5COSC009C SOFTWARE DEVELOPMENT

GROUP PROJECT

Project Proposal

Module Leader

Mr. Banuka Athuraliya

Team Name

DEBUG PIRATES

Team Member	Registration ID
H. Thiwanki Dias Hettiarachchi	2019741 / w1790191
Srimali Udayangani	20191114/ w1790361
Ahmed Isthaffa	2018497 / w1761936
K.N. Kumar	2018432 / w1761759
Akthab Bifaz	2018060 / w1761866
H.M.A.D. Herath	20191180 / w1790023

Table of Content

Contents

List of tables

Contents

1. Problem Background

In reality, studies show that humans are valuable to dogs. Dogs have evolved to have a close relationship with us. Researchers have found that they show sensitive behaviors similar to those seen in human infants when dogs communicate with their owners. When stressed, dogs will approach their owners, use them as a safe base for exploration, and reunite with them joyfully after separation. These findings support the theory that dogs develop real relationships with their individuals. This is quite unique given that two separate groups are dogs and humans. We will assess what dogs have gained from interacting with humans and what capacities they have for complicated communication, intelligence and emotion by exploring this relationship.

Studies have shown that dogs have feelings similar to human beings, and they understand us instead of words by facial expressions and body language. To increase the quality of life they spend with their fur-end, it's important for dog owners to understand dog emotions. Some animal owners bring dogs home to overcome isolation, loneliness and stress. Some buy it for their children's happiness. But did you ever think of the dog or puppy introduced to your family and looking at you as his only savior, from the viewpoint of him? The relational understanding of dogs has the advantages here:

- It will help you get a balanced sensitive dog up.
- This will help you manipulate the right moods and form the negative emotions on the spot.
- It stops the dog from being sad, stressful or disturbed.
- You may have a smart emotional puppy.

Dogs also capture your thoughts. So, by remaining conscious of your attitudes to your dog, you can understand your responses and feelings better. As the problem of less understands of dogs Emotions we will go to make app to detect dogs' emotions using image recognition of machine learning. In order to tell you what your dog is thinking, a new app uses machine learning.

2. Research Gap

2.1 Research Questions

Do the owners of the pet have interest in knowing the emotions of their pet? How can we use machine learning to interpret live emotions of the dog?

Is there any previous study for such development in the industry?

What are the technologies and algorithms used to detect the emotions using images?

3. Aim of the Project

Aim of this project is to show the emotion of the dog through an mobile application and we make use image processing to develop this application and make this a platform where the owner of the pet or anybody who has a pet can easily or efficiently recognize the some basic emotion of their pet dog whether they are happy or sad or neutral. Normally people are not able to recognize emotions of the pet dog. Dog is the most domestic pet animal in the world. The owner of the pet dog should take a picture of it and upload it into our application and the application will process the input of the user and it will output the emotion of the dog.

Initially we are making an android application where the user can easily use. And to make this project a success our team is trying the best to find the best solution. We are also doing some research on some algorithms that have been used in the past how it worked out and also why it did not work out and can we improve that solution and also we do researches on how to process images using Artificial Intelligence and we must meet people who knows how to detect and what are the techniques they use to detect them, and we need more and more datasets on dogs' images to find out the emotions of the dog and we got some of the data sets from Kaggle.com. And we must train our data and make use of Artificial Intelligence to detect the image of the dogs. Through this mobile application the user will be able to recognize the emotions of a dog just through a picture of it.

4. Project Scope

a. In scope

- Using Machine Learning – Classifying all the above datasets and by using Machine learning produce a summary
- Using image processing – Based on the user uploads the image it will show what are the emotions that his/her dog having right now
- A mobile application with a set of features – A mobile application where you what are the emotions of your dog and when it's a negative emotion it will show a warning

b. Out of Scope

- Application which Supports to find emotions for different breeds of dogs

5. Features of the prototype

Analyses an animal's facial features, tells you what breed it is and indicates which of the five most common animal emotions — happy, angry, neutral, sad and scared — it is feeling. We are going to uses AI, or machine learning. It's technology that's used for vision in robotics and self-driving cars and it works by taking in images and assigning importance to them.

