

Visvesvaraya Technological University

Jnana Sangama, Belagavi - 590018



A Project Work Phase-I (17CSP78)

Report on

“Dog Breed Identification with Product Classification and Assisted Services”

*Project Report submitted in partial fulfilment of the requirement for the
award of the degree of*

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

Submitted by

RUCHITHA G K

1KS17CS066

SPOORTHY R

1KS17CS081

VARUN ATTIGANAL VENKATESH

1KS17CS096

Under the guidance of

Dr. Swathi K

Assistant Professor

Department of Computer Science & Engineering

K.S.I.T, Bengaluru-560109



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

K. S. Institute of Technology

#14, Raghuvanahalli, Kanakapura Road, Bengaluru - 560109

2020 - 2021

K. S. Institute of Technology

#14, Raghuvanahalli, Kanakapura Road, Bengaluru - 560109

Department of Computer Science & Engineering



CERTIFICATE

Certified that the Project Work Phase-I (17CSP78) entitled “**Dog Breed Identification with Product Classification and Assisted Services**” is a bonafide work carried out by:

RUCHITHA G K

1KS17CS066

SPOORTHY R

1KS17CS081

VARUN ATTIGANAL VENKATESH

1KS17CS096

in partial fulfillment for VII semester B.E., Project Work in the branch of Computer Science and Engineering prescribed by **Visvesvaraya Technological University, Belagavi** during the period of September 2020 to January 2021. It is certified that all the corrections and suggestions indicated for internal assessment have been incorporated. The Project Work Phase-I Report has been approved as it satisfies the academic requirements in report of project work prescribed for the Bachelor of Engineering degree.

.....
Signature of the Guide

[Dr. Swathi K]

.....
Signature of the HOD

[Dr. Rekha B. Venkatapur]

.....
**Signature of the Principal &
CEO**

[Dr. K.V.A. Balaji]

DECLARATION

We, the undersigned students of 7th semester, Computer Science & Engineering, KSIT, declare that our Project Work Phase-I entitled “**Dog Breed Identification with Product Classification and Assisted Services**”, is a bonafide work of ours. Our project is neither a copy nor by means a modification of any other engineering project.

We also declare that this project was not entitled for submission to any other university in the past and shall remain the only submission made and will not be submitted by us to any other university in the future.

Place: Bangalore

Date: 20/01/2021

Name and USN

Signature

RUCHITHA G K (1KS17CS066)

.....

SPOORTHY R (1KS17CS081)

.....

VARUN ATTIGANAL VENKATESH (1KS17CS096)

.....

ACKNOWLEDGEMENT

The satisfaction and euphoria that accompany the successful completion of any task will be incomplete without the mention of the individuals, we are greatly indebted to, who through guidance and providing facilities have served as a beacon of light and crowned our efforts with success.

First and foremost, our sincere prayer goes to almighty, whose grace made us realize our objective and conceive this project. We take pleasure in expressing our profound sense of gratitude to our parents for helping us complete our Project Work Phase-I successfully.

We take this opportunity to express our sincere gratitude to our college **K.S. Institute of Technology**, Bengaluru for providing the environment to work on our project.

We would like to express our gratitude to our **MANAGEMENT**, K.S. Institute of Technology, Bengaluru, for providing a very good infrastructure and all the kindness forwarded to us in carrying out this project work in college.

We would like to express our gratitude to **Dr. K.V.A Balaji, Principal &CEO**, K.S. Institute of Technology, Bengaluru, for his valuable guidance.

We like to extend our gratitude to **Dr. Rekha.B.Venkatapur, Professor and Head**, Department of Computer Science & Engineering, for providing a very good facilities and all the support forwarded to us in carrying out this Project Work Phase-I successfully.

We also like to thank our Project Coordinators, **Mr. K Venkata Rao, Associate Professor, Mrs.Vaneeta M, Associate Professor, Mr. Raghavendrachar S, Asst. Professor, Mr.Aditya Pai H, Asst. Professor, and Mrs. Sneha K, Asst. Professor**, Department of Computer Science & Engineering for their help and support provided to carry out the Project Work Phase-I successfully.

Also, we are thankful to **Dr. Swathi K, Assistant Professor**, for being our Project Guide, under whose able guidance this project work has been carried out Project Work Phase-I successfully.

We are also thankful to the teaching and non-teaching staff of Computer Science & Engineering, KSIT for helping us in completing the Project Work Phase-I work.

**RUCHITHA G K
SPOORTHIR
VARUN ATTIGANAL VENKATESH**

ABSTRACT

The demand for having a pet at home has been increasing drastically over a few years. People are considering pets to be an important addition to the family. As a pet owner, one would want to do everything they can to care for their pet; this involves regular, everyday activities to ensure they stay happy and healthy.

