Project Report

Team ID	Team-592393
Project Name	Dog Breed Identification using Transfer Learning

1. **INTRODUCTION**

1.1 Project Overview

The dog breed identification project using transfer learning aims to leverage pre-trained transfer learning models to accurately classify dog breeds from images. By fine-tuning a pre-existing model on a diverse dataset of dog images, the project seeks to develop an efficient and reliable algorithm capable of identifying various breeds. The project's future scope encompasses improving accuracy, enabling real-time applications on mobile/embedded systems, expanding to multispecies recognition, addressing ethical concerns, and integrating into domains such as veterinary science, smart homes, education, adoption, and animal welfare for a positive societal impact.

1.2 Purpose

Its primary focus is to reduce manual effort, minimize human error, and showcase the efficacy of deep learning techniques. By employing pre-trained models and adapting them to specific breed recognition tasks, the project supports pet care, aids veterinarians, and contributes to research in computer vision. Ultimately, it serves as a practical demonstration of AI's potential while providing a valuable tool for efficient and precise dog breed identification.

2. **LITERATURE SURVEY**

2.1 Existing problem

One of the prevailing challenges in the project of dog breed identification using transfer learning is the limitation posed by the availability and quality of data. Obtaining a comprehensive and diverse dataset encompassing a wide range of dog breeds with sufficient samples for each breed remains a significant hurdle. Often, the dataset might suffer from class imbalances, where some breeds are overrepresented while others are underrepresented or absent. This imbalance can result in biased models that perform well on commonly occurring breeds but poorly on less frequent or mixed breeds. Additionally, variations within breeds due to factors like age, colour, size, and pose further complicate accurate identification. Overcoming these limitations necessitates extensive efforts in dataset collection, curation, and augmentation to ensure a balanced representation across breeds, thereby enhancing the model's ability to generalize and accurately identify diverse dog breeds.

2.2 References

Stanford Dogs Dataset:
Website: http://vision.stanford.edu/aditya86/ImageNetDogs/

Towards Data Science - Dog Breed Identification:
Website: https://towardsdatascience.com/tagged/dog-breed-identification

Kaggle Dog Breed Identification Competition:
Website: https://www.kaggle.com/c/dog-breed-identification

TensorFlow Hub - Image Feature Vector:
Website: https://tfhub.dev/google/imagenet/mobilenet_v2_130_224/feature_vector/4

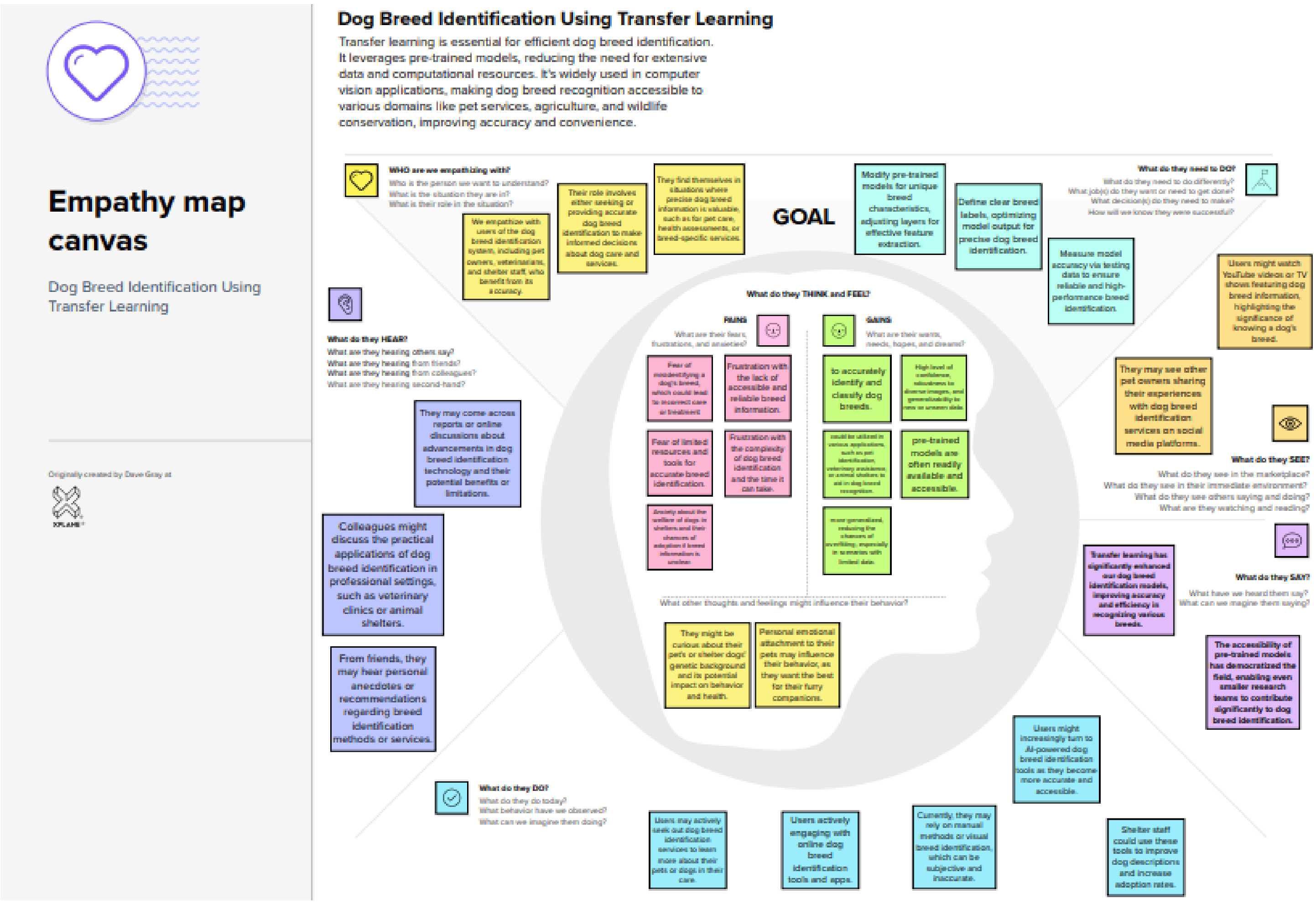
ArXiv - Research Papers:
Website: https://arxiv.org/

2.3 Problem Statement Definition

Dog breed identification is a challenging and valuable problem in the field of computer vision and machine learning. It involves training a machine-learning model to classify dog images into specific breed categories. The main problem to be solved in this context is to develop a robust and accurate dog breed identification system using transfer learning.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



What do they THINK and FEEL?

PAINS

What are their fears, frustrations, and anxieties?

- Fear of misidentifying a dog's breed, which could lead to incorrect care or treatment
- Frustration with the lack of accessible and reliable breed information.
- Fear of limited resources and tools for accurate breed identification.
- Frustration with the complexity of dog breed identification and the time it can take.
- Anxiety about the welfare of dogs in shelters and their chances of adoption if breed information is unclear.

GAINS

What are their wants, needs, hopes, and dreams?

- to accurately identify and classify dog breeds.
- High level of confidence, robustness to diverse images, and generalizability to new or unseen data.
- could be utilized in various applications, such as pet identification, veterinary assistance, or animal shelters to aid in dog breed recognition.
- pre-trained models are often readily available and accessible.
- more generalized, reducing the chances of overfitting, especially in scenarios with limited data.

What other thoughts and feelings might influence their behavior?

- They might be curious about their pet's or shelter dogs' genetic background and its potential impact on behavior and health.
- Personal emotional attachment to their pets may influence their behavior, as they want the best for their furry companions.

WHO are we empathizing with?

Who is the person we want to understand?
What is the situation they are in?
What is their role in the situation?

- We empathize with users of the dog breed identification system, including pet owners, veterinarians, and shelter staff, who benefit from its accuracy.
- Their role involves either seeking or providing accurate dog breed identification to make informed decisions about dog care and services.
- They find themselves in situations where precise dog breed information is valuable, such as for pet care, health assessments, or breed-specific services.

What do they need to DO?

What do they need to do differently?
What job(s) do they want or need to get done?
What decision(s) do they need to make?
How will we know they were successful?

