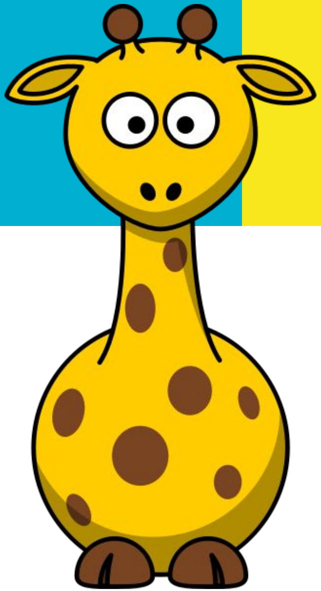
Masai Giraffe

Giraffa camelopardalis tippelskirchi



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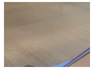
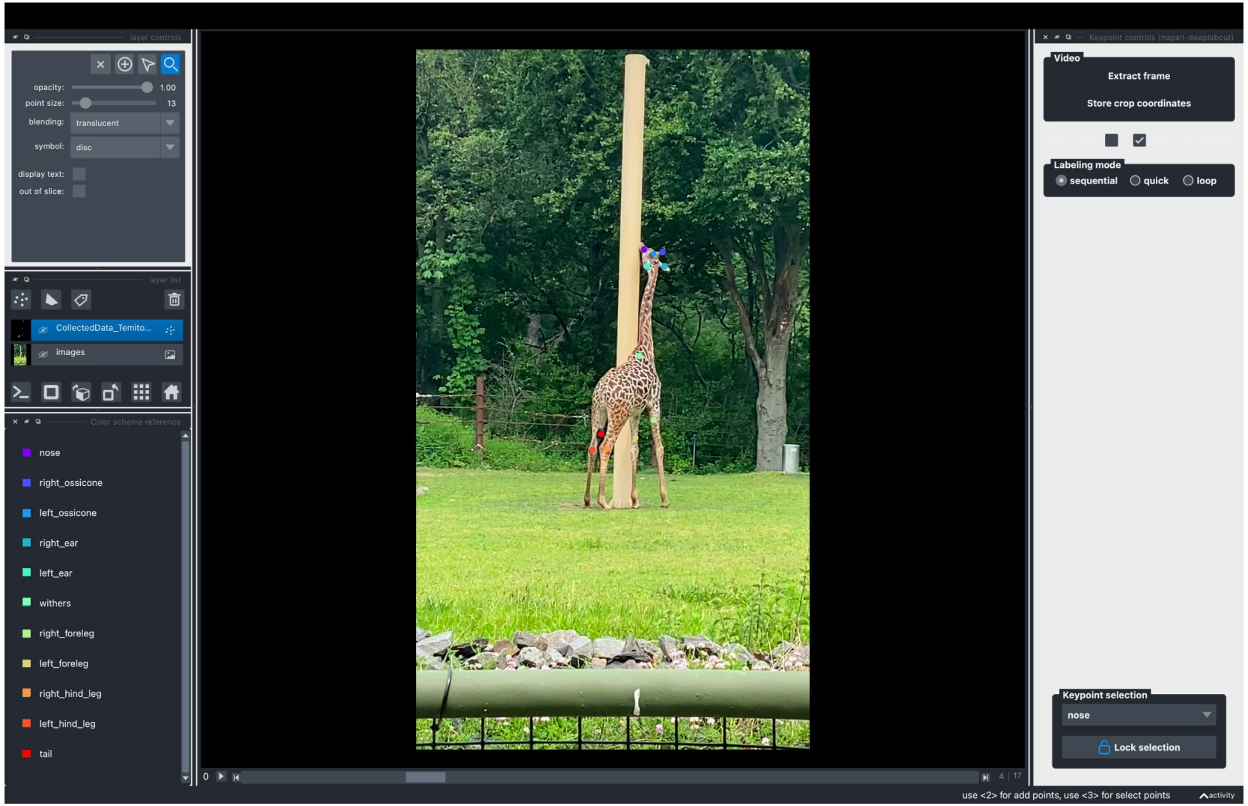


Introduction

Giraffa camelopardalis tippelskirchi, commonly known as the Masai giraffe, is the largest subspecies of giraffes, and among the tallest quadruped animals in the world.

