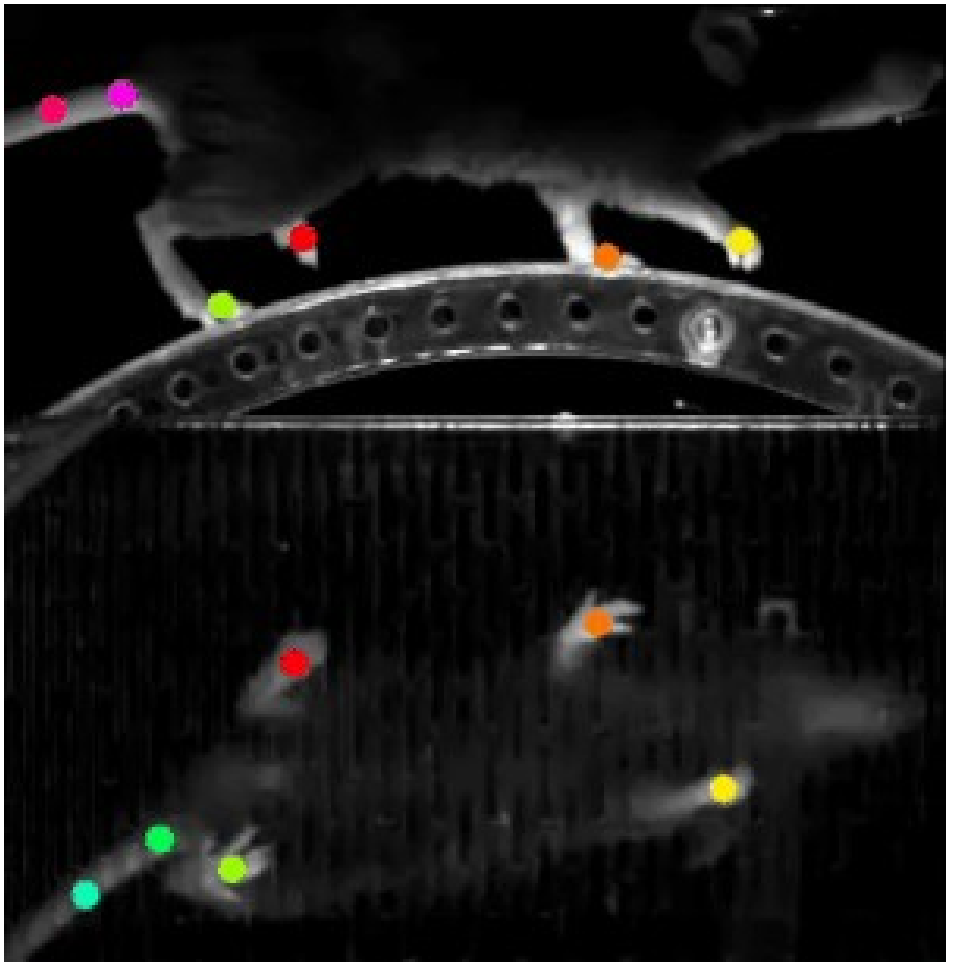
# Demo

- Let’s have a look at your trained networks!

# Analyze and label videos

- Here is the standard output:



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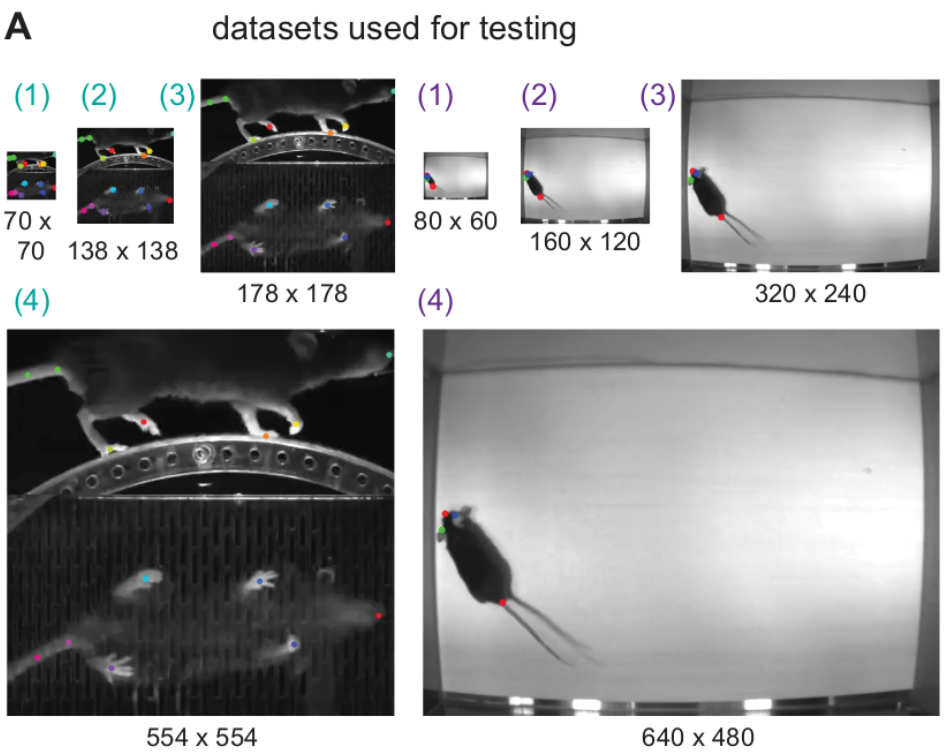
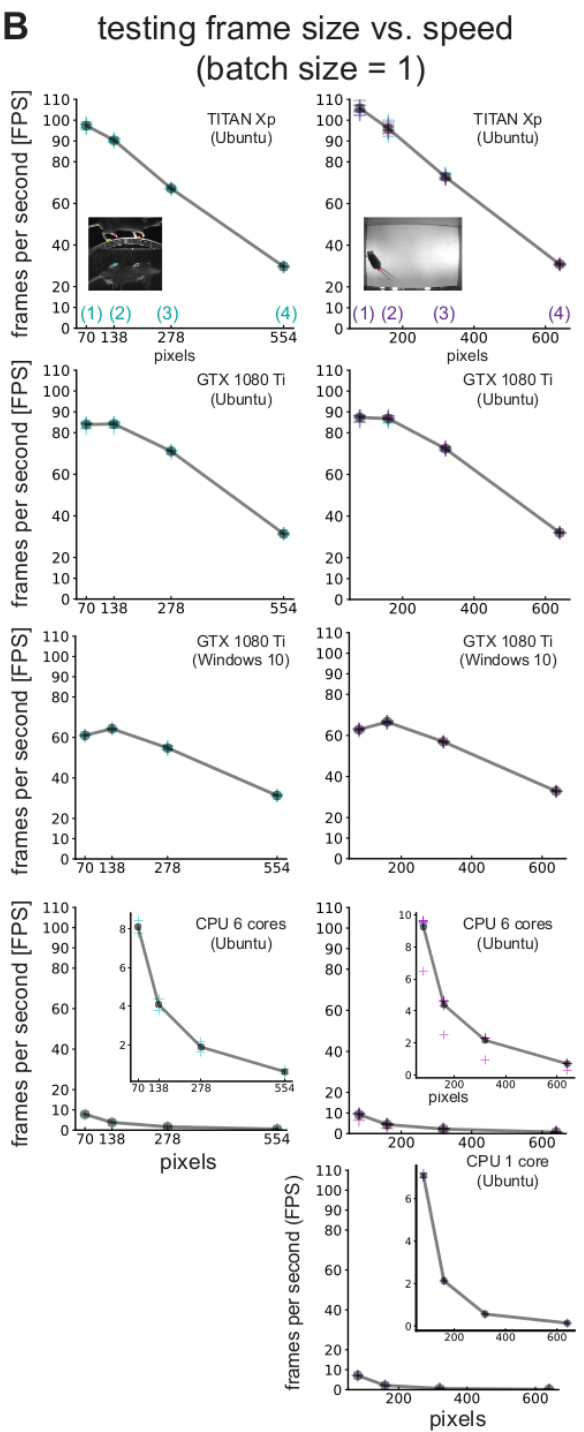
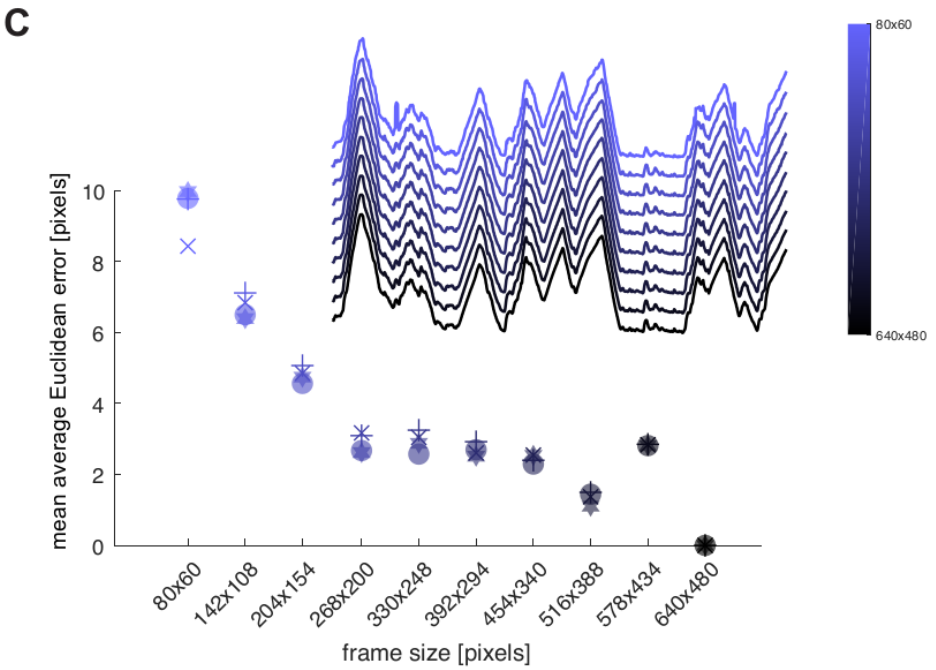
# Key parameters for analysis of novel videos