- Modify pre-trained models for unique breed characteristics, adjusting layers for effective feature extraction.
- Define clear breed labels, optimizing model output for precise dog breed identification.
- Measure model accuracy via testing data to ensure reliable and high-performance breed identification.

What do they DO?

What do they do today?
What behavior have we observed?
What can we imagine them doing?

Users may actively seek out dog breed identification services to learn more about their pets or dogs in their care.

Users actively engaging with online dog breed identification tools and apps.

Currently, they may rely on manual methods or visual breed identification, which can be subjective and inaccurate.

Users might increasingly turn to AI-powered dog breed identification tools as they become more accurate and accessible.

Shelter staff could use these tools to improve dog descriptions and increase adoption rates.

What do they HEAR?

What are they hearing others say?
What are they hearing from friends?
What are they hearing from colleagues?
What are they hearing second-hand?

They may come across reports or online discussions about advancements in dog breed identification technology and their potential benefits or limitations.

Colleagues might discuss the practical applications of dog breed identification in professional settings, such as veterinary clinics or animal shelters.

From friends, they may hear personal anecdotes or recommendations regarding breed identification methods or services.

Users might watch YouTube videos or TV shows featuring dog breed information, highlighting the significance of knowing a dog's breed.

They may see other pet owners sharing their experiences with dog breed identification services on social media platforms.

What do they SEE?

What do they see in the marketplace?
What do they see in their immediate environment?
What do they see others saying and doing?
What are they watching and reading?

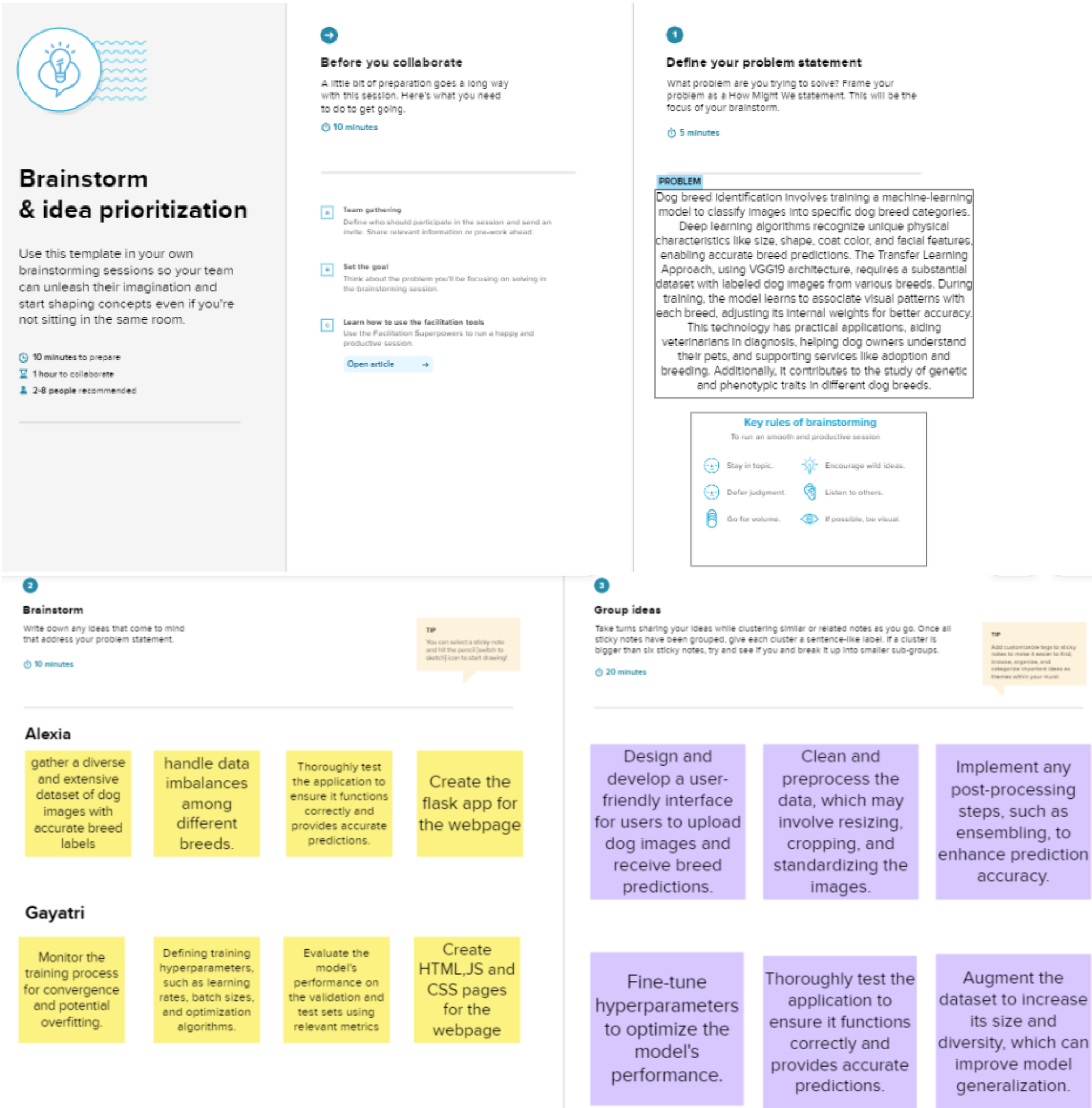
Transfer learning has significantly enhanced our dog breed identification models, improving accuracy and efficiency in recognizing various breeds.

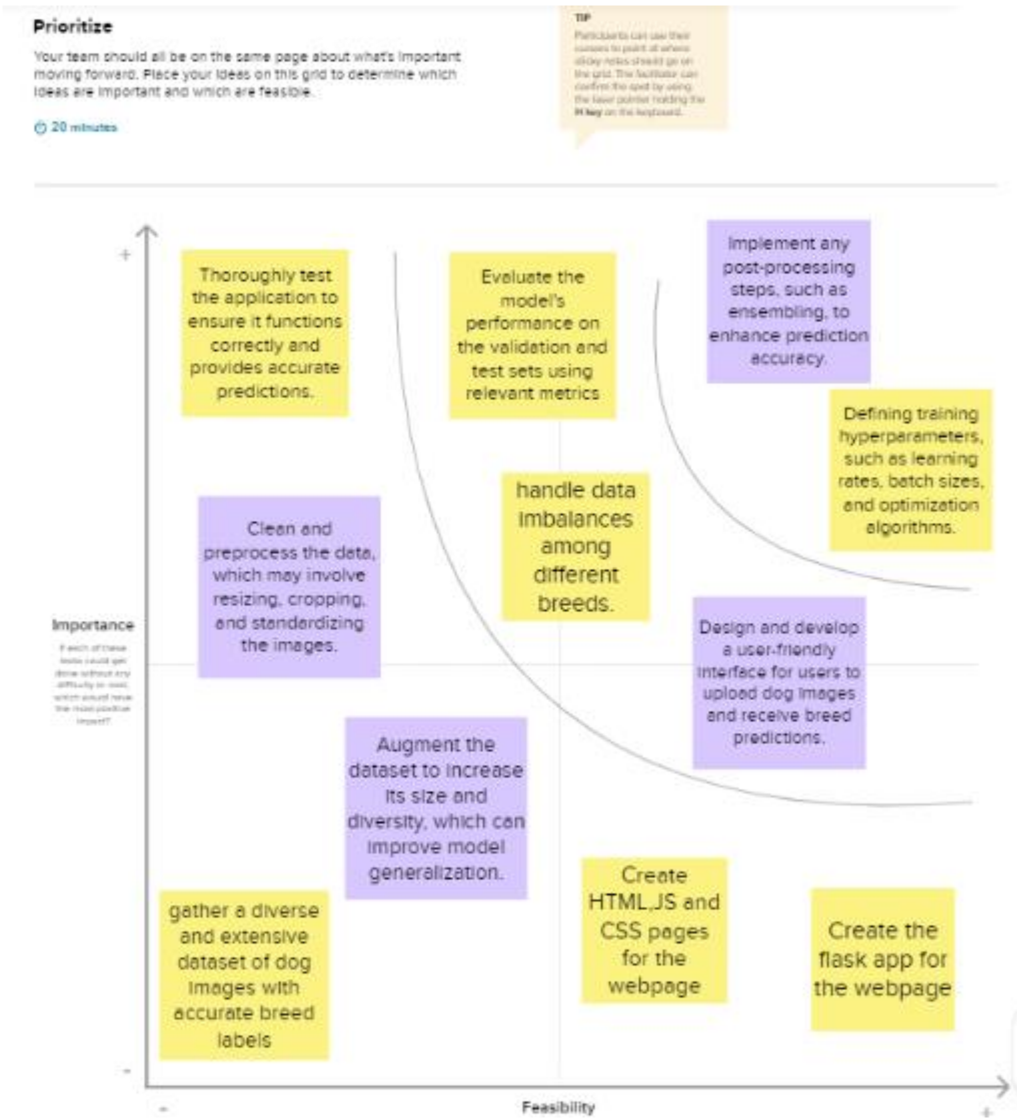
What do they SAY?