- These endangered herbivores have been in captivity for many years, as we readily see them in our sanctuaries and zoos. They exhibit ***unnatural and non-beneficial physical behaviors across these differing captive environments***.
- One major observed action in these captured animals is associated with *oral activities*, such as stereotypic licking, which is not seen in their respective wild counterparts.
    - Stereotypic licking can be defined as a recurring motion focused on non-food related objects.
- Research studies have begun to explore what allures the captive Masai Giraffe to adopt these actions. Previous studies have indicated that certain aversive stimuli fail to alter this conduct.
    - Other studies have explored how controlling, introducing, or reducing foraging encouragements, nutritional modifications, and human interaction impact a captive Masai Giraffes physical performances. However, the scope of these studies is limited.
- Typically, the studies are focused on Masai giraffes in only a few enclosures; they are too narrow to draw any definitive conclusions. There is still much to consider regarding this observed behavior in captive Masai giraffes.
- While what universally creates these behaviors remains unresolved, the purpose of this study is to try and gain insight into how captivity can greatly impact this animal's natural instincts and cause them to lose their instinctual disposition, leading them to adopt odd behaviors as a result.

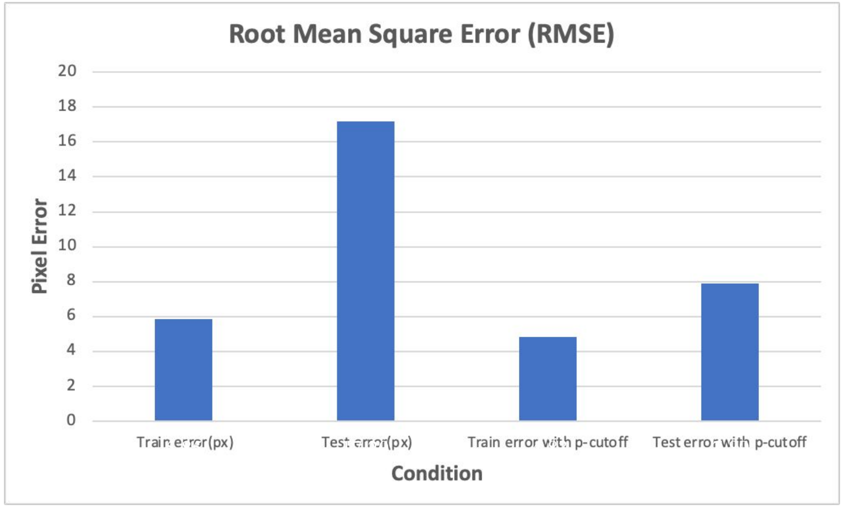
Labeled Body Parts

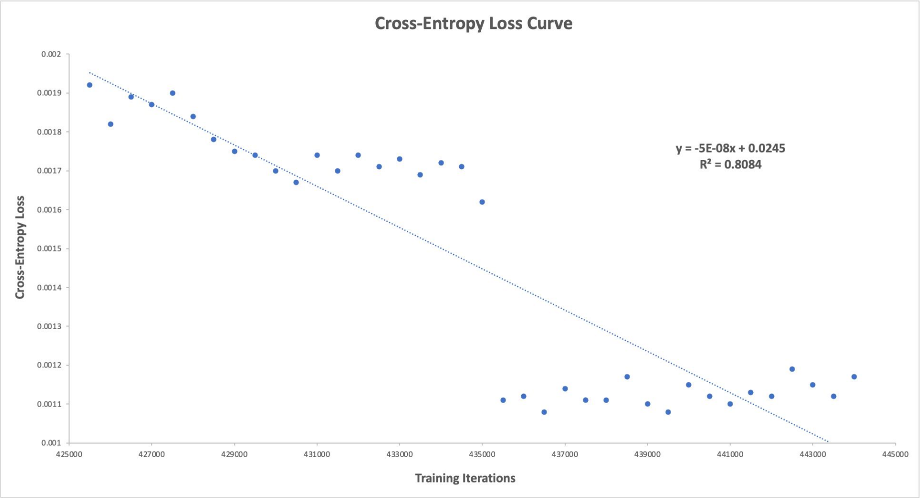


Napari DeepLabCut graphical user interface displaying a single extracted video frame. The colored data points indicate how and which body parts were labeled. These labeled body parts on each video frame served as the source of the "true" probability distributions to which the machine was trained.