- batch_size (see next slides); thus try to make sure the frames are “as small as possible”
- Snapshoptindex (which state of the network during training shall be used; default -1 will take the final one)

# Analysis speed

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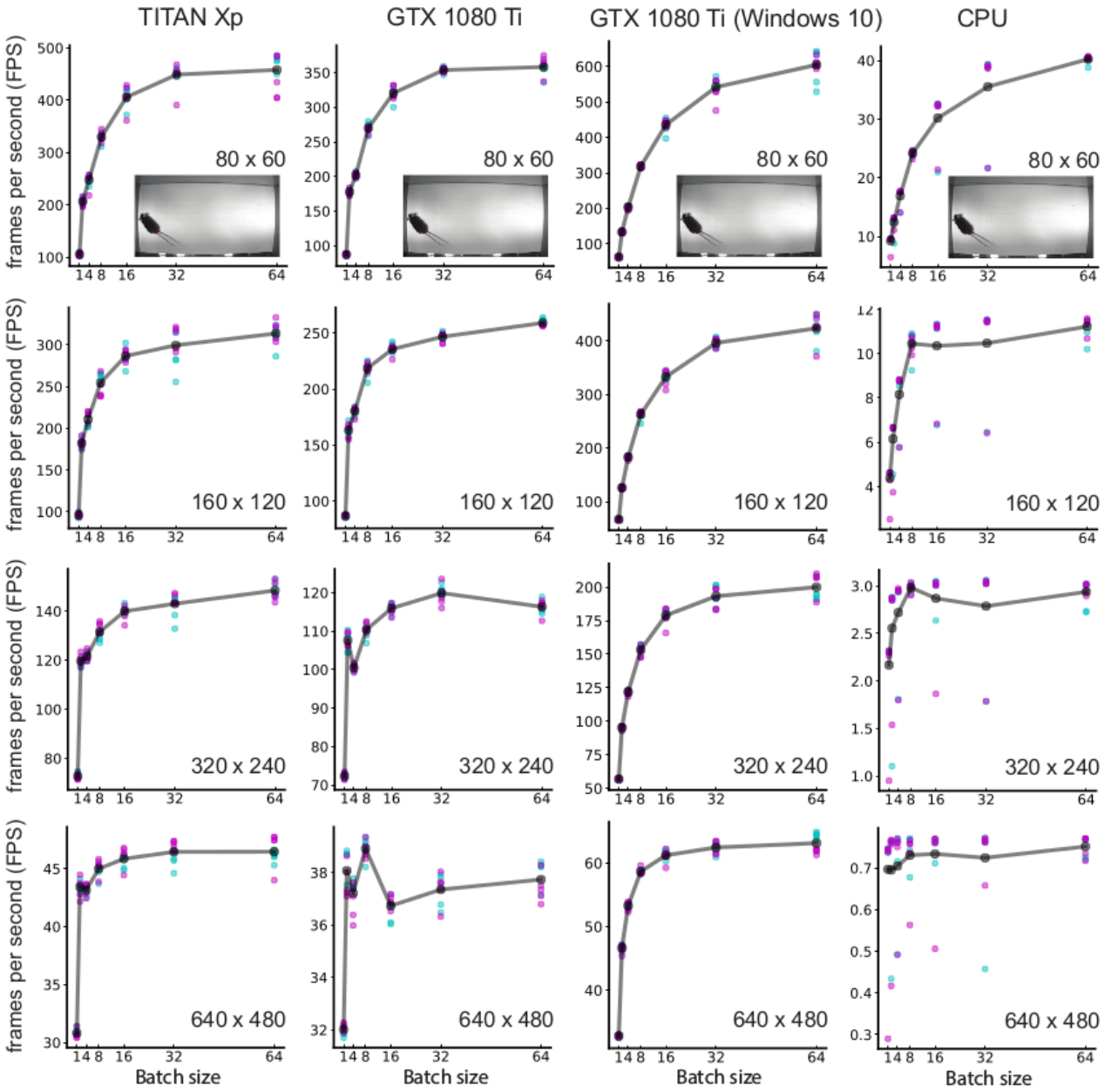
# Analysis speed