The population of pet dogs in India amounted to around 19.5 million in the year 2018. The population was forecast to reach over 31 million by the end of the year 2023. The growth in the number of pet dogs in India had led to an increase in pet food sales, from approximately 139 million U.S. dollars in 2014 to approximately 285 million dollars in 2018. The demand for having a pet at home has been increasing drastically over the past few years. People are considering pets to be an important addition to the family.

Therefore we aim to develop an application that recognizes the breed of the dog, serves as a platform that sells pets' food and accessories, helps the pet owner take appointments and consult the veterinary doctor during emergencies using the consultancy that we aim to provide, and serve as a portal to find lost pets.

Keywords — Image Recognition, Breed Classification, Consultancy, YOLO object detection using Python, Python, React.

TABLE OF CONTENTS

Chapter No.	Title	Page No.
1.	INTRODUCTION	1-4
1.1	Overview	1
1.2	Purpose of the Project	1-2
1.3	Definitions	2-4
2.	LITERATURE SURVEY	5-7
2.1	General Requirements	5
2.2	Literature Survey	5-6
2.3	Pros and Cons	6
2.4	Conclusion	6-7
3.	PROBLEM IDENTIFICATION	8-9
3.1	Problem Statement	8
3.2	Project Scope	8-9
4.	GOALS AND OBJECTIVES	10-11
4.1	Project Goals	10
4.2	Project Objectives	11
5.	SYSTEM REQUIREMENT SPECIFICATION	12-13
5.1	Software Requirements	12
5.2	Hardware Requirements	13
5.3	General Requirements	13
6.	METHODOLOGY	14-17
6.1	Introduction to Algorithm	14

6.2	Object Detection Overview	14-15
6.3	Processes Involved	15-17
7.	APPLICATIONS	18-19
8.	CONTRIBUTION TO SOCIETY AND ENVIRONMENT	20
	REFERENCES	21
	APPENDIX - I CSI PUBLISHED PAPER COPY	22
	APPENDIX - II CERTIFICATES OF PAPER PRESENTED	22

LIST OF FIGURES

Fig. No.	Figure Name	Page No.
6a	Classification of Objects in YOLO	15
6b	Identifying the Required Target Image	16
6c	Block diagram representation of working of the project	17

Chapter 1

INTRODUCTION

1.1 Overview

When a full time working individual has to take care of the pet, he/she will have a million other things to do in their every day busy schedule. This is where technology can come to their rescue and make the process of owning a pet very easy. A lot of pet care apps have cropped up recently allowing better caretaking of pets. These pet care services offer different types of services such as grooming, pet care, finding lost pets, buying food online, booking appointments with the veterinary online to the pet owners. But that problem with the existing application is that all these services are not available to pet owners at one place, that is all these services are not centralized. Pet owners usually have to switch between many applications in order to get these applications. We aim to develop an application that makes the process of looking after a pet easier.

There is no centralized platform for products and services classified specifically according to the breed which is necessary for the following reasons.

Food and accessories are specific to a breed. A particular type of food can be only fed to one category of dogs but if other categories are made to consume the same food, then this could affect the dogs' health. For example, puppies are not given the normal Pedigree consumed by adult dogs but are given a special type of soft food that digests easily. Similarly certain accessories are also very specific to certain breeds. For example, electrocuting collars can only be sustained by pit-bulls.

Selling pets that look similar in the puppy stage in place of expensive dogs is a major fraud committed nowadays. For example, Rs. 9000/- Pomeranian puppies are sold as chow chows that are worth about Rs. 70,000/-.

Finding pets that are lost are now easier because the pets that are lost are again classified according to the breeds, that make the entire process for finding the dogs easier.

These are some main key highlights of the application that we aim to develop.

1.2 Purpose of the Project

The major purposes of the project are the following:

1) Breed classification: Identification of the breed of the dog. Image processing and classifier will be added. This is mainly for the users who do not know the breed of their pet and struggle with the upbringing of the pet. They can identify the breed of their pets. A small box of general information about that breed will be displayed to educate the user regarding the same.

2) Vet and grooming services: We aim to develop an application that makes the process of looking after a pet easier. Veterinarian visits play a vital role in looking after the pets. Regular visits to the vets ensure that pets are in healthy condition. Our application allows the registered users to book appointments with the vets when it is required. We also aim to have a chat box which can be used by the pet owners to talk to the vets when it is an emergency or whenever they feel the need for an immediate consultancy. Vaccinating pets is a vital component of responsible pet care. The application also sends email reminders to pet owners asking them to get their pets vaccinated if any vaccination is due. This helps the pet owners to avoid missing any vaccination to their pets. These four factors discussed above (appointments, consultancy, push notifications, online chat) avoids confusion and makes pet consultancy easier).