Machine Labeled Video 1

Pixel Error and Loss Curve for the Trained Neural Network

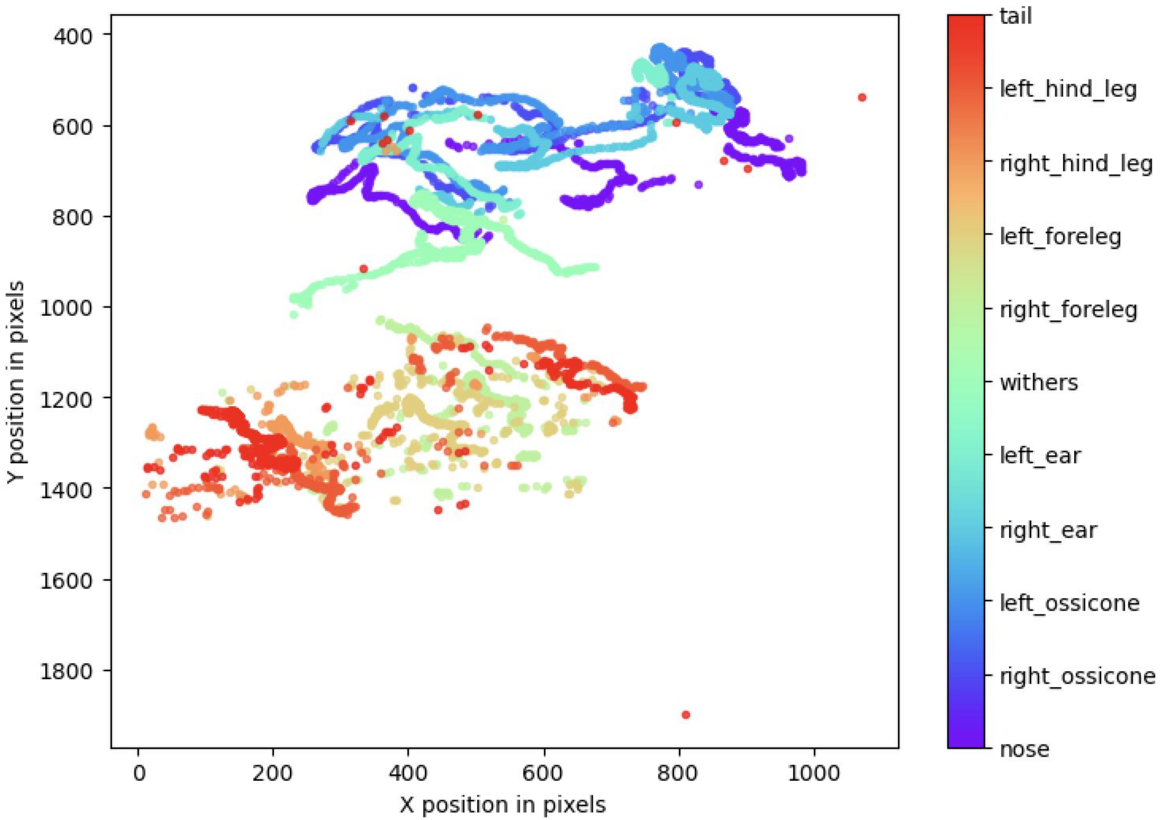




DLC calculates trained network performance using the mean average Euclidean error (average summed multi-dimensional distance) between manually labeled “true” points versus those predicted by the network. Mean average Euclidean error is proportional to the average root mean square error. The P-cutoff used was 0.6.