What have we heard them say?
What can we magine them saying?

The accessibility of pre-trained models has democratized the field, enabling even smaller research teams to contribute significantly to dog breed identification.

3.2 Ideation & Brainstorming





4. **REQUIREMENT ANALYSIS**

4.1 Functional requirement

<u>Image Dataset Collection:</u> Gather a diverse dataset of high-quality dog images encompassing various breeds, ensuring proper labelling and organization.

<u>Preprocessing Pipeline:</u> Develop an efficient preprocessing pipeline to standardize image sizes, normalize colour channels, and augment data to enhance model performance.

<u>Transfer Learning Model Selection:</u> Choose an appropriate pre-trained deep learning

architecture (e.g., VGG19) for feature extraction and fine-tuning.

Model Training and Fine-Tuning: Train the model on the dataset, implementing transfer learning techniques, and fine-tune hyperparameters for accurate breed classification.

Evaluation and Validation: Assess the model's performance using metrics like accuracy, precision, recall, and F1 score. Validate the model on separate test datasets to ensure generalization.

Real-time Inference: Develop or optimize the model for real-time breed identification on different platforms, considering computational efficiency for deployment.

4.2 Non-Functional requirements

Accuracy and Performance: The model should achieve a high accuracy rate (>90%) across diverse dog breeds while maintaining reasonable inference time.

Scalability and Robustness: Ensure the model's scalability to handle a growing dataset and robustness to variations in dog poses, lighting conditions, and backgrounds.

Ethical Considerations: Avoid reinforcing breed stereotypes or biases; prioritize ethical handling of data and aim for fair and unbiased predictions.

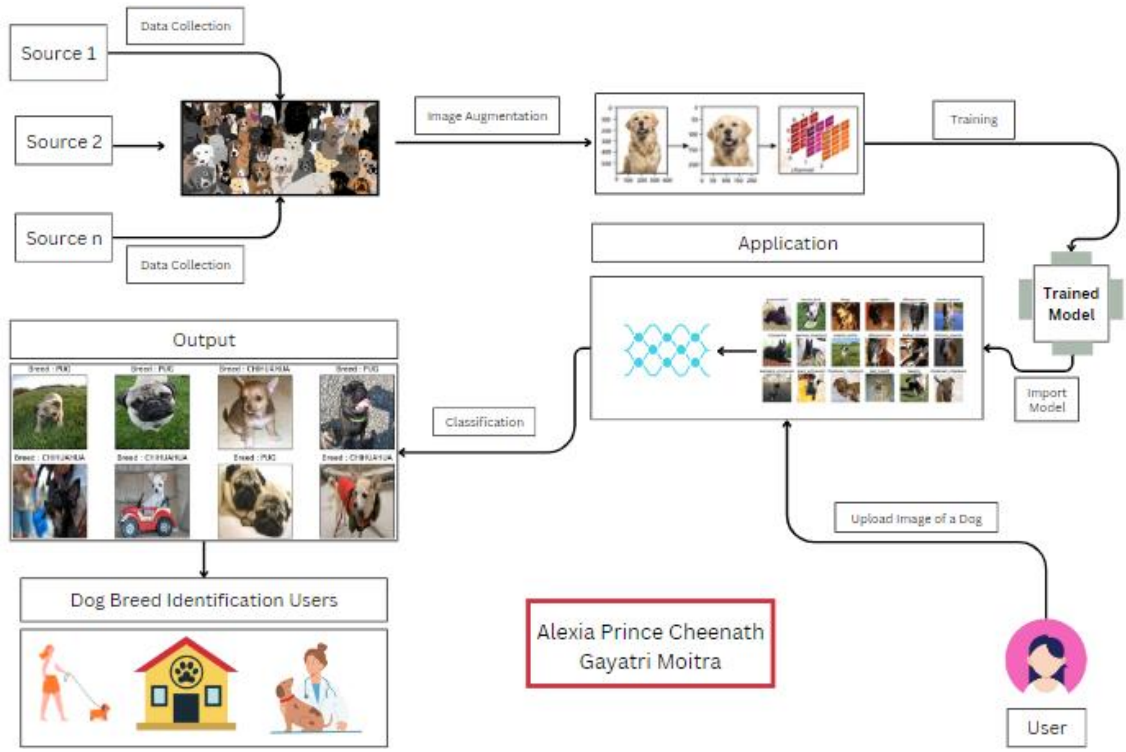
User Interface and Accessibility: Design an intuitive and user-friendly interface for users to interact with the model, making it accessible across different devices and platforms.

Security and Privacy: Implement measures to secure the dataset, model, and user data, complying with privacy regulations and preventing unauthorized access.

Documentation and Maintainability: Provide comprehensive documentation for the codebase, model architecture, and training process to ensure ease of maintenance and future updates.

5. PROJECT DESIGN

5.1 Data Flow Diagrams & User Stories



User stories

User Type	Functional Requirement	User Story Number	User Story/Task	Acceptance Criteria	Priority	Release
Vets, Dog Owners, Animal Shelter and Rescues, Pet Adoption Agencies, Researchers, Dog Shows and Competition, Mobile App Users and General Public	Project Setup and Infrastructure	USN-1	Set up the development environment with the necessary tools and frameworks to initiate the dog breed classification project.	Successfully configured environment with required tools and frameworks.	High	Sprint 1
	Development Environment	USN-2	Gather a diverse dataset of images containing various dog breeds for training the machine learning model.	Collected a diverse dataset of images representing multiple dog breeds	High	Sprint 1
	Data Collection	USN-3	Preprocess the collected dataset by resizing images, normalizing	Preprocessed dataset with resized images	High	Sprint 2

			pixel values, and dividing it into training and validation sets.	and normalized pixel values; split into training and validation sets.		
	Data Preprocessing	USN-4	Using VGG19 Transfer Learning architecture for the model.	Selected a Transfer Learning model that is suitable.	High	Sprint 2
	Model Development	USN-5	Train the selected machine learning model using the preprocessed dataset and monitor its performance on the validation set.	Trained model and assessed performance on validation set.	High	Sprint 3
	Training	USN-6	Implement data augmentation techniques (e.g., rotation, flipping) to enhance the model's accuracy and robustness.	Applied augmentation techniques to improve model performance.	Medium	Sprint 3
	Model deployment and Integration	USN-7	Deploy the trained machine learning model as an API or web service for dog breed classification. Integrate the model's API into a user-friendly web interface.	Deployed model as an accessible API and integrated it into a user-friendly web interface.	Medium	Sprint 4
	Testing and Quality Assurance	USN-8	Conduct comprehensive testing of the model and web interface, identifying and addressing any issues or bugs. Optimize the model based on user feedback and testing results.	Thoroughly tested model and web interface, optimized model performance based on feedback.	Medium	Sprint 5