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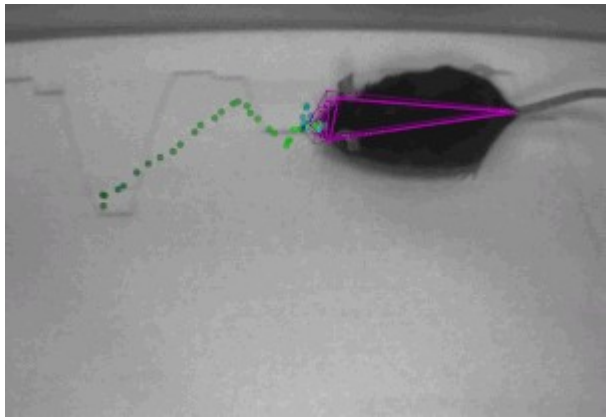
# You can also change the plotting code (per frame)

- Plotting based on *matplotlib*, so you can just create skeletons by connecting body parts, etc.



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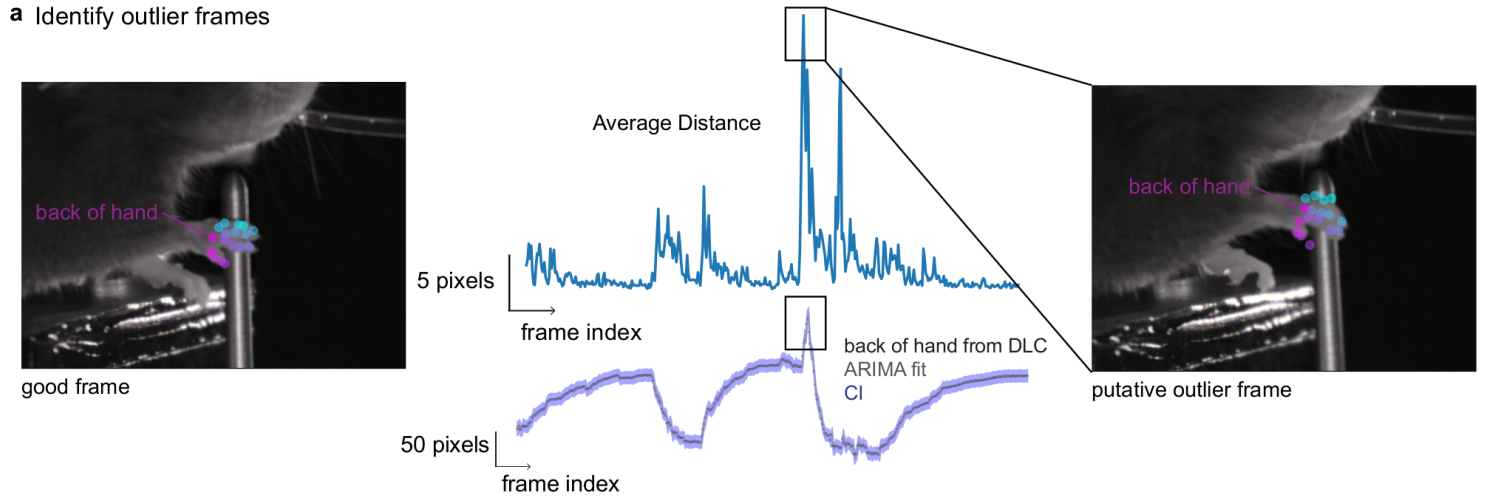
# Demo