3) Food and products specific to breed and age: Elements of pet ownership include providing them with fresh, cool water and healthy food at all times that is specific to the breed. With so many meal options to choose from, one might often get confused with what to feed their pets. This application helps to buy food for pets based on their breed, age and nutrient contents. Along with food, pet accessories are also available to the users who wish to shop from our application. Categorizing these accessories will also be done to make sure that the user gets the best product specific for the breed of their pets.

4) Lost and found pets : Images of Dogs that are lost are classified based on the breed and location so the users can recognize them easily and facilitate fast return of the dog. The centralized structure can facilitate the process.

1.3 Definitions

1.3.1 Kaggle Dataset:

Kaggle allows users to find and publish data sets, explore and build models in a web-based data-science environment, work with other data scientists and machine learning engineers, and enter competitions to solve data science challenges.

1.3.2 Database:

A database is an application that manages data and allows fast storage and retrieval of that data. There are different types of database but the most popular is a relational database that stores data in tables where each row in the table holds the same sort of information. In the early 1970s, Ted Codd, an IBM researcher devised 12 laws of normalization. These apply to how the data is stored and relations between different tables.

1.3.3 MongoDB

MongoDB is a cross-platform document-oriented database program. Classified as a NoSQL database program, MongoDB uses JSON-like documents with optional schemas. MongoDB is developed by MongoDB Inc. and licensed under the Server Side Public License (SSPL).

MongoDB provides high availability with replica sets.^[24] A replica set consists of two or more copies of the data. Each replica-set member may act in the role of primary or secondary replica at any time. All writes and reads are done on the primary replica by default. Secondary replicas maintain a copy of the data of the primary using built-in replication. When a primary replica fails, the replica set automatically conducts an election process to determine which secondary should become the primary. Secondaries can optionally serve read operations, but that data is only eventually consistent by default.

MongoDB scales horizontally using sharding.^[25] The user chooses a shard key, which determines how the data in a collection will be distributed. The data is split into ranges (based on the shard key) and distributed across multiple shards. (A shard is a master with one or more replicas.). Alternatively, the shard key can be hashed to map to a shard – enabling an even data distribution.

MongoDB can run over multiple servers, balancing the load or duplicating data to keep the system up and running in case of hardware failure.

It has official drivers for major programming languages and development environments. There are also a large number of unofficial or community-supported drivers for other programming languages and frameworks.

1.3.4 Anaconda:

Anaconda is a free and open source distribution of the Python and R programming languages for data science and machine learning related applications (large-scale data processing, predictive analytics, scientific computing), that aims to simplify package management and deployment. Package versions are managed by the package management system conda. The Anaconda distribution is used by over 6 million

users and it includes more than 250 popular data science packages suitable for Windows, Linux and MacOS.

1.3.5 Python:

Python is an interpreter, object-oriented, high-level programming language with dynamic semantics, created by Guido van Rossum and first released in 1991. Python features a dynamic type system and automatic memory management and supports multiple programming paradigms, including object-oriented, imperative, functional programming, and procedural styles. It has an expansive and extensive standard library its abnormal state worked in information structures, joined with dynamic writing make it extremely alluring for Rapid Application Development, and in addition for use as a scripting or paste dialect to interface existing parts together. gories of Clinical care. This project facilitates prediction of the type 2 diabetes.

1.3.6 React - Web Framework:

React is an open-source, front end, JavaScript library for building user interfaces or UI components. It is maintained by Facebook and a community of individual developers and companies. React can be used as a base in the development of single-page or mobile applications.

1.3.7 JavaScript

JavaScript is a programming language commonly used in web development. It was originally developed by Netscape as a means to add dynamic and interactive elements to websites. While JavaScript is influenced by Java, the syntax is more similar to C and is based on ECMAScript, a scripting language developed by Sun Microsystems.

JavaScript is a client-side scripting language, which means the source code is processed by the client's web browser rather than on the web server. This means JavaScript functions can run after a webpage has loaded without communicating with the server. For example, a JavaScript function may check a web form before it is submitted to make sure all the required fields have been filled out. The JavaScript code can produce an error message before any information is actually transmitted to the server.

Like server-side scripting languages, such as PHP and ASP, JavaScript code can be inserted anywhere within the HTML of a webpage. However, only the output of server-side code is displayed in the HTML, while JavaScript code remains fully visible in the source of the webpage. It can also be referenced in a separate .JS file, which may also be viewed in a browser.