5.2 Solution Architecture

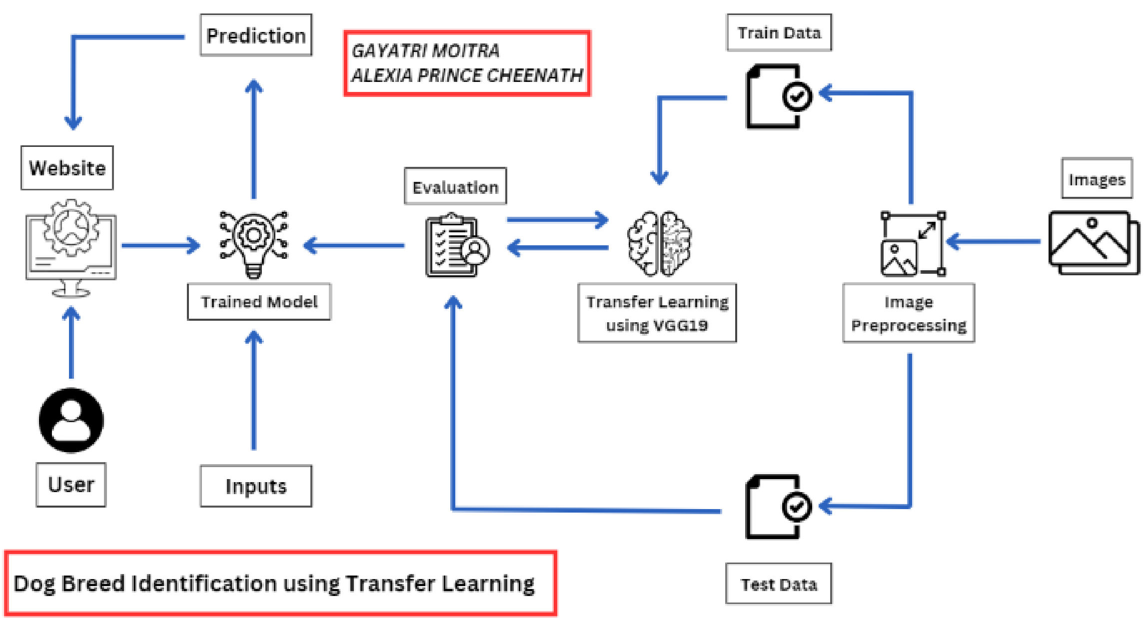
Deep learning algorithms excel in recognizing these distinctive traits and patterns in images, enabling accurate predictions regarding a dog's breed. Our approach employs the power of Transfer Learning, specifically utilizing the VGG19 architecture, to tackle dog breed identification. To accomplish this, we rely on a substantial dataset of labelled dog images, which is essential for training the model effectively. This dataset must encompass images representing a wide array of dog breeds, with each image meticulously labelled with its corresponding breed.

The solution architecture unfolds as follows:

1. Data Collection and Preparation
2. Model Building with Transfer Learning using VGG19 architecture
3. Training Phase
4. Dog Breed Predictions
5. Practical Applications

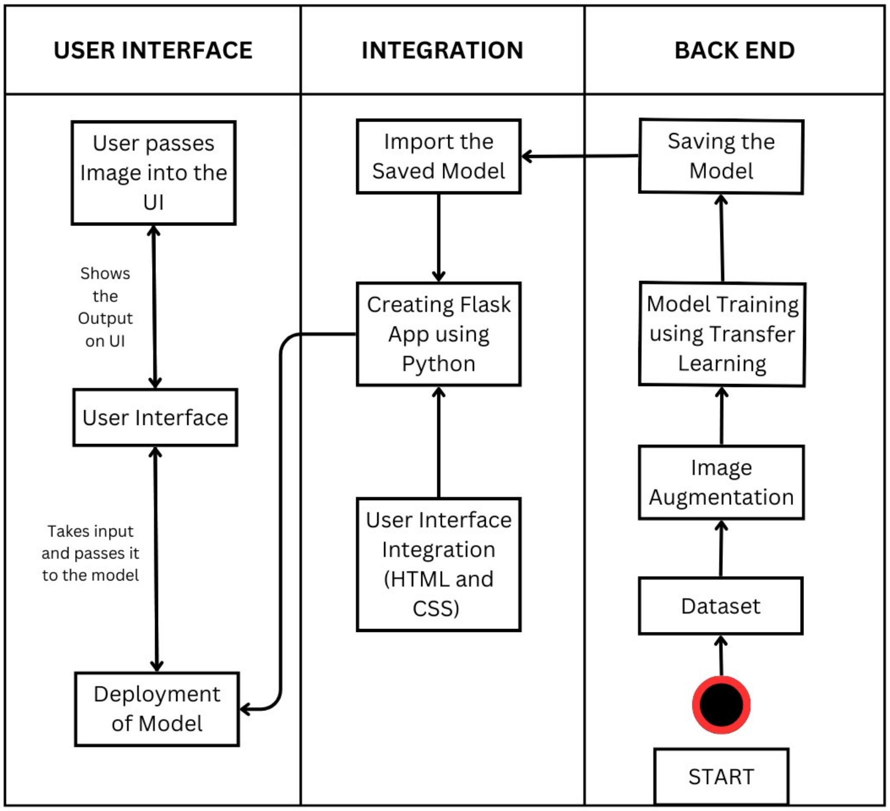
In conclusion, our solution architecture leverages Transfer Learning and the VGG19 architecture to address the intricate task of dog breed identification. By using a comprehensive dataset and deep learning techniques, we can accurately classify dog breeds, ultimately benefiting veterinarians, dog owners, and various dog-related services while contributing to scientific research in canine genetics and phenotypic traits.

Solution Architecture Diagram:



6. PROJECT PLANNING & SCHEDULING

6.1 Technical Architecture



6.2 Sprint Planning & Estimation

Sprint	Functional Requirement	User Story Number	User Story/Task	Story Points	Priority	Team Members
Sprint 1	Project Setup and Infrastructure	USN-1	Set up the development environment with the necessary tools and frameworks to initiate the dog breed classification project.	5	High	Alexia Prince Cheenath
Sprint 1	Data Collection	USN-2	Gather a diverse dataset of images containing various dog breeds for training the machine learning model.	5	High	Gayatri Moitra

Sprint 2	Data Preprocessing	USN-3	Preprocess the collected dataset by resizing images, normalizing pixel values, and dividing it into training and validation sets.	6	High	Gayatri Moitra
Sprint 2	Model Development	USN-4	Using VGG19 Transfer Learning architecture for the model.	4	High	Alexia Prince Cheenath
Sprint 3	Training and Testing	USN-5	Train the selected machine learning model using the preprocessed dataset and monitor its performance on the validation set.	4	High	Alexia Prince Cheenath
Sprint 3	Data Augmentation	USN-6	Implement data augmentation techniques (e.g., rotation, flipping) to enhance the model's accuracy and robustness.	6	Medium	Gayatri Moitra
Sprint 4	Model deployment and Integration	USN-7	Deploy the trained machine learning model as an API or web service for dog breed classification. Integrate the model's API into a user-friendly web interface.	10	Medium	Alexia Prince Cheenath
Sprint 5	Testing and Quality Assurance	USN-8	Conduct comprehensive testing of the model and web interface, identifying and addressing any issues or bugs. Optimize the model based on user feedback and testing results.	10	Medium	Gayatri Moitra

6.3 Sprint Delivery Schedule

Sprint	**Total Story Points**	**Duration**	**Sprint Start Date**	**Sprint End Date (Planned)**	**Story Points Completed (as on Planned End Date)**	**Sprint Release Date (Actual)**
Sprint-1	10	2 Days	04 November 2023	05 November 2023	10	05 November 2023

Sprint-2	10	3 Days	06 November 2023	08 November 2023	10	08 November 2023
Sprint-3	10	5 Days	09 November 2023	13 November 2023	10	13 November 2023
Sprint-4	10	1 Day	14 November 2023	14 November 2023	10	14 November 2023
Sprint-5	10	1 Day	15 November 2023	15 November 2023	10	15 November 2023

Velocity:

For Sprint 1:

Average Velocity = 10/2 = 5

For Sprint 2:

Average Velocity = 10/3 = 3.33

For Sprint 3:

Average Velocity = 10/5 = 2

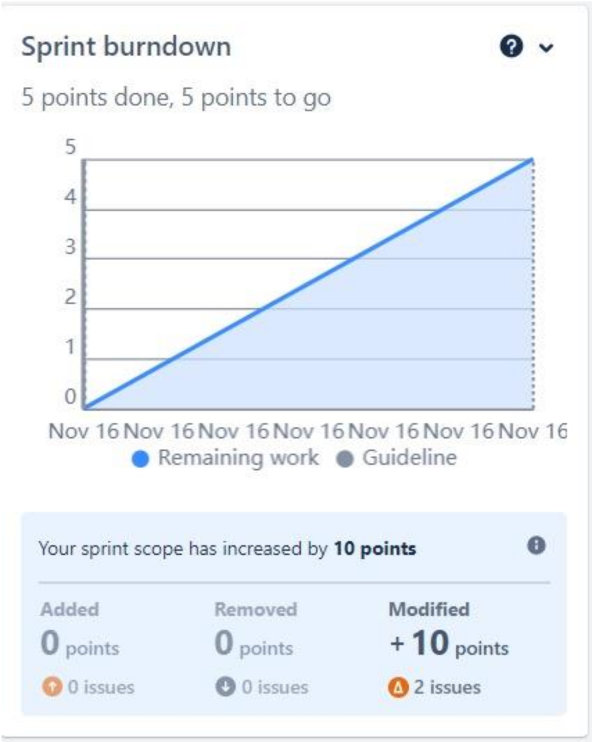
For Sprint 4:

Average Velocity = 10/1 = 10

For Sprint 5:

Average Velocity = 10/1 = 10

Sprint Burndown Chart

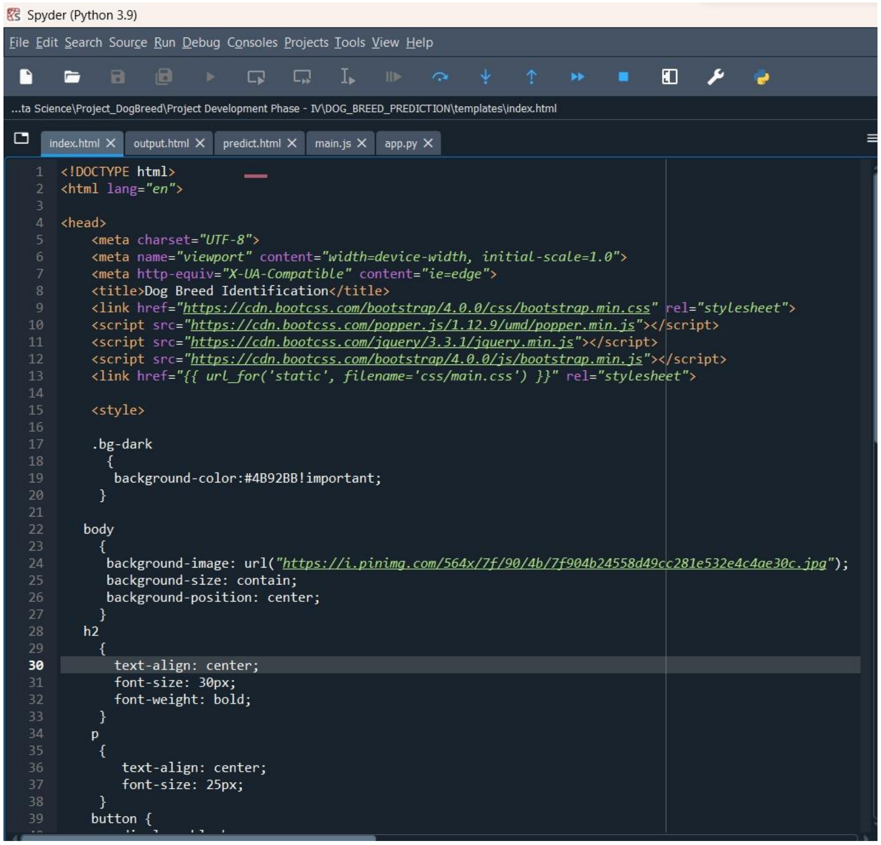


7. CODING & SOLUTIONING

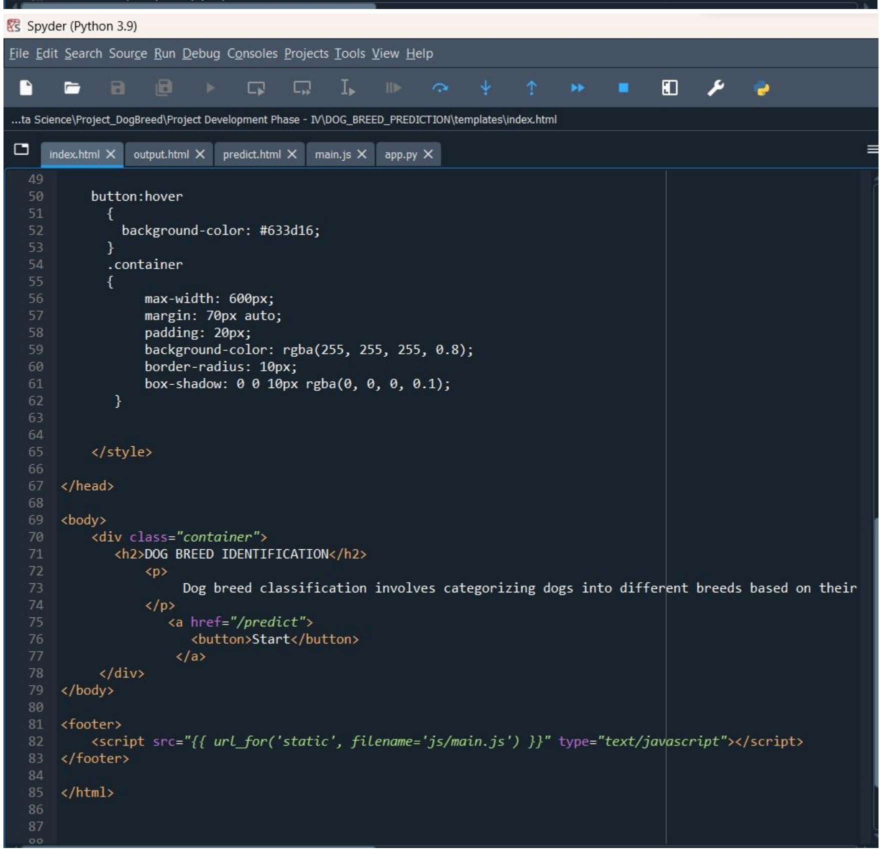
Flask app:

```python
import numpy as np
import os
from keras.models import load_model
from keras.utils import load_img,img_to_array
from PIL import Image
from flask import Flask,request,render_template

app=Flask(__name__)
model=load_model("dogBreed.h5",compile=False)

@app.route('/')
def index():
    return render_template("index.html")

@app.route('/predict')
def predict():
    return render_template("predict.html")

@app.route('/output',methods=['GET','POST'])
def output():
    if request.method == 'POST':
      f=request.files['file']
      basepath=os.path.dirname(__file__)
      filepath=os.path.join(basepath,'uploads',f.filename)
      f.save(filepath)
      img=load_img(filepath,target_size=(224,224))
      x=img_to_array(img)
      x=np.expand_dims(x,axis=0)
      pred=np.argmax(model.predict(x),axis=1)
      index = ['Affenpinscher','Beagle','Appenzeller','Basset','Bluetick','Boxer','Cairn',
               'Doberman','German Shepherd','Golden Retriever','Kelpie','Komondor','Leonberg',
               'Mexican_Hairless','Pug','Redbone','Shih-tzu','Toy Poodle','Vizsla','Whippe']
      breed_prediction=index[pred[0]]
      return render_template('output.html',breed=breed_prediction)
if __name__ == '__main__':
    app.run(debug=False,threaded=False)
```

