Challenges in Video Capture and Landmark Identification: New Models for Locomotion Analysis

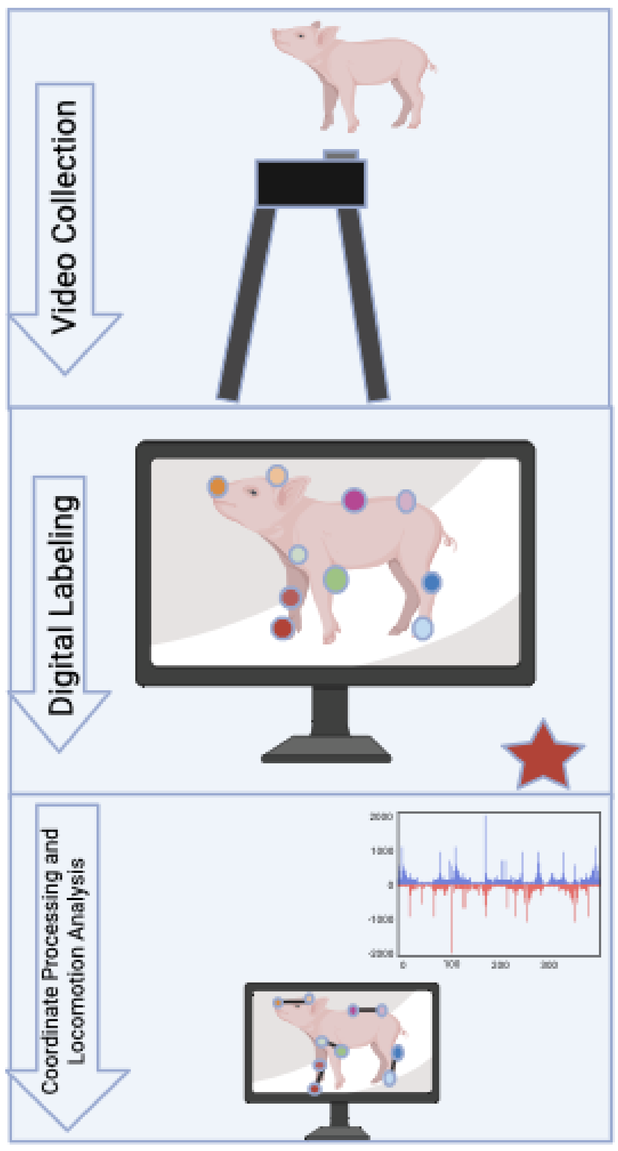
Megan Granum[1], Samantha A. Brooks[1, 2]

[1]University of Florida Department of Animal Sciences, Gainesville, FL
[2]UF Genetics Institute/University of Florida Department of Animal Sciences, Gainesville, FL

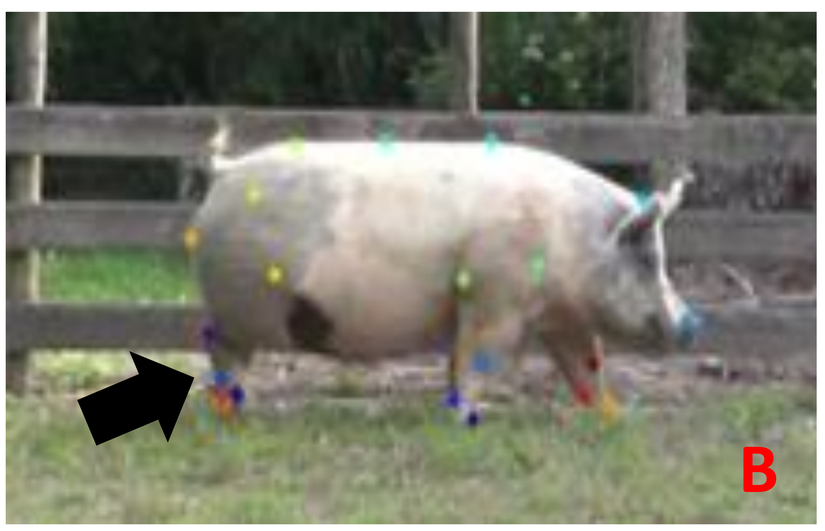
Introduction

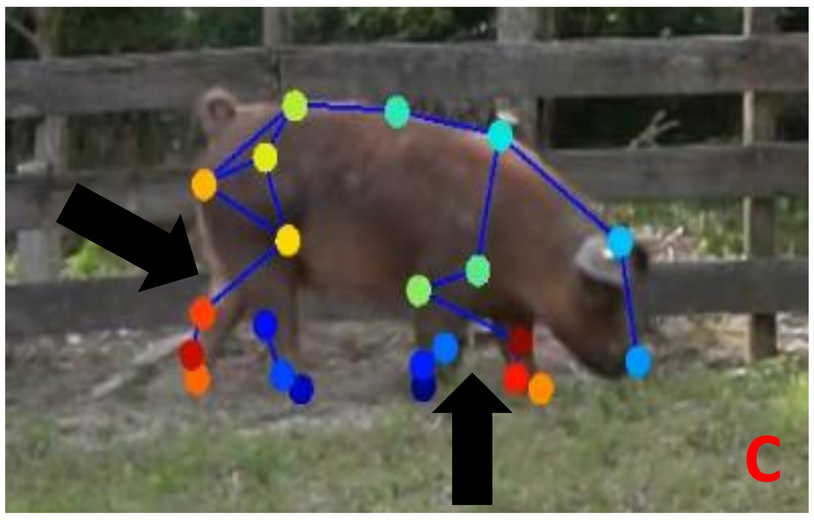
- Lameness occurs across all species and poses significant impacts on production systems due to it being an economic and welfare concern [1].
- To examine and analyze lameness in animals digitally, we utilized DeepLabCut (DLC). DLC identifies key anatomical points on images of an animal, enabling analysis of the locomotion of these individual points within the video frame [2].
- Identifying lameness is a challenge, so with the help of this model, pinpointing lameness will be more effective and accurate, thus improving overall animal welfare and efficiency in production systems.
- This project builds off early success in our research group analyzing the locomotion of sport horses and the performance scores received at a competition. We have now branched to other species, such as porcine and canine, however, expanding locomotion analysis to these new species poses new challenges in video capture and landmark identification.

Methodology



Results





Scan me!

Challenges

A. If the pig turns his head or his path of trajectory away from the camera, body points, such as the nostril or poll will be unable to be annotated on the animal.
B. If a frame captures a limb mid-movement, part of the limb might be blurred. This scenario proves difficult to clearly label parts of a front or hind leg, such as the hoof, knee, or hock.
C. Unclear landmark identification could cause the model that is created by DLC to mistakenly draw connection points to the wrong limb.

For the Future

- To decrease the occurrence of labeling errors, we are:
  - increasing the number of frames used to train both our pig and dog DLC models.
  - increasing the variety in background where the animals are recorded.
  - increasing the range of physical characters that are present on the animals, such as varying colors and spots.

References

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[2] Mathis A, Mamidanna P, Cury KM, Abe T, Murthy VN, Mathis MW, et al. DeepLabCut: markerless pose estimation of user-defined body parts with deep learning. Nat Neurosci. 2018;21(9):1281-9. Epub 20180820. doi: 10.1038/s41593- 018-0209-y. PubMed PMID: 30127430.

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