Chapter 2

LITERATURE SURVEY

2.1 General Introduction

Literature Survey is an important activity, which we have to do while gathering information about a particular topic. It will help us to get required information or ideas to do work. The following paragraphs discuss the related work and issues in the area of object detection in a Computer Laboratory using machine learning algorithm.

2.2 Literature Survey

Paper 1:

Arif Warsi, Munaisyah Abdullah, Mohd Nizam Husen, Muhammad Yahya, “Gun detection system using YOLO” .

The objective of this paper is to visually detect the handgun in real time videos. The proposed method is using YOLO-V3 algorithm and comparing the number of false positive and false negative with Faster RCNN algorithm. To improve the result, we have created our own dataset of handguns with all possible angles and merged it with ImageNet dataset. The merged data was trained using YOLO-V3 algorithm. They have used four different videos to validate the results of YOLO-V3 compared to Faster RCNN. The detector performed very well to detect handgun in different scenes with different rotations, scales and shapes. The results showed that YOLO-V3 can be used as an alternative of Faster RCNN. It provides much faster speed, nearly identical accuracy and can be used in a real time environment.

Paper 2:

Joseph Redmon, Santosh Divvala, Ross Girshick, Ali Farhadi “You Only Look Once: Unified, Real-Time Object Detection”.

YOLO is a new approach to object detection. Prior work on object detection repurposes classifiers to perform detection. Instead, they frame object detection as a regression problem to spatially separated bounding boxes and associated class probabilities. A single neural network predicts bounding boxes and class probabilities directly from full images in one evaluation. Since the whole detection pipeline is a single network, it can be optimized end-to-end directly on detection performance. Our unified architecture is extremely fast. Their base YOLO model processes images in real-time at 45 frames per second.

Paper 3:

Chengji Liu, Yufan Tao, Jiawei Liang, Kai Li1, Yihang Chen, Object Detection Based on YOLO Network, 2018.

A generalized object detection network was developed by applying complex degradation processes on training sets like noise, blurring, rotating and cropping of images. The model was trained with the degraded training sets which resulted in better generalizing ability and higher robustness.

The experiment showed that the model trained with the standard sets does not have good generalization ability for the degraded images and has poor robustness. Then the model was trained using degraded images which resulted in improved average precision. It was proved that the average precision for degraded images was better in general degenerative model compared to the standard model.

2.3 Pros and Cons of YOLO inferred from papers:

Pros:

- It is extremely fast compared to other real time detectors which came before it as it uses a Unified Model where the detection is seen as a single regression problem and there is no complex pipeline, just a neural network run on the image.
- It makes less errors than Fast R-CNN as it can see the bigger context because YOLO, unlike Fast R-CNN, can globally reason the image when making predictions. YOLO sees the entire image and encodes some of the contextual information about all classes and their appearance.
- YOLO has learnt generalized representations of objects. YOLO successfully differentiates natural images against art work.

Cons:

- Small object detection, such as a flock of birds, is a problem as there is a spatial restriction on bounding boxes with each cell being able to predict only two boxes and have one class.
- Problems when generalizing objects of abnormal aspect ratios and configurations.
- Loss function will treat the errors of small or large bounding boxes as same.

2.4 Conclusion

- In this paper, we have surveyed the YOLO architecture, YOLO network model for object detection, pedestrian detection, obstacle detection and solder joint detection.
- A unified model for object detection which is easy to build and is trained straight on full images. YOLO also generalized well to new domains used in applications that rely on fast, robust object detection.

- A degenerative model built for detecting degraded images like blurred and noisy images has the model being trained with these degraded images. This model performed better in terms of detecting degraded images and coped better with complex scenes.
- For detection shallow pedestrian features, a YOLO v2 network was modified by adding three Pass through layer to them. The number of detection frames can reach 25 frames/s, which meets the demands of real-time performance.
- To recognize indoor obstacles a new method of using deep learning along with a light field camera was used. The method identifies the obstacles and perceives its information.
- YOLO applied to automobile door panel welding panel lines can identify and detect solder joint accurately. The algorithm can also detect the position of the solder joints and more.

Chapter 3

PROBLEM IDENTIFICATION

Pet owners might find it difficult to identify the breed of the pet in its early stages which can lead to adoption of a different breed dog. In many cases, consumers are cheated by selling dogs that are less expensive in the place of an expensive dog due to the similarity in their appearances. Therefore there is a need for a system that can recognize the breed of a dog when an image is given as a input.

Consumers end up buying wrong food that could affect the health of the dog without having the knowledge of breed specific food or sometimes not knowing the exact breed of the dog. They also end up using wrong accessories which could harm the pet physically. Therefore there is a need for a system that can sort food and accessories according to the breed of the dog.