Index Page:




```html
<!DOCTYPE html>
<html lang="en">

<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <meta http-equiv="X-UA-Compatible" content="ie=edge">
    <title>Dog Breed Identification</title>
    <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css" rel="stylesheet">
    <script src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
    <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
    <script src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
    <link href="{{ url_for('static', filename='css/main.css') }}" rel="stylesheet">

    <style>

    .bg-dark
      {
       background-color:#4B92BB!important;
      }

   body
     {
      background-image: url("https://i.pinimg.com/564x/7f/90/4b/7f904b24558d49cc281e532e4c4ae30c.jpg");
      background-size: contain;
      background-position: center;
     }
   h2
     {
       text-align: center;
       font-size: 30px;
       font-weight: bold;
     }
    p
     {
        text-align: center;
        font-size: 25px;
     }
    button {
```




```html

    button:hover
      {
        background-color: #633d16;
      }
      .container
      {
           max-width: 600px;
           margin: 70px auto;
           padding: 20px;
           background-color: rgba(255, 255, 255, 0.8);
           border-radius: 10px;
           box-shadow: 0 0 10px rgba(0, 0, 0, 0.1);
       }


    </style>

</head>

<body>
    <div class="container">
       <h2>DOG BREED IDENTIFICATION</h2>
           <p>
                Dog breed classification involves categorizing dogs into different breeds based on their
           </p>
              <a href="/predict">
                 <button>Start</button>
               </a>
     </div>
</body>

<footer>
    <script src="{{ url_for('static', filename='js/main.js') }}" type="text/javascript"></script>
</footer>

</html>
```

Predict Page:

Spyder (Python 3.9)

File Edit Search Source Run Debug Consoles Projects Tools View Help

... Science\Project_DogBreed\Project Development Phase - IV\DOG_BREED_PREDICTION\templates\predict.html

index.html predict.html output.html main.js app.py

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <meta http-equiv="X-UA-Compatible" content="ie=edge">
    <title>Dog Breed Identification</title>
    <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css" rel="stylesheet">
    <script src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
    <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
    <script src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
    <link href="{{ url_for('static', filename='css/main.css') }}" rel="stylesheet">
    <style>

    .bg-dark {
        background-color: #4B92BB!important;
    }

    body
      {
       background-image: url("https://i.pinimg.com/564x/7f/90/4b/7f904b24558d49cc281e532e4c4ae30c.jpg");
       background-size: contain;
       background-position: center;
      }
       h2
         {
           text-align: center;
           font-size: 30px;
           font-weight: bold;
         }

         img {
             display: block;
             max-width: 100%;
             margin: 20px 0;
             border-radius: 5px;
         }

      .container {
```

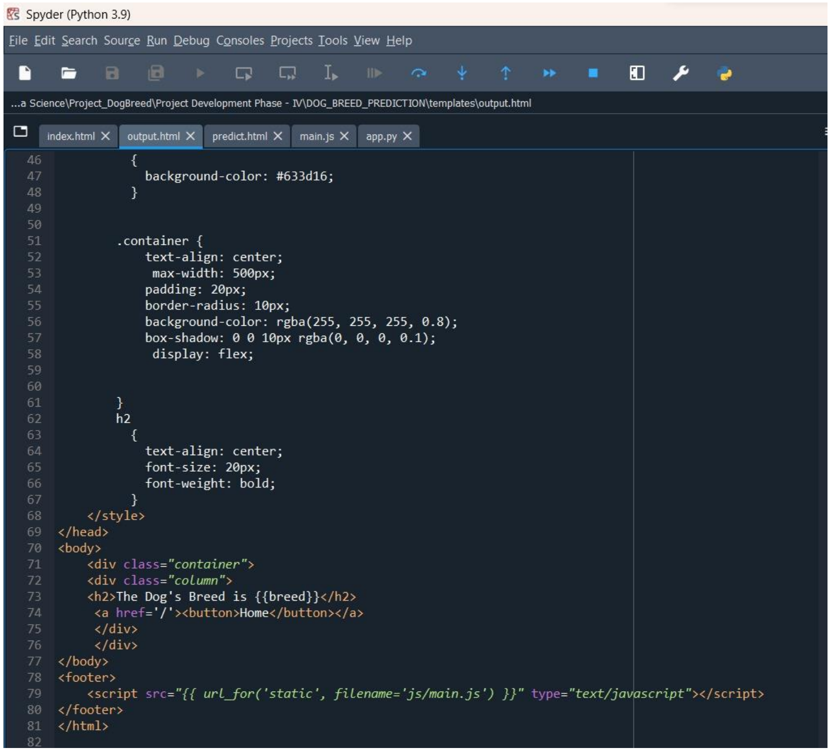
Spyder (Python 3.9)

File Edit Search Source Run Debug Consoles Projects Tools View Help

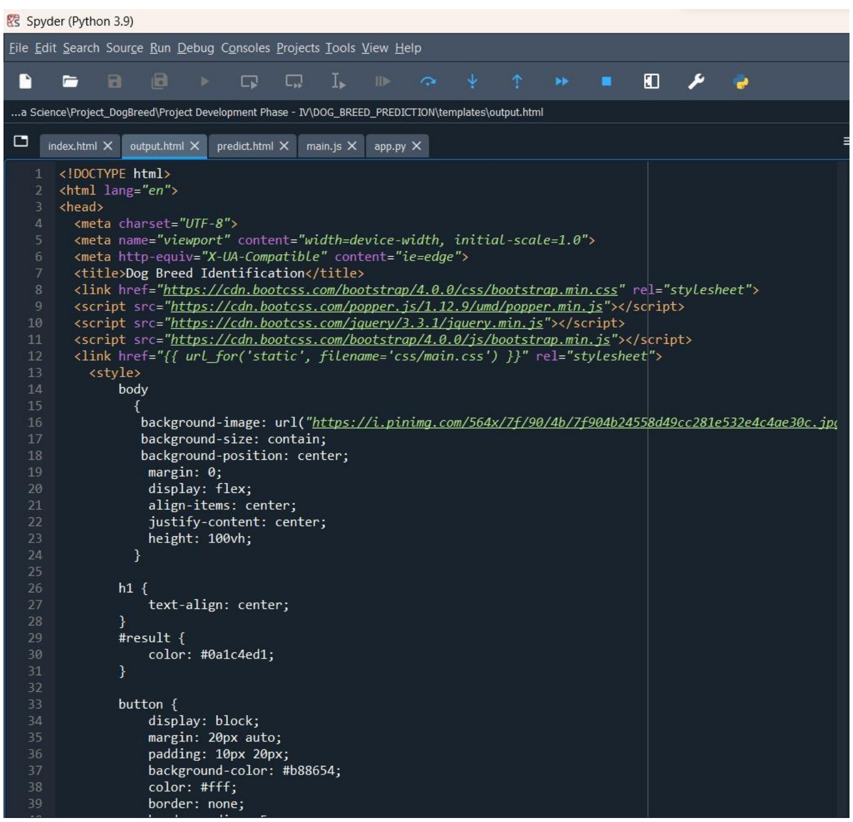
... Science\Project_DogBreed\Project Development Phase - IV\DOG_BREED_PREDICTION\templates\predict.html

index.html output.html predict.html main.js app.py

```html
      .container {
          max-width: 1000px;
          margin: 50px auto;
          padding: 20px;
          display: flex;
          background-color: rgba(255, 255, 255, 0.8);
          border-radius: 10px;
          box-shadow: 0 0 10px rgba(0, 0, 0, 0.1);
      }

    button {
        display: block;
        margin: 20px auto;
        padding: 10px 20px;
        background-color: #b88654;
        color: #fff;
        border: none;
        border-radius: 5px;
        cursor: pointer;
        text-align: left;
    }

