

# DeepLabCut workshop

## Got pose dynamics, what next?

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Harvard University

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DeepLabCut Workshop - Cambridge



# Automation of deeplabcut...

```
import subprocess, sys
import numpy as np
import itertools
import os
import deeplabcut

Maxiter=int(1.5*10**5)
model=int(sys.argv[1])
Projects=[['project1-phoenix-2019-01-28'],['ComplexWheelD3-12-Fumi-2019-01-28', 'maze-ariel-2019-01-28'], ['TBI-BvA-2019-01-28','group-eli-2019-01-28']]

shuffle=1

prefix='/home/alex/DLC-workshopRowland'

for project in Projects[model]:
    projectpath=os.path.join(prefix,project)
    config=os.path.join(projectpath,'config.yaml')

    cfg=deeplabcut.auxiliaryfunctions.read_config(config)
    previous_path=cfg['project_path']

    cfg['project_path']=projectpath
    deeplabcut.auxiliaryfunctions.write_config(config,cfg)

    print("This is the name of the script: ", sys.argv[0])
    print("Shuffle: ", shuffle)
    print("config: ", config)

    deeplabcut.create_training_dataset(config, Shuffles=[shuffle],windows2linux=True)

    deeplabcut.train_network(config, shuffle=shuffle, max_snapshots_to_keep=5, maxiters=Maxiter)
    print("Evaluating...")
    deeplabcut.evaluate_network(config, Shuffles=[shuffle],plotting=True)

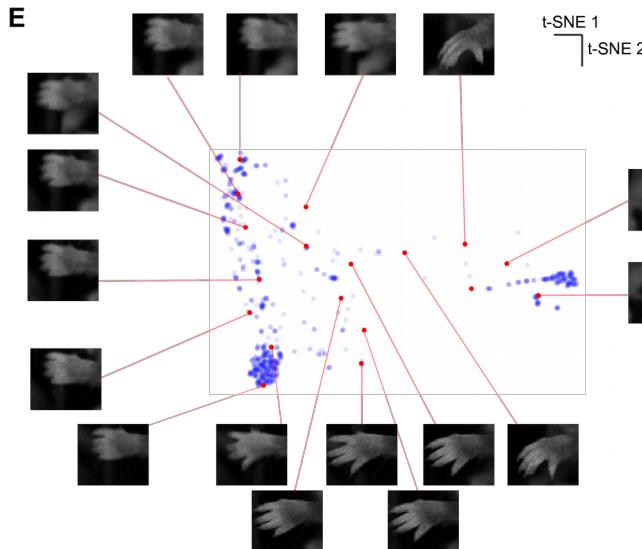
    print("Analyzing videos..., switching to last snapshot...")
    #cfg=deeplabcut.auxiliaryfunctions.read_config(config)
    #cfg['snapshotindex']=-1
    #deeplabcut.auxiliaryfunctions.write_config(config,cfg)

    for vtype in ['.mp4','.m4v','.mpg']:
        try:
            deeplabcut.analyze_videos(config,[str(os.path.join(projectpath,'videos'))],shuffle=shuffle,videotype=vtype,save_as_csv=True)
        except:
            pass

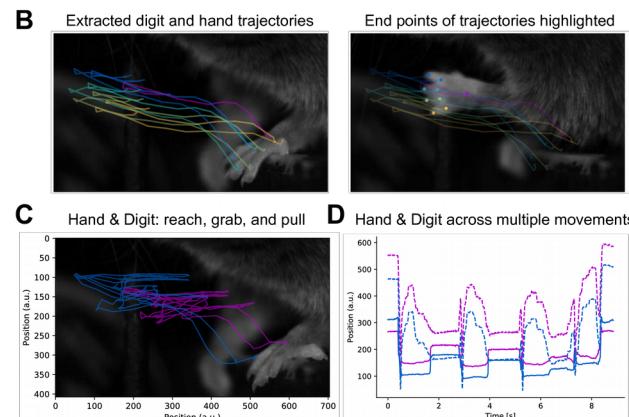
    print("DONE WITH ", project," resetting to original path")
    cfg['project_path']=previous_path
    deeplabcut.auxiliaryfunctions.write_config(config,cfg)
```