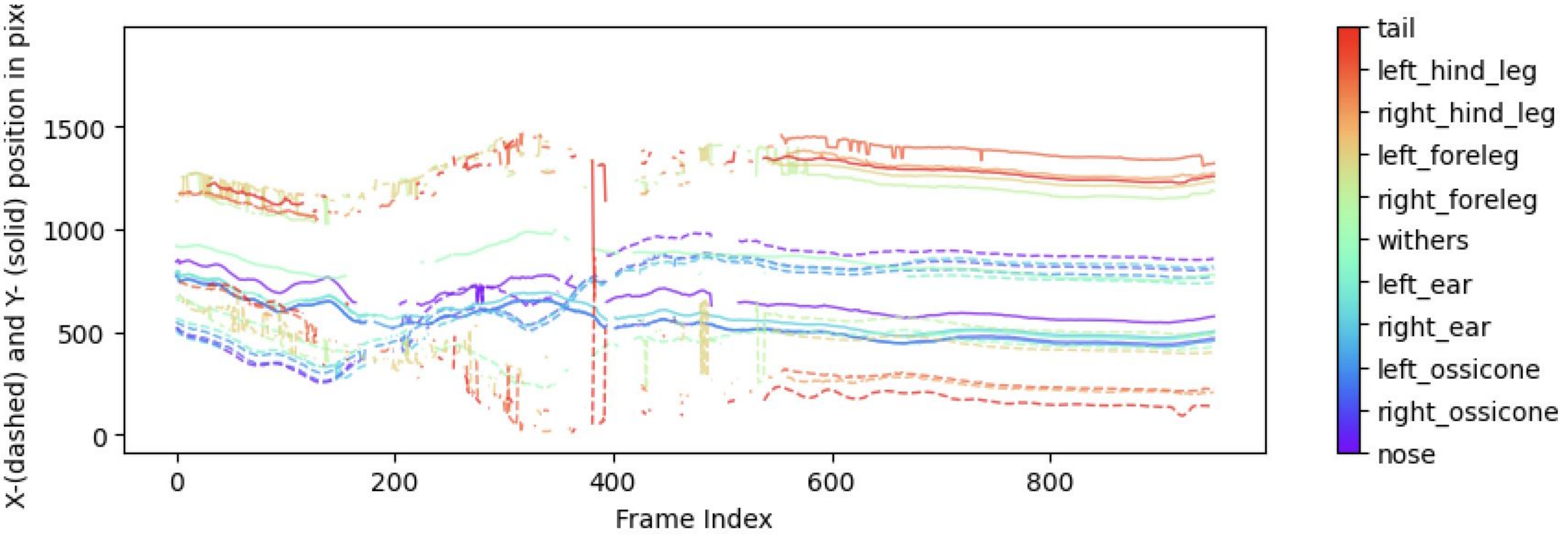
Cross-entropy loss is a general measure of how well predicted class probabilities compare to their respective actual classes on a logarithmic scale. When applied to the loss function, the difference between the two probability distributions outputs a loss value, which, when reviewed over multiple iterations, shows the likelihood of accurate predictions by the model. A cross-entropy loss value of 0 would indicate a perfectly trained model. The trendline in the graph above provides a negative correlation which implies that the model is becoming more accurate in its predictions.

All Body Parts Plotted Through Space



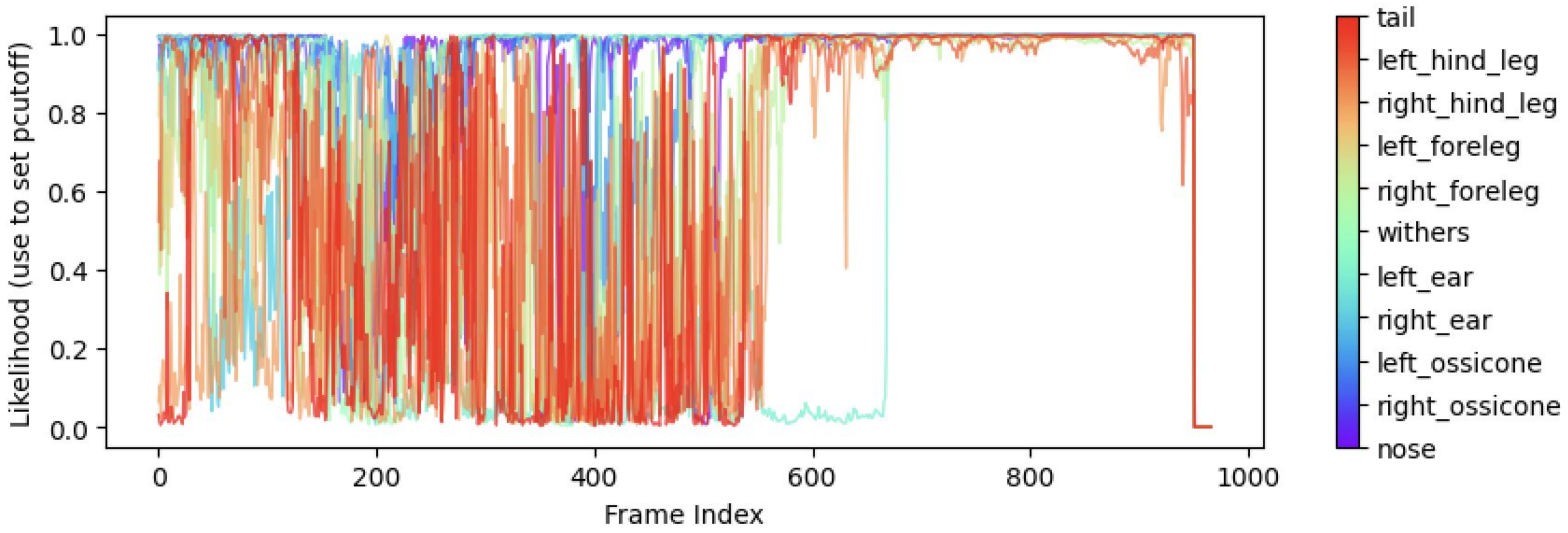
Cartesian coordinate points were plotted for each body part as it moved through space, measured in pixel components.