One common use for AI is in facial recognition technology. Many of us can unlock our mobile phones with an image of our part of face and it's an important security processes in, for instance, airports.

But this type of technology already used in an app called happy pets. The researchers had to teach the technology to recognize that an image was an animal — instead of, for instance, a blueberry muffin. It then had to learn to recognize facial features. This is complicated because photos can be taken in so many different ways: from the side, above, below, in bright light. And different animals can have such different facial features. Think about how different the snouts of a border collie and a bulldog are, for instance.

Once the AI behind this learned, it then had to be able to detect emotions based on specific facial features that are associated with each emotion, which it has learnt from thousands of examples. For instance, if a dog tightens its eyes and mouth while changing the position of its ears in a particular way, it's a sign of being scared.

Human faces tell us a lot about what someone is feeling or thinking – so, could the same facial recognition technology be used to interpret the emotions of animals? The face is responsible for communicating not only thoughts or ideas, but also emotions. First is
classifying the specific types of animals, we're talking about – in this case, pets. Secondly, we then needed to identify the key features and patterns that represent the underlying emotions. And AI can help us achieve this.

The current state-of-the-art technology for image recognition in general is Convolutional Neural Networks. These are Deep Learning algorithms which can take in images and assign importance to them. This kind of technology is widely used, from vision in robotics to self-driving cars.

Neural Networks are based on the way our brains work, using a mechanism called supervised learning. Through supervised learning, we learn what output (or label) should go with what input (an image). In the same way you would teach a child to differentiate between an apple and a pear, for the algorithm, we adjust the weights and parameters of functions that transform inputs into outputs.

We do this until we have optimal results on training data – that is, if given a picture of an apple, the algorithm gives a high score that it thinks it is looking at an apple. Convolutional Neural Networks are optimized for image recognition. They work like normal neural networks but, in addition, they have the ability to extract and identify features from images, though a technique known as convolution.

The issue with facial features – like an arched eyebrow or a smirking mouth – isn't so much what they look like, but the fact that they can appear 'anywhere' on an image. This is because photos can be taken at infinite angles, in different lighting and zooms.

A filtering mechanism is used to correct for this and transform images into feature maps.

This can then be repeated to create feature maps of feature maps until huge volumes of data, involving millions of pixels, are reduced to succinct features. Labels for these images (or features) can then be learnt by the AI.

For our mobile app, we used images extracted from online resources for the AI to learn what breed a pet is. But we also wanted it to interpret what emotion the animal was expressing at the time. Key to getting our app to work were well curated and labelled training data that covers many, many examples, with lots and lots of parameter tweaking to optimize the performance of the neural nets.

The AI detects emotions based on specific facial features that are associated with each emotion, which it has learnt from thousands of examples. For instance, if a dog tightens its eyes and mouth while changing the position of its ears in a characteristic way, it's a sign of being scared. How accurate are the results? Well, we think they are pretty solid, having extensively tested the app, but you should judge for yourself.
At the moment, we only have a limited number of breeds available, so if yours isn't there, it might get approximated to the nearest one.

5.1 The technologies we're going to use in the app

The technologies were going to use is machine learning, Artificial intelligence, and mobile app features for this app. For machine learning we're going to use Microsoft azure, for artificial intelligence using python and for the mobile app we'll use flutter. And we can use dlib, OpenCV and deep learning also for the face emotion recognition. he development of machine learning algorithms for the detection of activity and emotion is very important.

6. Feature Comparison Chart

In this feature comparison chart, we added three products as our competitors. They designed IT based products to detect dog's emotions. So, in this chart compare these IT solutions' features with our product's features.