# What next?

## Clustering poses

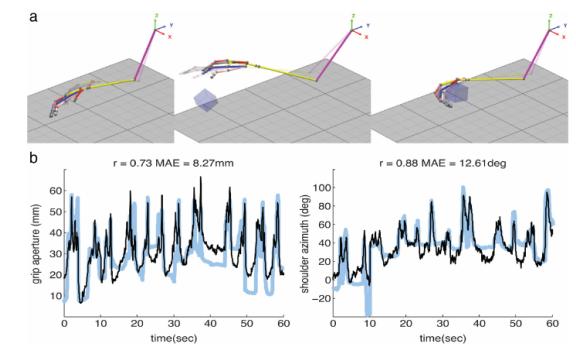
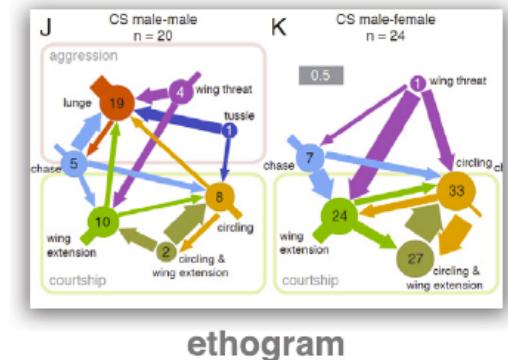