All Body Parts Plotted Across Time



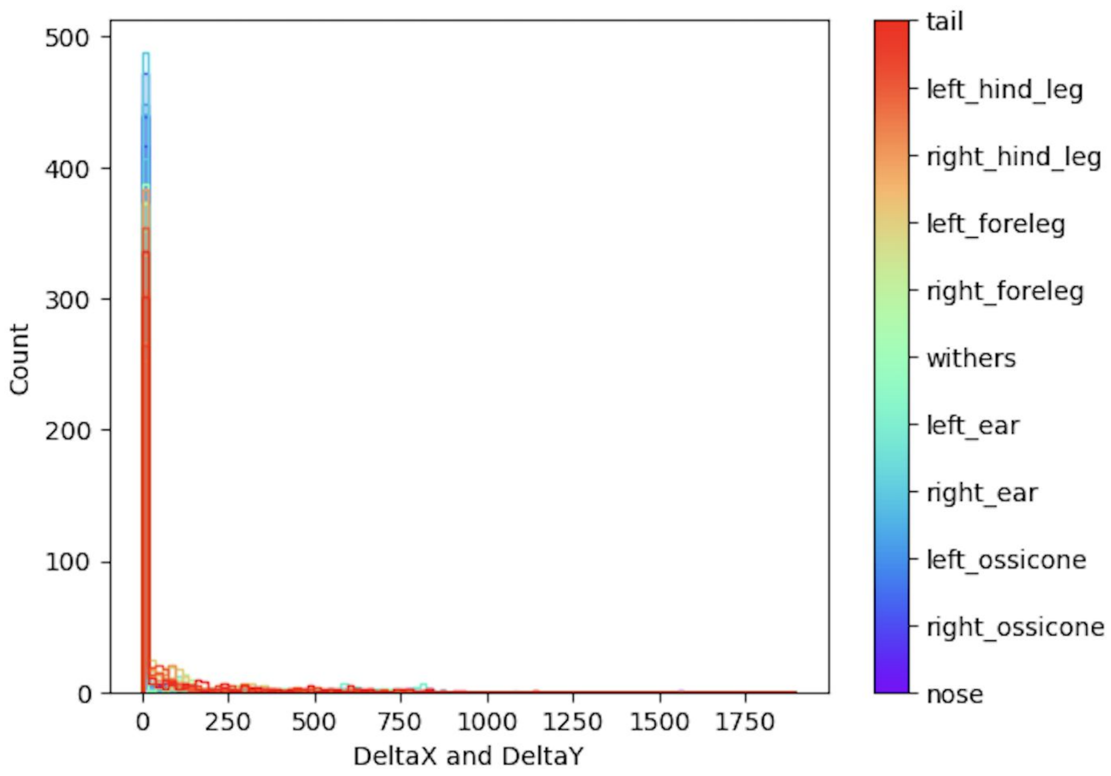
The x- and y- components of the position of each body part were plotted across frame indices of the video.

Body Part Likelihood Over Time



The probabilities of each body part appearing were plotted across frame indices of the video.

Consecutive Coordinate Differences



The number of times a body part experienced a measurable change in distance from one location with respect to its preceding location.