Some often find it hard to navigate between many websites as there is no centralized platform . Many dogs that are lost and found cannot be reported efficiently as there are many platforms and social media networks the owner and the person who finds a stray dog may not be looking in the same platform.

3.1 Problem Statement

There has always been a need for a centralized platform the breed of dog is recognized and suitable products and services are available to pet owners. This platform overcomes all of the problems discussed above and makes the entire process of taking care of the pets easy.

3.2 Project Scope

Scope is the defined features and functions of a product, or the scope of work needed to finish a project. Scope involves getting information required to start a project, and the features the product would have that would meet its stakeholders requirements.

Project scope is oriented towards the work required and methods needed, while product Scope is more oriented toward functional requirements. If requirements aren't completely defined and described and if there is no effective change control in a project, scope or requirement creep may ensue.

Scope management is the listing of the items to be produced or tasks to be done to the required quantity, quality, and variety, in the time and with the resources available and agreed upon, and the modification of those variable constraints by dynamic flexible juggling in the event of changed circumstance.

This is called Scope Creep.

Performing and evaluating feasibility studies like cost-benefit analysis, technical feasibility, time feasibility and operational feasibility for the project. Project Scheduling should be made using charts. Feasibility study is carried out to decide whether the proposed system is feasible for the company. It begins with a request from the user for a new system.

The scope of our project is limited to the following:

- Registration
- Breed classification
- Vet and grooming services
- Food and products specific to breed and age
- Lost and found pets

Chapter 4

GOALS AND OBJECTIVES

4.1 Project Goals

- **Identification of dog breeds**

Identification of the breed of the dog. Image processing and classifier will be added. This is mainly for the users who do not know the breed of their pet and struggle with the upbringing of the pet. They can identify the breed of their pets. A small box of general information about that breed will be displayed to educate the user regarding the same.

- **Recommend species/breed specific food and products assisted by breed classification**

Food and products specific to breed and age: Elements of pet ownership include providing them with fresh, cool water and healthy food at all times that is specific to the breed. With so many meal options to choose from, one might often get confused with what to feed their pets. This application helps to buy food for pets based on their breed, age and nutrient contents. Along with food, pet accessories are also available to the users who wish to shop from our application. Categorizing these accessories will also be done to make sure that the user gets the best product specific for the breed of their pets.

- **Facilitate recovery of stolen or lost dogs**

Images of Dogs that are lost are classified based on the breed and location so the users can recognize them easily and facilitate fast return of the dog. The centralized structure can facilitate the process.

- **Recommend grooming and vet services**

We aim to develop an application that makes the process of looking after a pet easier. Veterinarian visits play a vital role in looking after the pets. Regular visits to the vets ensure that pets are in healthy condition. Our application allows the registered users to book appointments with the vets when it is required. We also aim to have a chat box which can be used by the pet owners to talk to the vets when it is an emergency or whenever they feel the need for an immediate consultancy. Vaccinating pets is a vital component of responsible pet care. The application also sends email reminders to pet owners asking them to get their pets vaccinated if any vaccination is due. This helps the pet owners to avoid missing any vaccination to their pets. These four factors discussed above (appointments, consultancy, push notifications, online chat) avoids confusion and makes pet consultancy easier.)

4.1 Project Objectives

- Authentication for user security
- Classification of dog breeds
- Recommend food and products for users
- Portal for recovery of lost or stolen dogs
- Grooming and veterinary services
- User friendly environment
- Portal for product manufacturers to sell their products.
- Centralized platform dedicated especially for pets

Chapter 5

SYSTEM REQUIREMENT SPECIFICATION

A software requirements specification (SRS) is a comprehensive description of the intended purpose and environment for software under development. The SRS fully describes what the software will do and how it will be expected to perform. Software requirements specification permits a rigorous assessment of requirements before design can begin and reduces later redesign. It should also provide a realistic basis for estimating product costs, risks, and schedules. The software requirements specification document enlists enough and necessary requirements that are required for the project development. To derive the requirements we need to have clear and thorough understanding of the products to be developed or being developed. This is achieved and refined with detailed and continuous communications with the project team and customer till the completion of the software.

5.1 Software Requirements

- Browser: Mozilla, Google Chrome
- Operating System: Windows XP / Windows7/ Windows Vista
- Programming Language: Python
- MongoDB
- JavaScript, HTML, CSS
- Node.js
- React Native
- React.js
- Express.js
- Mongoose
- Material UI
- Firebase
- iOS 10.0 and Android 4.1 (API 16) or newer

5.2 Hardware Requirements

- 4 GHz minimum, multi-core processor
- Memory (RAM): 4GB, preferably higher
- Hard disk space:10 GB or above

5.3 General Requirements

- The system should be cost effective
- To improve productivity and service.
- To enhance user interface.
- To improve information presentation and durability.
- To upgrade systems reliability, availability and flexibility.
- To address human factors for better user acceptance

Chapter 6

METHODOLOGY

6.1 Introduction to algorithm

The major part of our project is dependent on recognizing our dog breed. This is done using an algorithm called YOLO (You Only Look Once). Before getting into the details of working of the algorithm, here is a gist of the algorithm.