## Kinematics



## Neural coding

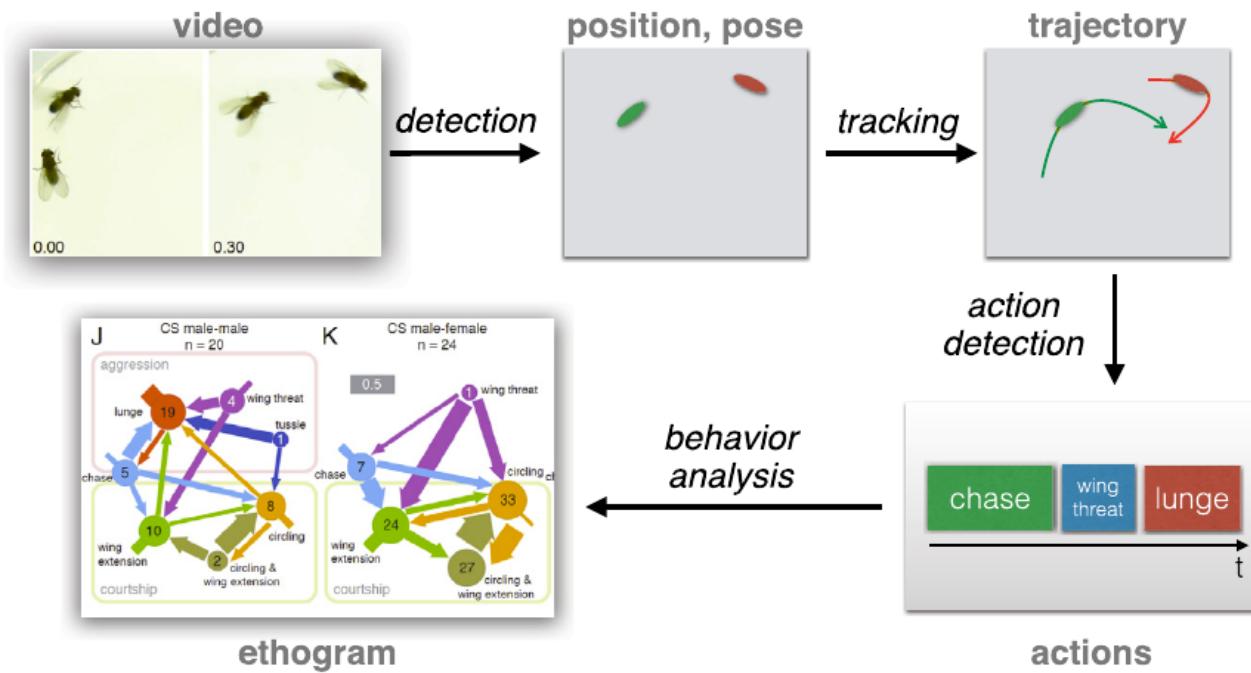
## Behavioral description



## Decoding Complete Reach and Grasp Actions from Local Primary Motor Cortex Populations

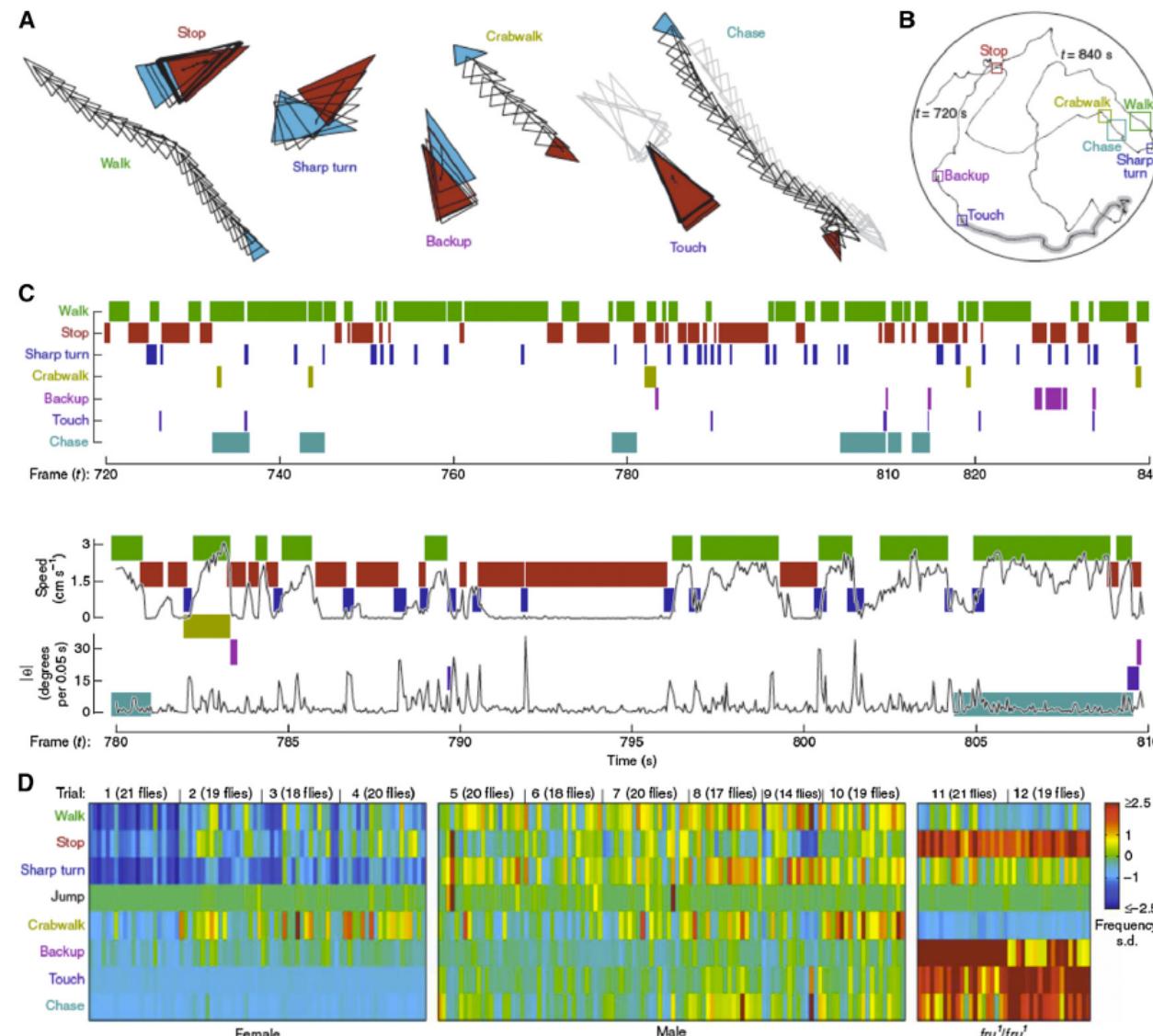
Carlos E. Vargas-Irwin,<sup>1</sup> Gregory Shakhnarovich,<sup>2,3</sup> Payman Yadollahpour,<sup>2,3</sup> John M. K. Mislow,<sup>1,4</sup> Michael J. Black,<sup>2</sup> and John P. Donoghue<sup>1,5</sup>