    button:hover
      {
        background-color: #633d16;
      }

    </style>
</head>

<body>

    <div class="container">
    <h2>Upload Image Here to Identify its Breed</h2>
    </div>
    <div class="container">
     <div class="column">
        <img src="https://media.istockphoto.com/id/1278389684/photo/large-group-of-various-breeds-of-do
        <form action = "http://localhost:5000/predict" id="upload-file" method="post" enctype="multipar
```


Spyder (Python 3.9)
File Edit Search Source Run Debug Consoles Projects Tools View Help
...a Science\Project_DogBreed\Project Development Phase - IV\DOG_BREED_PREDICTION\templates\output.html
index.html
output.html
predict.html
main.js
app.py
{
background-color: #633d16;
}
.container {
text-align: center;
max-width: 500px;
padding: 20px;
border-radius: 10px;
background-color: rgba(255, 255, 255, 0.8);
box-shadow: 0 0 10px rgba(0, 0, 0, 0.1);
display: flex;
}
h2
{
text-align: center;
font-size: 20px;
font-weight: bold;
}
</style>
</head>
<body>
<div class="container">
<div class="column">
<h2>The Dog's Breed is {{breed}}</h2>
<button>Home</button>
</div>
</div>
</body>
<footer>
<script src="{{ url_for('static', filename='js/main.js') }}" type="text/javascript"></script>
</footer>
</html>

Output Page:


Spyder (Python 3.9)
File Edit Search Source Run Debug Consoles Projects Tools View Help
...a Science\Project_DogBreed\Project Development Phase - IV\DOG_BREED_PREDICTION\templates\output.html
index.html
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predict.html
main.js
app.py
<!DOCTYPE html>
<html lang="en">
<head>
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<script src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
<script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
<script src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
<link href="{{ url_for('static', filename='css/main.css') }}" rel="stylesheet">
<style>
body
{
background-image: url("https://i.pinimg.com/564x/7f/90/4b/7f904b24558d49cc281e532e4c4ae30c.jp
background-size: contain;
background-position: center;
margin: 0;
display: flex;
align-items: center;
justify-content: center;
height: 100vh;
}
h1 {
text-align: center;
}
#result {
color: #0a1c4ed1;
}
button {
display: block;
margin: 20px auto;
padding: 10px 20px;
background-color: #b88654;
color: #fff;
border: none;

Spyder (Python 3.9)

File Edit Search Source Run Debug Consoles Projects Tools View Help

...a Science\Project_DogBreed\Project Development Phase - IV\DOG_BREED_PREDICTION\templates\output.html

index.html output.html predict.html main.js app.py

```
            display: block;
            margin: 20px auto;
            padding: 10px 20px;
            background-color: #b88654;
            color: #fff;
            border: none;
            border-radius: 5px;
            cursor: pointer;
            text-align: left;
        }

        button:hover
          {
            background-color: #633d16;
          }


        .container {
            text-align: center;
             max-width: 500px;
            padding: 20px;
            border-radius: 10px;
            background-color: rgba(255, 255, 255, 0.8);
            box-shadow: 0 0 10px rgba(0, 0, 0, 0.1);
             display: flex;


        }
        h2
          {
            text-align: center;
            font-size: 20px;
            font-weight: bold;
          }
    </style>
</head>
<body>
    <div class="container">
    <div class="column">
```

Spyder (Python 3.9)

File Edit Search Source Run Debug Consoles Projects Tools View Help

...a Science\Project_DogBreed\Project Development Phase - IV\DOG_BREED_PREDICTION\templates\output.html

index.html output.html predict.html main.js app.py

```
          {
            background-color: #633d16;
          }


        .container {
            text-align: center;
             max-width: 500px;
            padding: 20px;
            border-radius: 10px;
            background-color: rgba(255, 255, 255, 0.8);
            box-shadow: 0 0 10px rgba(0, 0, 0, 0.1);
             display: flex;


        }
        h2
          {
            text-align: center;
            font-size: 20px;
            font-weight: bold;
          }
    </style>
</head>
<body>
    <div class="container">
    <div class="column">
    <h2>The Dog's Breed is {{breed}}</h2>
     <a href='/'><button>Home</button></a>
     </div>
     </div>
</body>
<footer>
    <script src="{{ url_for('static', filename='js/main.js') }}" type="text/javascript"></script>
</footer>
</html>
```

Main.js:

```javascript
$(document).ready(function () {
    // Init
    $('.image-section').hide();
    $('.loader').hide();
    $('#result').hide();

    // Upload Preview
    function readURL(input) {
        if (input.files && input.files[0]) {
            var reader = new FileReader();
            reader.onload = function (e) {
                $('#imagePreview').css('background-image', 'url(' + e.target.result + ')');
                $('#imagePreview').hide();
                $('#imagePreview').fadeIn(650);
            }
            reader.readAsDataURL(input.files[0]);
        }
    }
   $("#imageUpload").change(function () {
        $('.image-section').show();
       $('#btn-predict').show();
        $('#result').text('');
        $('#result').hide();
        readURL(this);
   });

     //Predict
    $('#btn-predict').click(function () {
       var form_data = new FormData($('#upload-file')[0]);

        // Show loading animation
        $(this).hide();
        $('.loader').show();

        // Make prediction by calling api /predict
        $.ajax({
            type: 'POST',
            url: '/output',
            data: form_data,
            contentType: false,
            cache: false,
            processData: false,
            async: true,
            success: function (data) {
                // Get and display the result
                $('.loader').hide();
                $('#result').fadeIn(600);
                $('#result').text(data);
                console.log('Success!');
            },
        });
    });
});
```

Main.css:

Spyder (Python 3.9)

...ata Science\Project_DogBreed\Project Development Phase - IV\DOG_BREED_PREDICTION\static\css\main.css

index.html | output.html | predict.html | main.js | app.py | main.css

```css
.img-preview {
    width: 256px;
    height: 256px;
    position: relative;
    border: 5px solid #F8F8F8;
    box-shadow: 0px 2px 4px 0px rgba(0, 0, 0, 0.1);
    margin-top: 1em;
    margin-bottom: 1em;
}

.img-preview>div {
    width: 100%;
    height: 100%;
    background-size: 256px 256px;
    background-repeat: no-repeat;
    background-position: center;
}

input[type="file"] {
    display: none;
}

.upload-label{
    display: inline-block;
    padding: 12px 30px;
    margin: 20px auto;
    border-radius: 5px;
    background: #b88654;
    color: #fff;
    font-size: 1em;
    transition: all .4s;
    cursor: pointer;
    text-align: left;
}

.upload-label:hover{
    background: #633d16;
    color: #fff;
}

```

Spyder (Python 3.9)

...ata Science\Project_DogBreed\Project Development Phase - IV\DOG_BREED_PREDICTION\static\css\main.css

index.html | output.html | predict.html | main.js | app.py | main.css

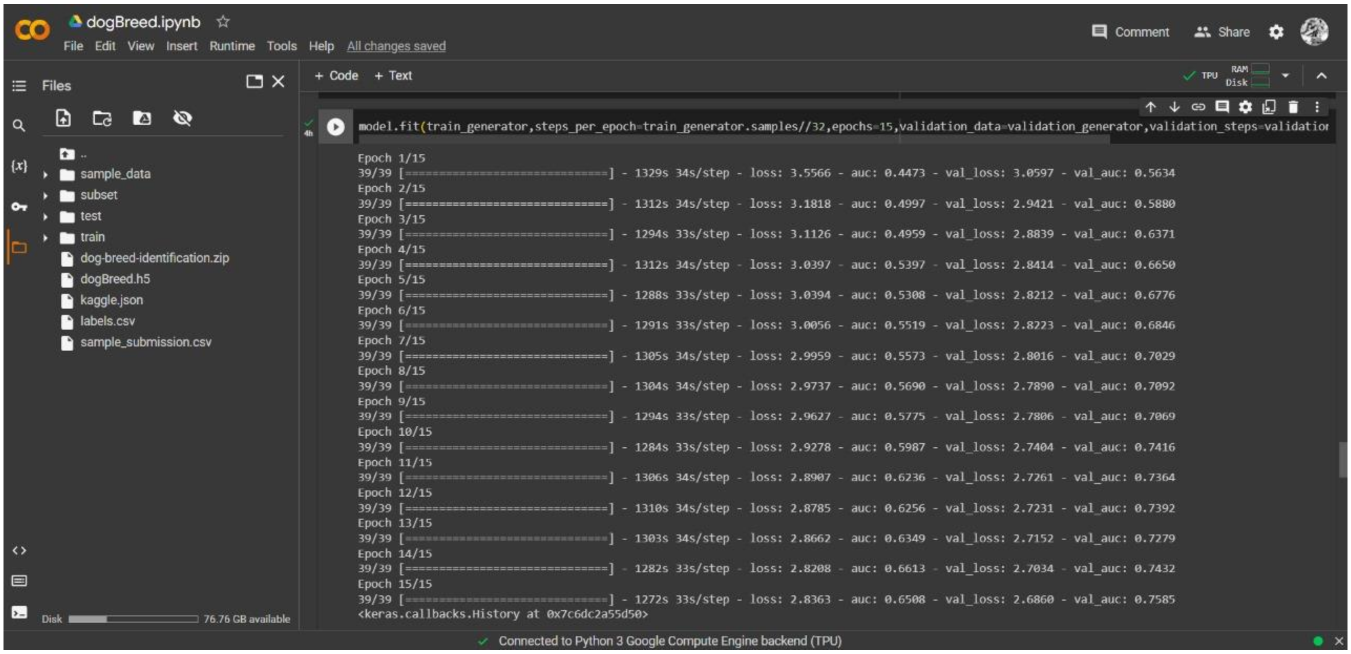
```css
    background-position: center;
}

input[type="file"] {
    display: none;
}

.upload-label{
    display: inline-block;
    padding: 12px 30px;
    margin: 20px auto;
    border-radius: 5px;
    background: #b88654;
    color: #fff;
    font-size: 1em;
    transition: all .4s;
    cursor: pointer;
    text-align: left;
}