YOLO (“You Only Look Once”) is an effective real-time object recognition algorithm, first described in the seminal 2015 paper by Joseph Redmon et al.

Image classification is one of the many exciting applications of convolutional neural networks. Aside from simple image classification, there are plenty of fascinating problems in computer vision, with object detection being one of the most interesting.

Why use YOLO?

First, YOLO is extremely fast. Since we frame detection as a regression problem we don’t need a complex pipeline. The base network runs at 45 frames per second with no batch processing on a Titan X GPU and a fast version runs at more than 150 fps. This means a streaming video in real-time can be processed with less than 25 milliseconds of latency.

Second, YOLO makes less than half the number of background errors compared to Fast R-CNN.

Third, YOLO learns generalizable representations of objects. Since YOLO is highly generalizable it is less likely to break down when applied to new domains or unexpected input.

6.2 Object Detection Overview

To explore the concept of object detection it is useful to begin with image classification. Image Classification goes through levels of incremental complexity.

- Image classification aims at assigning an image to one of a number of different categories (e.g. car, dog, cat, human, etc.), essentially answering the question “*What is in this picture?*”. One image has only one category assigned to it.
- Object localization then allows us to locate our object in the image, so our question changes to “*What is it and where it is?*”.

- Object detection provides the tools for doing just that – finding all the objects in an image and drawing the so-called bounding boxes around them.

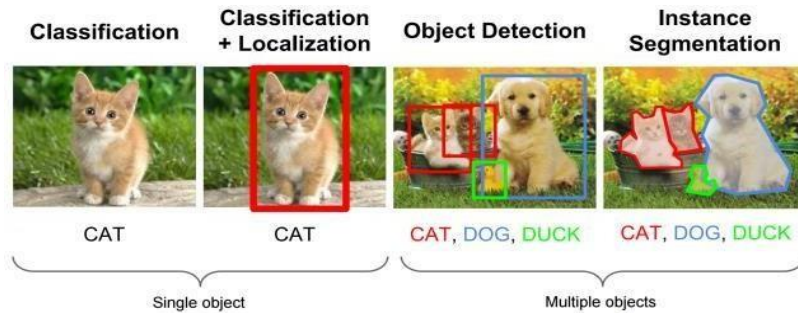


Fig 6a: Classification of objects in YOLO

6.3 Processes Involved

The breed detection in our project is a two step process:

- Extracting a target image:**

YOLO is used to crop out the excess in a image to obtain only the target image. When any user uploads a picture of their dog, it is obvious that the picture can contain some other objects along with the object that has to be recognized. YOLO makes sure that the required target image is extracted in order to identify the breed of the dog.

The separate components of object detection are unified into a single neural network. This network uses features from the entire image to predict each bounding box. It even predicts all bounding boxes for an image all at once. This means that the network reasons globally about the full image and all the objects in the image. The YOLO design enables end-to-end training and real-time speed while maintaining high average precision.

Working:

This YOLO system divides the input \times image into a $S \times S$ grid. If the center of an object falls into a grid cell, that grid cell is responsible for detecting that object. Each grid cell predicts B bounding boxes and confidence scores for those boxes. These confidence scores reflect how confident the model is that the box contains an object and also how accurate it thinks the box is that it predicts.

Formally we define confidence as $\Pr(\text{Object}) \text{ IOU}$. If no object exists in that cell, the confidence scores should be zero. Otherwise we want the confidence score to equal the intersection over union (IOU) between the predicted box and the ground truth.

Each bounding box consists of 5 predictions: x , y , w , h , and confidence. The (x, y) coordinates represent the center of the box relative to the bounds of the grid cell. The width and height are predicted relative to the whole image. Finally which gives us class-specific confidence scores for each box. These scores encode both the probability of that class appearing in the box and how well the predicted box fits the object.

This system models detection as a regression problem. It divides the image into an even grid and simultaneously predicts bounding boxes, confidence in those boxes, and class probabilities. These predictions are encoded as $S \times S \times (B * 5 + C)$ tensor.

For evaluating YOLO on PASCAL VOC, we use $S = 7$, $B = 2$. PASCAL VOC has 20 labeled classes so $C = 20$. The final prediction is a $7 \times 7 \times 30$ tensor.