		Our product **Ooggy doggy**-mobile application using machine learning)	Product2 (**Happy Pets** mobile application)	Product3 (DogStar app - **TailTalk**)	Product4 (**Inupathy**-communication device – IOS application)
F	Detect happy expression of dogs	✔	✔	✔	✔

E A T U R E S	Detect anxious/stressed expression of dogs	✓	✓	—	✓
	Detect Neutral expression of dogs	✓	✓	—	—
	Detect sad expression of dog	✓	✓	—	—
	Detect some other expressions	✓			✓
	Non-torture to your dogs by without using sensor belts or sensor rubber bands	✓	✓	—	—
	Detect cat's emotions	—	✓	—	—
	Print the application's data	✓	—	—	—
	Creative icons / logos/best colors to get attraction of viewers and users	✓	—	—	✓
	There is no charge	✓	✓	—	—
	When dog has negative expressions, it will show warning message	✓	—	—	—

Table 1: Feature comparison chart to compare features of our product with others products' features

Then in below we explained shortly how those competitors' product's solutions actually work

The "*Inupathy"* communication device use a wearable belt for detecting dog's five emotions like "relaxed, excited, happy, interested, and stressed". And also, they installed a heart rated sensors for that belt, then it will analyze the data from heart beat speed then it identifies the expression of dog and represent different colors for their unique expression and the data will goes to IOS app.

And the Happy Pets mobile application is worked when I get a picture or select a picture from gallery of the dogs or a cat. Then it will identify percentage of their expressions. But it can't print or store the data.

The DogStar TailTalk application is also worked using sensors. It uses wearable band for the tail. It detects happy expression with percentage. Sensor uses tail movement behaviors to identify dog's happiness. Then the data will go to app and it will show happiness overview, emotional events in a simple graph and track our dog's busy schedule.

Then we talk about our application's features- Ooggy doggy

First when we enter our dog's picture. Then this Ooggy doggy application is analyzed our picture of doggie and it will identify our dog's expressions like fear, happy, stresses, sad, neutral etc. When it identified expressions then it will show a unique colour for different expressions. Then anyone who uses this app can get their attraction. And if the dog has any negative expression like fear, stress or sad then it will show a warning message to owner. And also another feature of our app is, can print our data.

7. References

- IoT and animal communication - Dogstar helps you understand your pet. (2016). *Business Operations*. Available from https://www.ibm.com/blogs/internet-of-things/dogstar-iot/
- https://inupathy.com/en/home/
- pursuit.unimelb.edu.au/articles/ever-wondered-what-your-pet-is-thinking
- https://www.kidsnews.com.au/technology/is-my-puppy-happy-angry-scared-or-sad/news-story/c9c55401fb2f789dbcce4cead5a4b2db#:~:text=A%20new%20app%20uses%20Artificial,and%20scared%20%E2%80%94%20it%20is%20feeling
- Aditya Khosla, Nityananda Jayadevaprakash, Bangpeng Yao and Li Fei-Fei. Novel dataset for Fine-Grained Image Categorization. First Workshop on Fine-Grained Visual Categorization (FGVC), IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2011
- Donaldson, T.M. et al. (2018). Understanding your dog's mind and emotions. *Animal Wellness Magazine*. Available from https://animalwellnessmagazine.com/understanding-dogs-mind-emotions/
- Humans' ability to read dogs' facial expressions is learned, not innate. (2019). *Neuroscience News*. Available from https://neurosciencenews.com/dog-facial-expressions-15190/
- History, M.P.I. for the S. of H. (2019). Humans Can Read Dogs' Facial Expressions, but They Must First Learn How. *SciTechDaily*. Available from https://scitechdaily.com/humans-can-read-dogs-facial-expressions-but-they-must-first-learn-how/

8. Participation list

- Problem background part– Srimali Udayangani: w1790361
- Research Gap part – Ahmed Isthaffa: w1761936
- Aim part – Akthab Bifaz: w1761866
- Scope part, merge the parts for report, First page– K.N. Kumar: w1761759
- Feature of the prototype part – H.M.A.D Herath: w1790023
- Feature comparison chart part and participation list, merge the parts for report – Thiwanki Dias Hettiarachchi: w1790191

- When a question arises, helped to other members – All the group members