# Computational Ethology



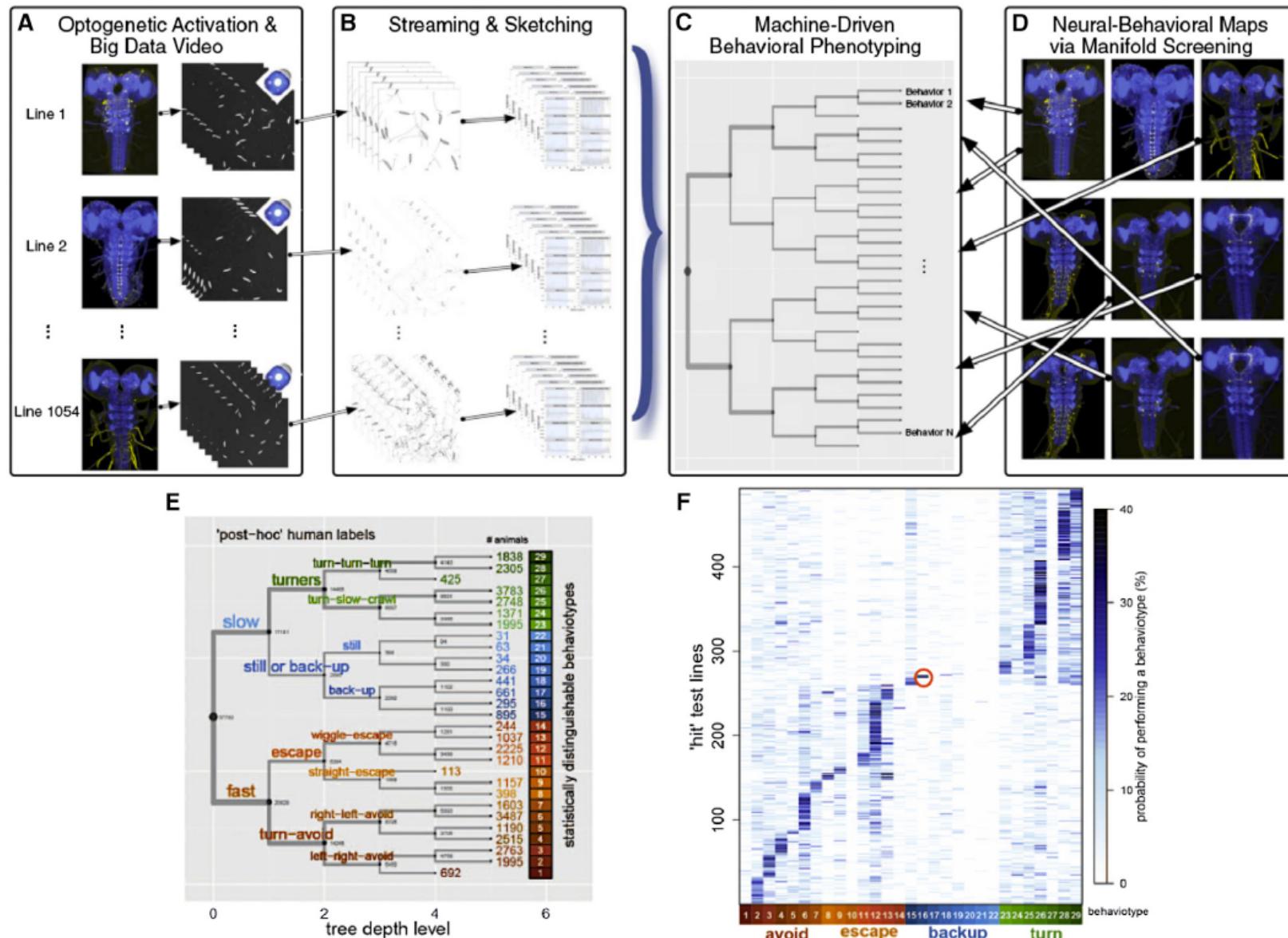
Toward a Science of Computational Ethology

