INFORMATICS
INSTITUTE OF
TECHNOLOGY

# 5COSC009C SOFTWARE DEVELOPMENT

# GROUP PROJECT

## Project Proposal

Module Leader

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**DEBUG PIRATES**

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# 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:

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- 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 understand 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

Humans have been evolving with domestic animals such as dogs and cats as pets for a long time. But with the developing technology and evolving of human mind and emotions the time and care that is given to the pet has reduced. As humans even, pets have emotions that without proper interaction and care cannot be understood. Generally, a pet is a companion for a human where they interact with their pet with all those emotions. But, as stated above with the decreasing interaction with the pets it has been difficult for owners to understand their pet in times of need, thus creating a vast distance between each other which lead to loss of relationship. So, here we are focusing on developing a relationship with the help of technology to understand the emotions of a pet for the owner to understand their emotions.

There are software and platform which are used to identify and classify different dog breeds using AI. It is also evident that human emotions are identified with different AI software in a very effective way. Hence, there is a gap of identifying emotions of a pet (in this case a dog) in any software. Learning the emotions of a pet has been a dire need for many owners in this evolving world. So this research is identify the data set needed to fill such gap.

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This research however is primarily focused on developing the data set needed for the platform. A machine learning application to read AI based content, there should be a data set feed to recognize the needed data to train the model.

## 2.1. Research Aim

The objective of this research is to create a platform for the owner to interact with their pet by understanding their emotions. As dogs are most considered as domestic pet by most of the humans, the research is focused on methodology of finding and collecting data set for the above-mentioned platform.

## 2.2. Limitations

This research is limited to study only about the dog as pet. As dog has been considered the most domestic pet which most of the humans like interacting with. Dogs are considered a life companion by some, and some value their relationship with their pet dog something more than they value.

## 2.3. Research Methodology (Identifying Data)

There have been previously invented platforms to identify the different dog breeds. That platform has been created with the help of data set formed by reading image. Thus, this has created a path for this research to identify data set needed to create a platform to read dogs emotions. Hence, the research is based on the data set that is readily available to identify the dog breeds and create a path for the machine to learn different emotions of different dog breeds.

The data set used for identification of dog breeds has been taken from, Kaggle.com. The link is provided below for further information.

Context of the data

The Stanford Dogs dataset contains images of 120 breeds of dogs from around the world. This dataset has been built using images and annotation from ImageNet for the task of fine-grained

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image categorization. It was originally collected for fine-grain image categorization, a challenging problem as certain dog breeds have near identical features or differ in color and age.

Content of the data

Number of categories: 120

Number of images: 20,580

Annotations: Class labels, Bounding boxes

The original data source is found on http://vision.stanford.edu/aditya86/ImageNetDogs/ and contains additional information on the train/test splits and baseline results.

**Reference**

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.

# 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.

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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

## 4.1. In scope

- Gathering data of images – Collecting the required data from Kaggle and Google
- Using Machine Learning– Gather 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

## 4.2. Out of Scope

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

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# 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 face and it's an important part of security processes in, for instance, airports.

But this type of technology already used in a app called happy pets.The researchers had to teach the technology to recognise that an image was an animal — instead of, for instance, a blueberry muffin.It then had to learn to recognise 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.

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The current state-of-the-art technology for image recognition in general are 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 optimised 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 optimise 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

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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.

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

The technologies were going to use is mechine learning, Artificianl intelligence,and mobile app features for this app. For mechine 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.

## References

Google

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

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# 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<br><br>**Expressions detection of dogs**- mobile application<br><br>using machine learning) | Product2<br><br>(**Happy Pets** mobile application) | Product3<br><br>(DogStar app - **TailTalk**) | Product4<br><br>(**Inupathy**- communication device – IOS application) |
|---|---|---|---|---|---|
| **F E A T U R E S** | Detect happy expression of dogs | ✔ | ✔ | ✔ | ✔ |
| | 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 | ✔ | ⎯ | ⎯ | ⎯ |

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| | | | | |
|---|---|---|---|---|
| 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 | ✔ | — | — | — |

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 like to talk about our application's features

First when we enter our dog's picture. Then our 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

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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 as another feature of our app can print our data.

**Reference**

- Google
- You tube
- [www.ibm.com](www.ibm.com)
- [https://inupathy.com/en/home/](https://inupathy.com/en/home/)

# 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

# Thank you ..