Elanco BCS Project: Methods

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This team coordinated with Purdue University’s Data Mine and Elanco Animal Health in order to solve an issue regarding pet’s health centered around an animal’s body condition score.

Body condition score, or BCS is defined as a scale usually used by veterinarians to rate the overall condition of a pet (https://raleighncvet.com). Not many pet owners are aware of their animal’s BCS score and during this past year, it may be difficult or unsafe to travel to a vet’s office.

The project’s goal is to analyze the different body composition scores of dogs through methods in computer vision. Currently, the team is developing a calculator to determine the body condition score a veterinarian would use for basic health monitoring, through a simple to use, Android app.

Problems/Future Goals

- Using deep neural network to track body
- Estimating BCS for all types of dog breeds
- Using standard deviation of
- Problems:
- Future Goals:

Conclusion/Acknowledgements

Conclusion: The team tried many methods to determine an AT ratio, to determine a BCS score. These three were the most successful:
- DeepLabCut: Using deep neural network to track body parts
- Stats-based: Using standard deviation of column sums
- Sobel operator: Using kernels to extract features.

Acknowledgements: The team would also like to thank Dr. Troy Hawkins and Dr. Amy Reibman for their help as mentors throughout this project!

The team would also like to acknowledge former members who helped with the project: Daniela Chanci Arrubla, Juan Antonio Barragan, Kourtney Masterson, and Emily Moritz.

References:
- https://raleighncvet.com (Formal BCS definition)
- Can you Estimate Body Composition in Dogs from Photographs? (paper on BCS in dogs)
- Mathis, A. et al. (2018) (paper on DeepLabCut)
Elanco BCS Project: App

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**App Introduction**

In the transition from the Fall 2020 semester into the Spring 2021 semester, one of the team's biggest goals was to develop an Android application that will determine the A:T ratio and thus the Body Condition Score (BCS) of a dog.

To accomplish this, the team split into three workstreams:
- **The frontend**, which designed the app/user interface.
- **The backend**, which was responsible for receiving the images and automating code for image processing.
- **The app**, which was responsible for creating the working app from the frontend's interfaces.

This poster focuses on each workflow's methods to create an Android application prototype.

**Frontend Workstream (Leader: Erin Johnson)**

This team is focused on the design of the user interface of the Elanco BCS Scorer app. The frontend helped to design and develop the interfaces for the following pages using Android Studio:

- Start pages
- Camera interface
- Instructional page
- Error page
- Results platform

**Backend Workstream (Leader: Zhiwen Cao)**

This team is focused on the backend calculations, such as using Semantic Segmentation to get A:T lines and dividing them to get an A:T ratio from an input picture.

**Flask** – Python framework that allows us to output BCS scores and any calculation errors after an image is input from the application.

The above figure shows the backend framework. A photo is sent from the app to the backend Flask framework where an A:T estimation is calculated and sent back to the app.

**Conclusion/Future Developments**

In conclusion, the three workstreams were able to create a BCS Scorer app prototype. While there is still much that could be accomplished through these interactive pages, this is the most basically applied method to encode a functioning calculator.

**Future Developments**

- Create server-based user interactions for application, including user profile, pets, and saved progress tracking
- More defined user error page
- Functionality to identify breeds of dog and accordingly match a BCS distribution
- Let user either takes an image or uploads an image for BCS calculation
- Take video/sequence of images as input such that it gives more accurate BCS estimation
- Create a version for IOS devices and computer systems.

**Acknowledgements**

The team would like to thank Dr. Troy Hawkins and Dr. Amy Reibman for all their help as mentors throughout this project!

The above interfaces, from left to right show the start page, a page with an instructions button and a BCS Calculator button which takes one to the camera, an instructions page, an error page if an image cannot be processed, two camera pages (one to take the picture and one to confirm the picture), and a results page that shows a dog’s BCS score and a chart showing what that score means.

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