# Ethograms based on machine vision analysis of multiple flies



Branson et al. 2009; figure from Anderson/Perona

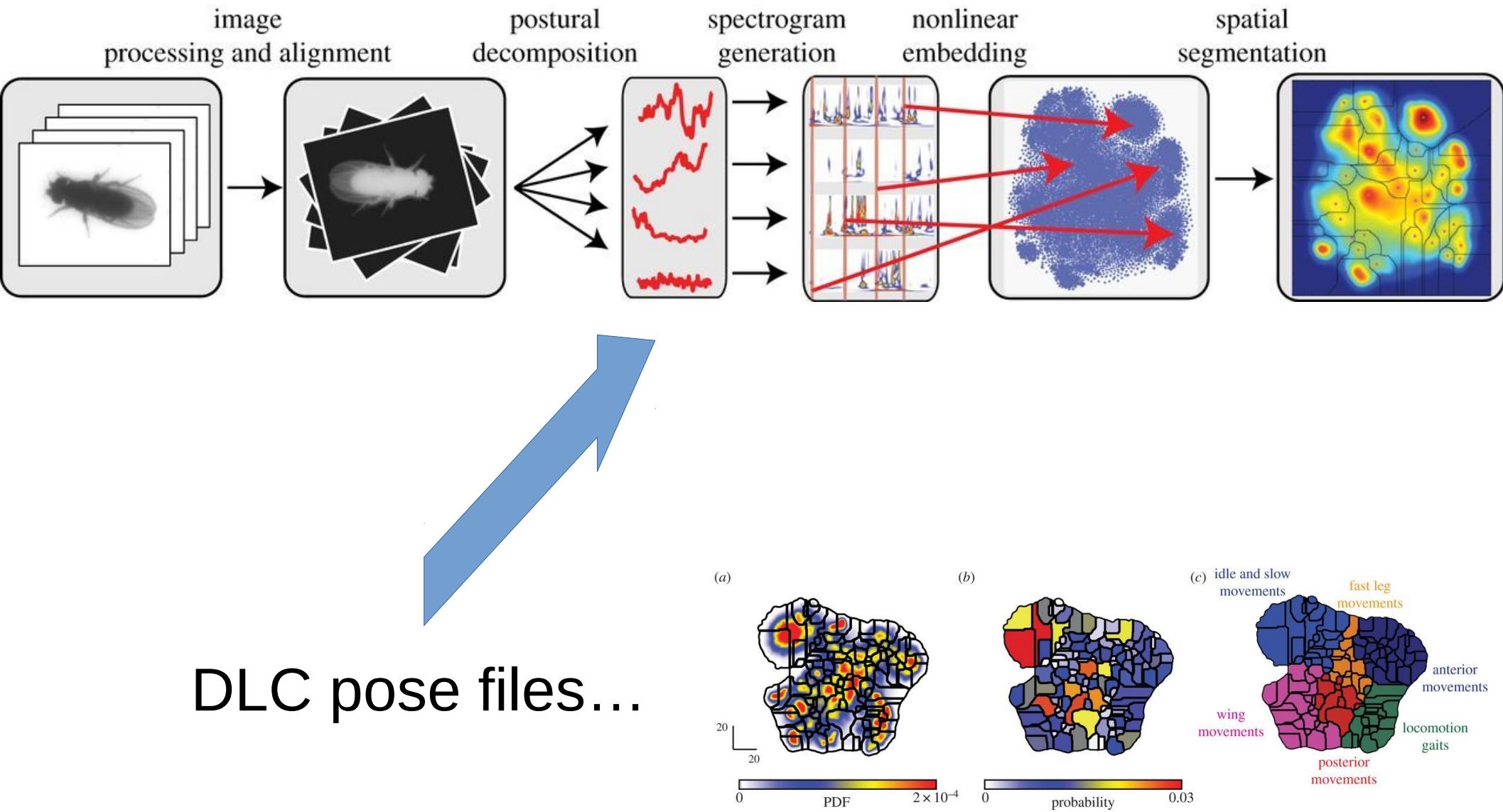
# Unsupervised analysis



# Literature

- Reviews: Todd et al 2017 “Systematic exploration of unsupervised methods for mapping behavior”, Anderson & Perona 2014, Dell et al 2014...
- JAABA (Kabra et al 2013)
- MotionMapper (Berman et al. 2014)
- MoSeq (Wiltschko et al. 2015),
- or other clustering approaches such as iterative denoising tree (IDT) methods (Vogelstein et al. 2014)
- ...