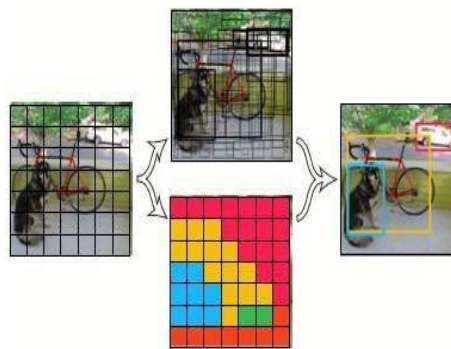


Fig 6b: Identifying the required target image

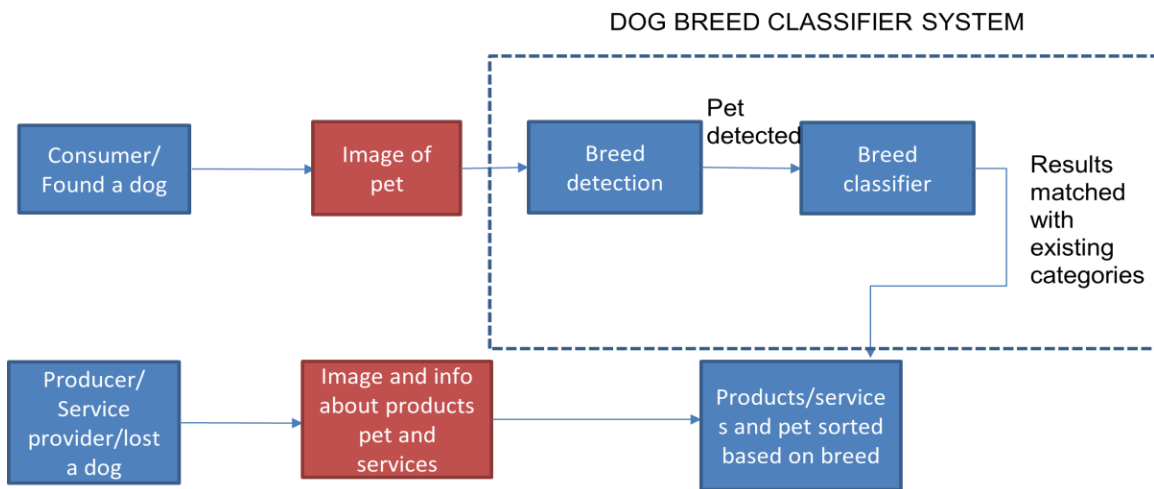
- **Classification-inception transfer learning:**

Transfer learning has several benefits, but the main advantages are saving training time, better performance of neural networks (in most cases), and not needing a lot of data. An Inception Module is an image model block that aims to approximate an optimal local sparse structure in a CNN. Put simply, it allows for us to use multiple types of filter size, instead of being restricted to a single filter size, in a single image block, which we then concatenate and pass onto the next layer.

Classification-inception transfer learning is therefore used to compare the target image and return the breed of the dog.

This is the major part of the project. On determining the breed of the dog we can proceed further classify the products and accessories.

This can be further understood with the help of a block diagram that is shown below;



5

Fig 6c: Block diagram representation of working of the project

The user uploads the picture of their dog into our website. This is passed into a dog breed classifier system which mainly works on classifying the dog breed. The two steps that are explained above work on classifying the breed of the dog. After our system has confirmed the breed of the dog it is displayed to the user. Based on the breed identified our system also classifies the products and accessories and displays it to the user so that they buy the right food and right accessories for their dogs.

Producers/Service Providers/ Person looking for a lost dog can also upload the information of the products, services and pictures of their pets respectively into our system where these are again sorted according to the breed and are added into their respective portals.

Chapter 7

APPLICATIONS

7.1 Breed Classification and Breed Identification

While many people like to know “What kind of dog is that?” just to satisfy their curiosity, dog breed designations have also been used in an attempt to predict future behaviour, match pets to families, find lost dogs, and even to restrict the ownership of certain types of dogs.

Dogs come in all shapes and sizes, and frequently without pedigrees to describe their heritage. The breeds of dogs with unknown or mixed-breed lineages are frequently guessed based on their physical appearance, but it is not known how accurate these visual breed assessments are.

It is common for animal shelter staff, veterinarians, dog owners, and others to guess the breed of dogs based on physical appearance. Breed identification is used on legal forms, in searching for lost dogs, and for prediction of behavioural and health traits. Previous studies suggest that visual breed identification in animal shelters is unreliable, but it is unknown what the reliability among other canine stakeholders is. The purpose of this study was to determine the accuracy of visual breed identification compared to DNA breed profiles.

