Elanco BCS Project: App

PURDUE UNIVERSITY

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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

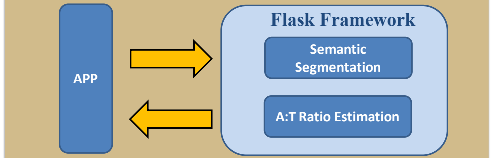
The Elanco BCS Scorer app logo

The Elanco BCS Scorer app icon

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.

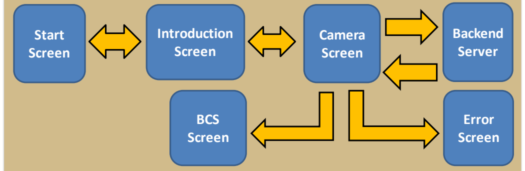
Flask – Python framework that allows us to output BCS scores and any calculation errors after an image is input from the application.



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.

App Workstream (Leader: Yubo Shao)

This team is focused on building an Android App which implements a custom camera to take a dog image, transfer the image to the backend server through Flask for BCS classification, and display either the BCS score or an error message.



The above figure shows the flowchart of our Android App's basic functionality for calculating BCS from dog images. Once the user takes a dog image, the Android App will connect with the server end based on a specific IP address through Flask and transfer the image to the server end.

Problems/Other Attempts

Frontend: using a splash screen orientation to cycle through interfaces didn't allow for the user to be able to navigate through the app easily, so we transitioned to using a start screen instead.

Backend: mobile devices cannot run large neural network , so we built a server end which can run our machine learning model in a better performance.

App: using the in-built camera app did not allow us to transfer the image to the server automatically, so we created a custom camera instead.

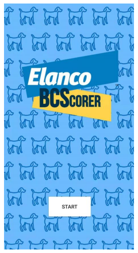
Conclusion/Future Developments

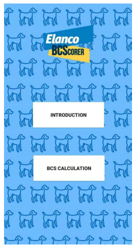
Conclusion:
In conclusion, the three workstreams were able to create a BCS Scorer app prototype. While there is still much that could be accomplished through these interactive pages, this is the most basically applied method to encode a functioning calculator.

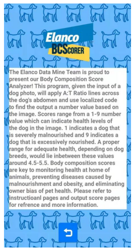
Future Developments:

- 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.

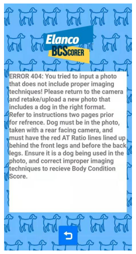
App/User Interface



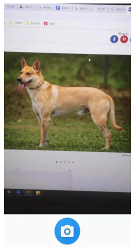


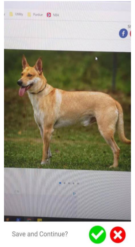


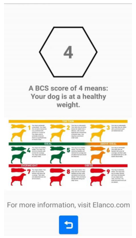
The Elanco Data Mine Team is proud to present our Body Composition Score Analyzer! This program, given the input of a dog photo, will apply A:T Ratio lines across the dog's abdomen and use localized code to find the output a number value based on the image. Scores range from a 1-9 number value which can indicate health levels of the dog in the image. 1 indicates a dog that is severely malnourished and 9 indicates a dog that is excessively nourished. A proper range for adequate health, depending on dog breeds, would lie inbetween these values around 4.5-5.5. Body composition scores are key to monitoring health at home of animals, preventing diseases caused by malnourishment and obesity, and eliminating owner bias of pet health. Please refer to instructioanl pages and output score pages for refrence and more information.



ERROR 404: You tried to input a photo that does not include proper imaging techniques! Please return to the camera and retake/upload a new photo that includes a dog in the right format. Refer to instructions two pages prior for refrence. Dog must be in the photo, taken with a rear facing camera, and must have the red AT Ratio lines lined up behind the front legs and before the back legs. Ensure it is a dog being used in the photo, and correct improper imaging techniques to recieve Body Condition Score.







A BCS score of 4 means: Your dog is at a healthy weight.

For more information, visit Elanco.com

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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