# MotionMapper



DLC pose files...

- MotionMapper (Berman et al. 2014)

# DLC utils...

AlexEMG / DLCutils

Unwatch 5    Unstar 16    Fork 6

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Various scripts to support deeplabcut...

Edit

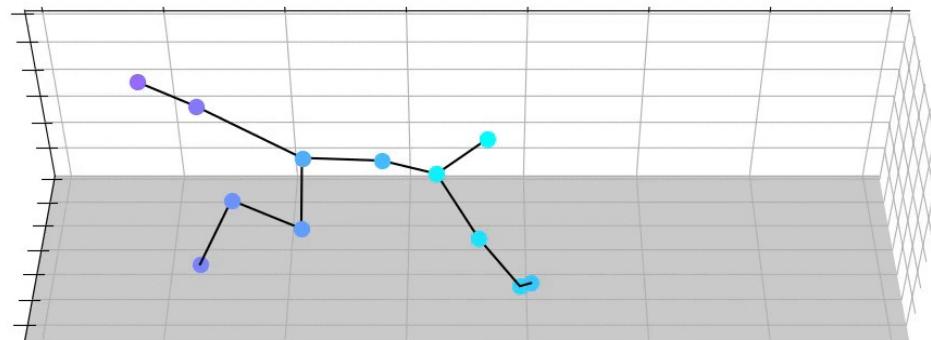
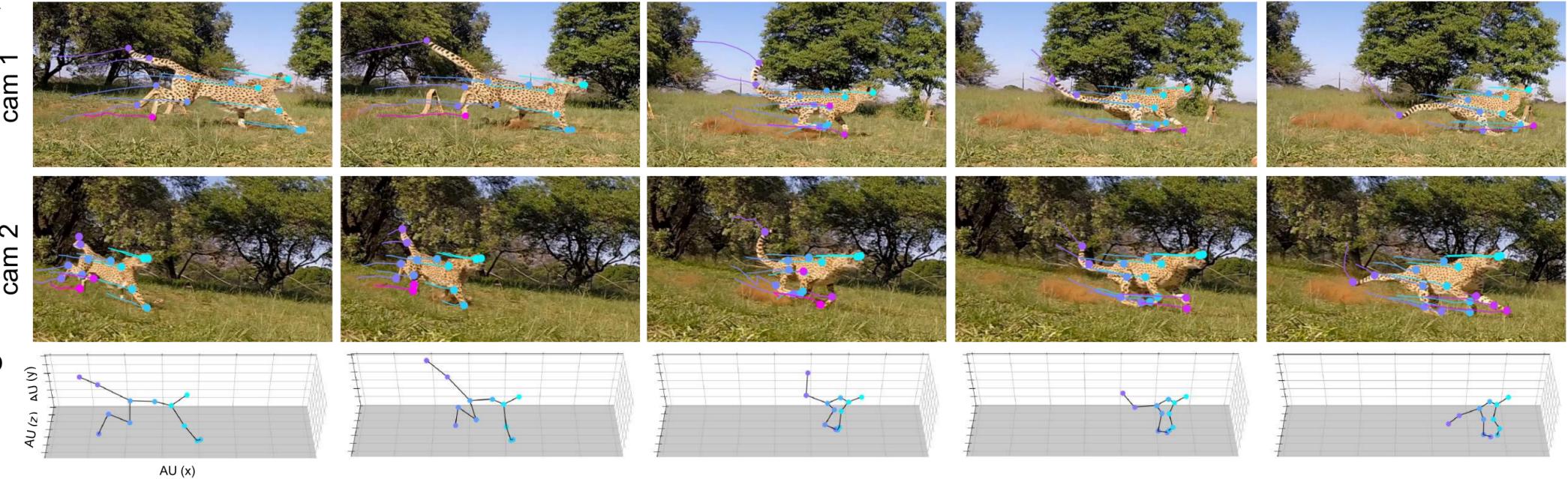
deeplabcut behavior-analysis clustering-algorithm Manage topics