7.2 Centralized Platforms for Lost and Found Pets

Have you ever been through the traumatic experience of searching for your lost pet? Finding your cuddly pooch could now be less harrowing using our new application

It works like this: Pet owners upload a picture of their dog. Shelters and other Finding users upload pictures of found dogs. Once a dog is reported found, its picture is scanned through all of the "lost" pictures.

A found dog and lost dog are then matched based on the technology and the owner is notified.

sorting of dogs based on the breed will also help immensely in reducing the number of data sets that a person has to go through to recognise the dog

7.3 Breed Specific food and Accessories

Choosing a food for your beloved puppy has become an overwhelming task. Pet stores are filled with aisle after aisle of different dog food brands, each one boasting that if you feed this food your puppy will live a longer and healthier life. Some brands have even developed breed-specific dog foods that are said to address the health needs of your specific breed of puppy. One can see why puppy owners gravitate to a dog food that claims to be tailor-made to their own dog's genetic makeup, but is it the right choice?

Unfortunately, breed-specific puppy foods are little more than a marketing gimmick and do not have sound nutritional science backing them. We do not yet have the research that pinpoints the difference in nutritional requirements between different specific breeds of dogs. A small breed dog's metabolism, for example, is much different from a large breed dog, but it is unlikely that a Yorkie's nutritional needs vary all that much from a Shih Tzu's.

therefore when the image of a dog has been processed and the breed of the dog has been recognised all the products and services in the web pages are going to be sorted based on that breed and only the products that are specific to the recognised breed will be shown to the user.

7.4 Vet and Grooming Services

Choosing a food for your beloved puppy has become an overwhelming task. Pet stores are filled with aisle after aisle of different dog food brands, each one boasting that if you feed this food your puppy will live a longer and healthier life. Some brands have even developed breed-specific dog foods that are said to address the health needs of your specific breed of puppy. One can see why puppy owners gravitate to a dog food that claims to be tailor-made to their own dog's genetic makeup, but is it the right choice?

Unfortunately, breed-specific puppy foods are little more than a marketing gimmick and do not have sound nutritional science backing them. We do not yet have the research that pinpoints the difference in nutritional requirements between different specific breeds of dogs. A small breed dog's metabolism, for example, is much different from a large breed dog, but it is unlikely that a Yorkie's nutritional needs vary all that much from a Shih Tzu's.

therefore when the image of a dog has been processed and the breed of the dog has been recognised all the products and services in the web pages are going to be sorted based on that breed and only the products that are specific to the recognised breed will be shown to the user.

Chapter 8

CONTRIBUTION TO SOCIETY AND ENVIRONMENT

The social support provided by a pet might also encourage more social interactions with people, reducing feelings of isolation or loneliness. For example, walking with a dog has been found to increase social interaction, especially with strangers, compared to walking without a dog.

We propose a trained model which uses some techniques to detect the breed of the dog. This classification is important because we are using this criteria to sort out food and accessories, and lost dogs so that pet owners can find anything they want very easily. By detecting the breed of the dog it helps the user to know which dog they're adopting or buying and can make decisions accordingly as each dog has different requirements, products, food and even the cost to take care of the dog is different. Also by posting the picture of the dog in our portal it detects the breed so the user will know what breed he/she is purchasing and can pay accordingly and not be scammed by paying the wrong amount for the wrong breed.

With online scams on the rise, please be aware of the many different types of pet scams. Many times users are lured in by a cute puppy or other pet for sale, only to find out that they have been scammed out of their money. A lot of confusion related to identifying the breed will bring the selling of wrong dogs under control. Most pet scams begin with a buyer searching online for free / cheap pets for sale or puppies for sale.

A centralized platform avoids the user from switching multiple tabs. There are no centralized platforms for all dog services like veterinary, grooming, online chat or video conference with an expert or a vet. As this is a growing industry with billions invested each year, this would really help the community and pet owners if there is a centralized platform for all pet needs.

REFERENCES

- [1]. Geethapriya. S, N. Duraimurugan, S.P. Chokkalingam Real-Time Object Detection with Yolo. International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-8, Issue-3S, February 2019.
- [2]. Joseph Redmon , Santosh Divvala, Ross Girshick , Ali Farhadi You Only Look Once: Unified, Real-Time Object Detection.
- [3]. Chengji Liu ,Yufan Tao ,Jiawei Liang ,Kai Li¹ ,Yihang Chen, "Object Detection Based on YOLO Network" 2018 IEEE 4th Information Technology and Mechatronics Engineering Conference (ITOEC 2018)
- [4]. <https://www.petsworld.in/> - the idea of food, accessories are referred from this website.

APPENDIX - 1

(Published Paper and Certificate)