Machine Labeled Video 2

5 Hypotheses

Hypothesis One:
If Masai giraffes in captive environments' human socialization was greatly reduced, then their population numbers would improve, especially within the context of their endangered-status.

Hypothesis Two:
If the artificial reproduction that shelters Masai Giraffes in captivity fails to stimulate a motivating, naturalistic environment, then the Giraffes will gradually lose their instinctual disposition and enact peculiar behaviors as a result.

Hypothesis Three:
If humans could reach a greater understanding of the Masai Giraffes spatial scale, then they would be able to improve the success of feeding in captivity, as well as better meet the preferences of the Masai Giraffes feeding and foraging habits.

Hypothesis Four:
If humans could improve the reproductive conditions of Masai Giraffes in captivity, they would ultimately be able to increase the successful survival rate and reproduction rate of the species as a whole.

Hypothesis Five:
If shifts in landscape and soil fertility can be stabilized, then the prominence of Giraffe Skin Disease (GSD) will decrease and improve the wellbeing of the Masai Giraffe.

Selected Hypothesis

Hypothesis Two:

If the artificial reproduction that shelters Masai Giraffes in captivity fails to stimulate a motivating, naturalistic environment, then the Giraffes will gradually lose their instinctual disposition and enact peculiar behaviors as a result.

Research Design

We hypothesize that bringing these giraffes back to their natural environment will restore natural behaviors.

- To test our hypothesis, we will **randomly** select **10 Masai giraffes** and send them back to **Kenya**, while leaving **10 giraffes** in the **Massachusetts** zoo enclosure.
- The **independent variable** is the **change** in the giraffes' **living conditions**. The **dependent variable** is the **behavior** exhibited by the giraffes **towards the metal poles, which is measured by licking.**
- The **experimental group** consists of the 10 giraffes who are sent back to **Kenya**. The **positive control group** consists of 5 captive giraffes who are given **enrichment toys**, and the **control group** includes 5 captive giraffes who have **no stimulating modifications** made to the enclosure. All giraffes will be remotely monitored by
- We expect the **control group** to lick the metal pole the **most**. We expect the **experimental group** to lick the metal pole the **least**, and we predict that the **positive control group** will lick the metal pole **more than** the experimental group but **less than** the control group.

Ethics

Biases:

- The Masai giraffe will have no issues reacclimating to differing wildlife environment
- The giraffe will return to its naturalistic behaviors in a setting that invokes those behavior
- Stereotypic licking will be eliminated
- The Masai giraffe will regain stimulation its species relies upon

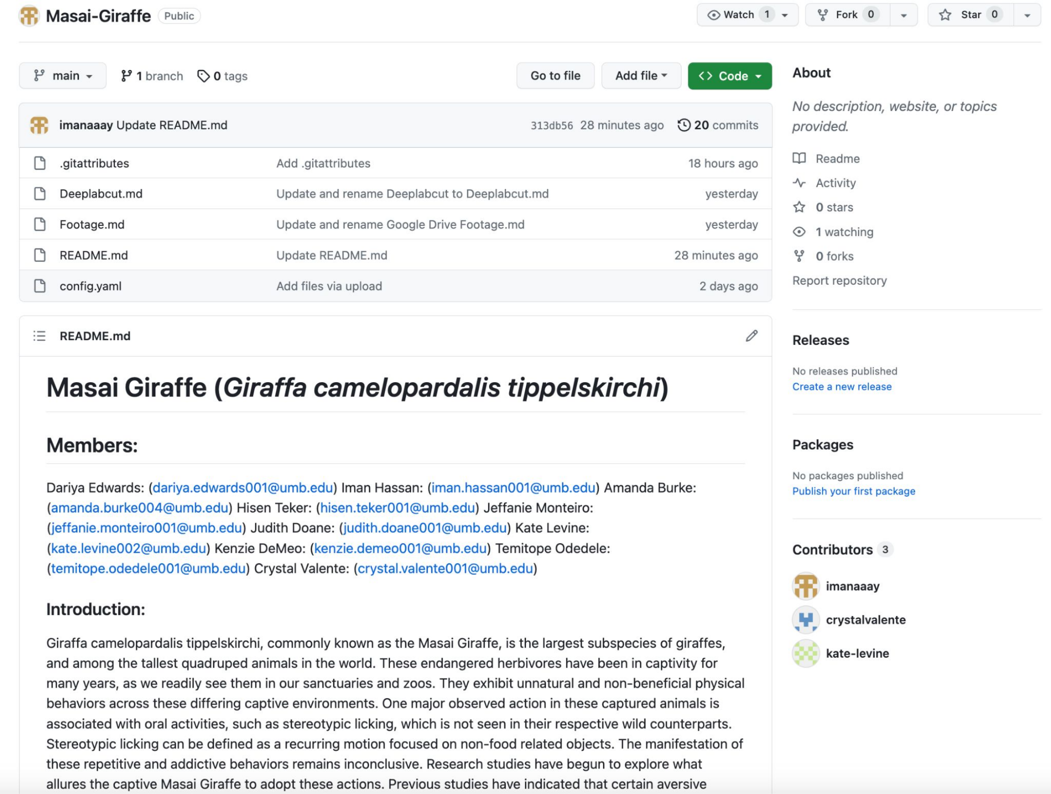
Benefits:

- Erases the possibility that the giraffe will encounter a lack of substantive food sources in wildlife scenarios
- Captivity provides safety from potential predators found in natural environments: lions, hyenas, leopards

Risks:

- The giraffe may already be too dependent on its previous artificial environment
- Disrupting Kenyan wildlife conservation
  - Although the Masai Giraffe is an herbivore, the release of 10 adult giraffes back into the wild could negatively impact the ecosystem surrounding it
- Financial Risk: Burdening potential Massachusetts-based zoos, Kenyan wildlife organizations, and other agencies and researchers involved
- Transportation of the Animal: Considering the hazardous conditions for the giraffe
  - This may take place in the form of weather, spatial enclosures, mental and physical confusion, hygienic upkeep, and overwhelming burdens placed on researchers/staff
  - May induce an overload of stress for the giraffe, which may also impact its ability to adapt to its new environment
- Potential for the Spread of Disease
  - Animals may become diseased due to stress during transportation
  - Captive giraffe contact with wild populations may lead to novel exposure to disease
- Shock for the Animal: Must consider the giraffe’s potential readiness for release into the wild
  - Those bred and born in captivity may experience extreme stress and may not survive long enough to conduct the experiment
- Cruel and Unusual Punishment for the Animal: Displacing them to facilitate a change in behavior
- Alienation: Losing the familiarity of zookeepers and other enclosed animals
- Observe behaviors throughout all hours of the day
  - Researchers need to establish a system that maintains a watchful eye without risking interaction with animals
- Possibility of poachers/general death of giraffes threatens the integrity of the experiment if any giraffes are eliminated early

GitHub and Jupyter Notebook



- We uploaded the Deep lab cut videos, jupyter notebook, slides, and all the footage to GitHub making them easily accessible to viewers.
- Deeplabcut was created by Alexander Mathis and his colleagues
- Their work with DeepLabCut has contributed to improving the methods used to study and understand animal behavior, offering researchers a valuable tool for their studies.

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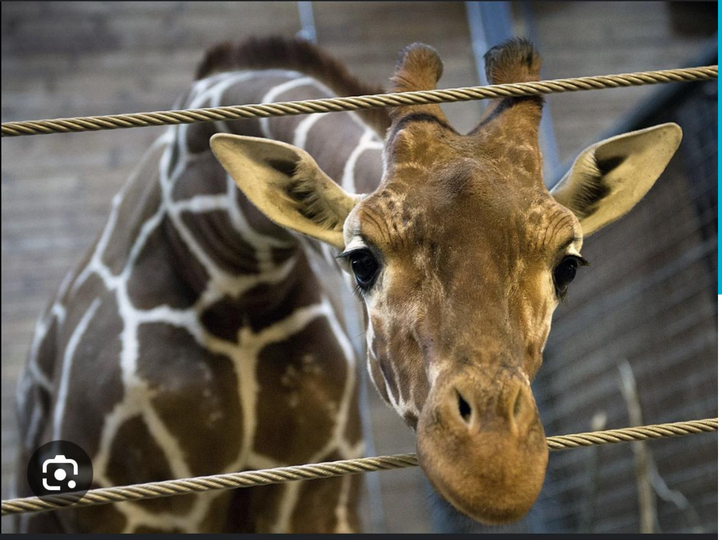

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