22 commits 1 branch 0 releases 3 contributors

Branch: master ▾ New pull request Create new file Upload files Find file Clone or download ▾

MMathisLab	Update README.md	Latest commit 58364af 27 minutes ago
DLC_2_MotionMapper	Create README.MD	6 hours ago
pupilTracking	PupilTracking scripts from Tom Vaissie	13 days ago
README.md	Update README.md	27 minutes ago
conda-environment-cheatsheet	Create conda-environment-cheatsheet	3 months ago
convertDLC1TO2.py	Update import file	3 months ago
convertWin2Unix.py	Hack for using colab with data labeled in windows...	16 days ago
time_in_each_roi.py	added scipy import	2 months ago
README.md		

# 3D pose estimation - cheetah hunting



Ongoing work with Amir Patel  
University of Cape Town

# Please get involved!

AlexEMG / DeepLabCut

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Markerless tracking of user-defined features with deep learning <http://www.mousemotorlab.org/deeplabcut> Edit

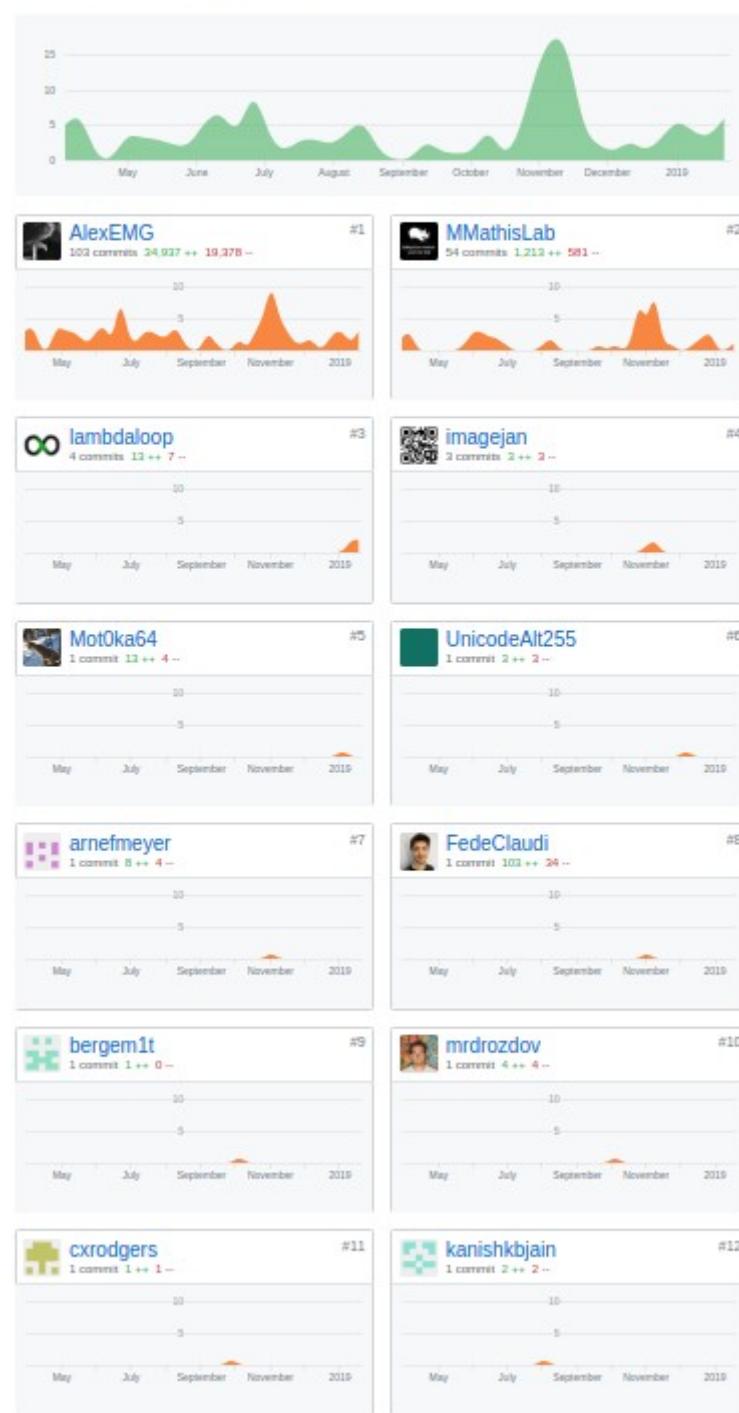
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191 commits 1 branch 12 releases 1 environment 12 contributors LGPL-3.0