- Create annotated video
- Create trajectory plots

# Generalization

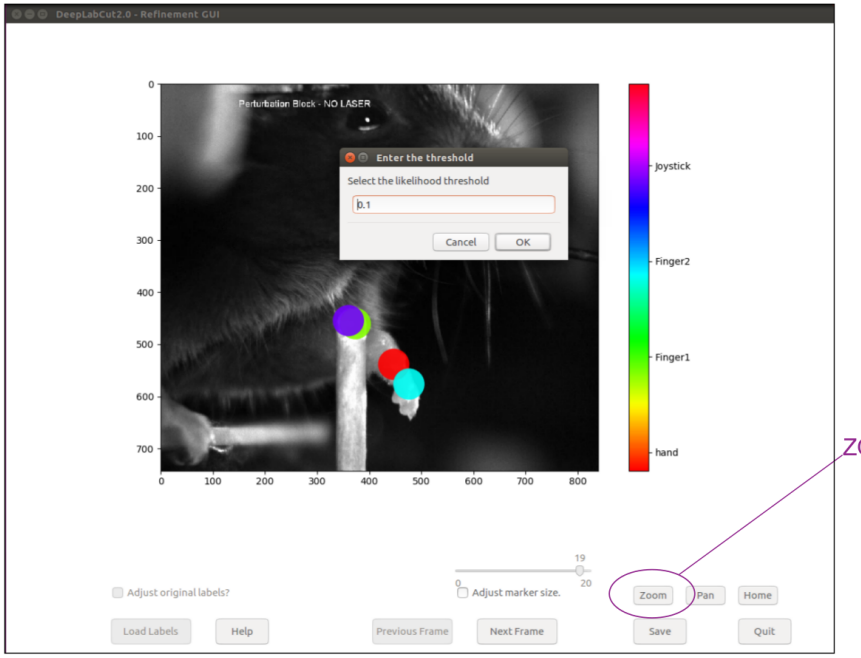
- If there are errors in analyzed videos, you can correct those manually and re-train!
- Note you do not need to correct all errors (presumably some are fixed due to generalization)
- **Current automatic methods for “outlier” detections**: jumps in trajectories, low confidence, and (large) deviation from state-space model fit

# Outlier detection & human feedback

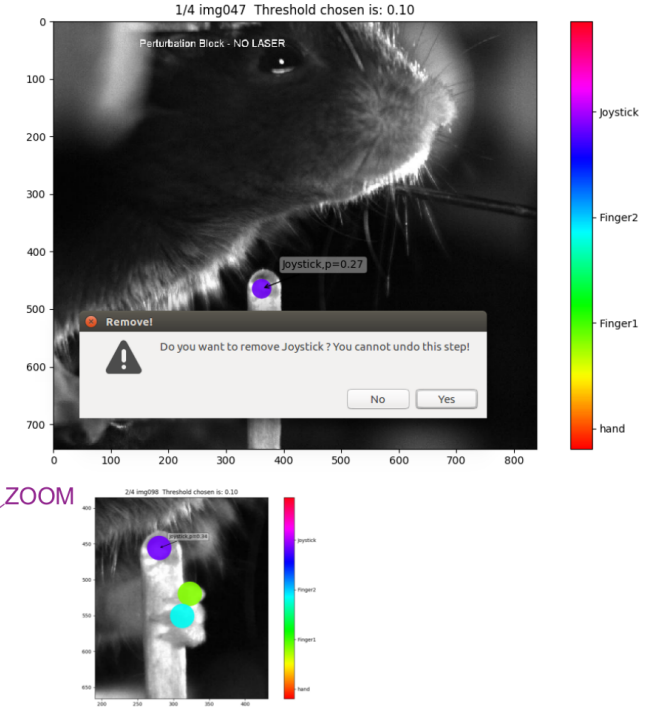



**b** Refine DLC applied label location(s)

`deeplabcut.refine_frames(config_path)`




**c** Remove label i.e. from an occluded point

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# Next steps

- Merge the data sets and train again!
- The weights will (again) be initialized from ImageNet weights! (because w.l.o.g. e.g. #body parts could have changed).
- You can manually link the *init_weights in pose_cfg.yaml* to the snapshot from previous iteration before starting to train

# Demo

- Extract outlier frames and correct them
- Merge data sets and create new training set
- Start training