Branch: master ▾ New pull request Create new file Upload files Find file Clone or download ▾

AlexEMG	Allowing longer videos for labeled video creation, made video path co...	...	Latest commit 58b0913 4 hours ago
.github/ISSUE_TEMPLATE	DeepLabCut 2.0 beta, hello world!		3 months ago
conda-environments	update URL		13 days ago
deeplabcut	Allowing longer videos for labeled video creation, made video path co...		4 hours ago
docs	updated labeling GUI details (for DLC 2.0.4)		3 days ago
examples	DLC 2.0.4 - hello world!		3 days ago

Contributions to master, excluding merge commits



- clarify the documentation
- add functions
- ...

## Code contributors:

Alexander Mathis, Tanmay Nath, Mackenzie Mathis, and especially the authors of DeepCut authors for the feature detector code. The feature detector code is based on Eldar Insafutdinov's TensorFlow implementation of DeepCut. DeepLabCut is an open-source tool and has benefited from suggestions and edits by many individuals including Richard Warren, Ronny Eichler, Jonas Rauber, Hao Wu, Federico Claudi, Taiga Abe, and Jonny Saunders as well as the contributors. In particular, the authors thank Ronny Eichler for input on the modularized version. We are also grateful to all the beta testers!

This is an actively developed package and we welcome community development and involvement!

## #helpdesk

☆ | 8 152 | 1 For code bugs, please check: <https://github.com/AlexEMG/DeepLabCut/issues>. He... Thursday, November 29th

AlexEMG/DeepLabCut  
Markerless tracking of user-defined features with deep learning -  
AlexEMG/DeepLabCut

1

Jxwang59 1:18 PM

Hi, everyone. Just a basic question! How to load a created project? Thank you in advance! 😊

mackenziewmathis 1:22 PM

I'm not sure I understand the question; i.e. if you create a project and work on it, then close the python session, you just import deeplabcut again, and define the config-path then you can keep working on it

Jxwang59 1:28 PM

@mackenziewmathis Thanks!

Raisa Rahim 8:42 PM

I'm trying to run Demo\_yourowndata on my Mac. I'm running pythonw through my terminal (to bypass the incompatibility of wxPython and jupyter). I get up to label frames when I get the "AttributeError: 'MainFrame' object has no attribute 'dir'" and an empty window opens. When I go to "load extracted frames", all the .png files are greyed out. Thanks in advance!

mackenziewmathis 8:58 PM

Are the frames grey in the folder outside of deeplabcut ?

21 replies Last reply 3 days ago

Friday, November 30th

Feng 11:14 AM

+ Message #helpdesk

@ ☺

# Support

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Welcome to the Scientific Community Image Forum at forum.image.sc! This forum's focus is software-oriented aspects of scientific imaging, particularly (but not limited to) image analysis, processing, acquisition, storag... <a href="#">read more</a>					

# Acknowledgements



Mackenzie Mathis (Harvard)  
Matthias Bethge (Uni Tuebingen)



A.M & Venkatesh N. Murthy (trail tracking / Harvard)  
Mackenzie Mathis & Naoshige Uchida (mouse reaching/ Harvard)  
Kevin Cury & Richard Axel (egg laying / Columbia)  
Amir Patel & An Chi Chen (Cheetah / U of Cape Town)

Tanmay Nath (DLC 2.0 code / Rowland Institute, Harvard)  
Richard Warren (Speed benchmarking / Columbia)

Pranav Mamidanna (labeling / Uni Tuebingen)  
Taiga Abe (labeling / Columbia)

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