.upload-label:hover{
    background: #633d16;
    color: #fff;
}
```


```css

.loader {
    border: 8px solid #f3f3f3; /* Light grey */
    border-top: 8px solid #3498db; /* Blue */
    border-radius: 50%;
    width: 50px;
    height: 50px;
    animation: spin 1s linear infinite;
}

@keyframes spin {
    0% { transform: rotate(0deg); }
    100% { transform: rotate(360deg); }
}

```

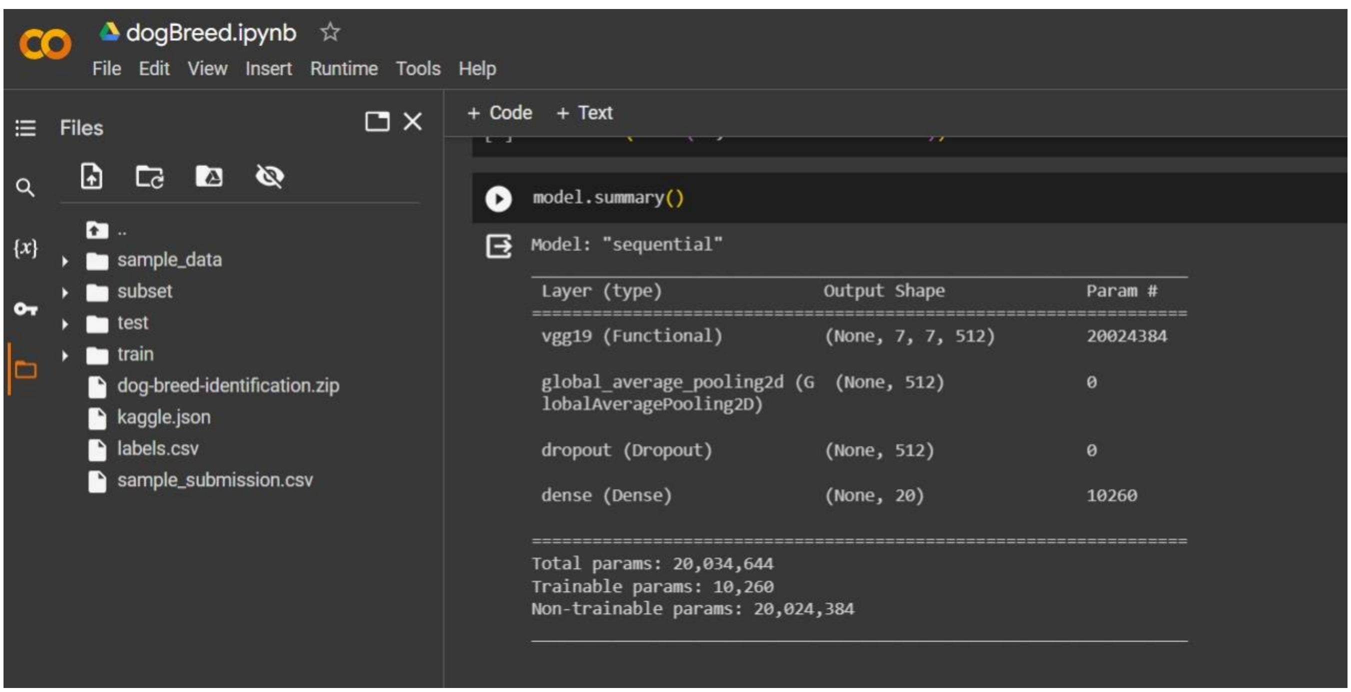
8. PERFORMANCE TESTING

8.1 Performance Metrics

Model Accuracy:

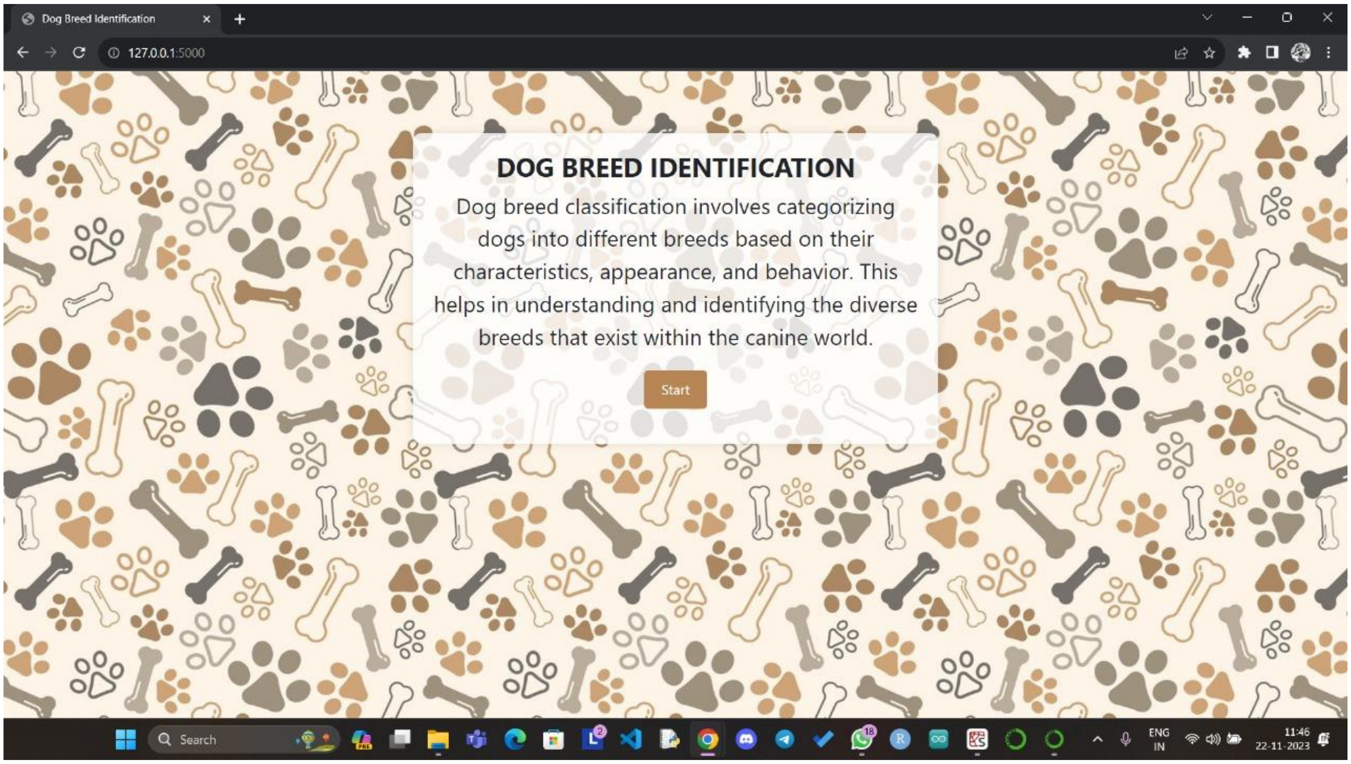


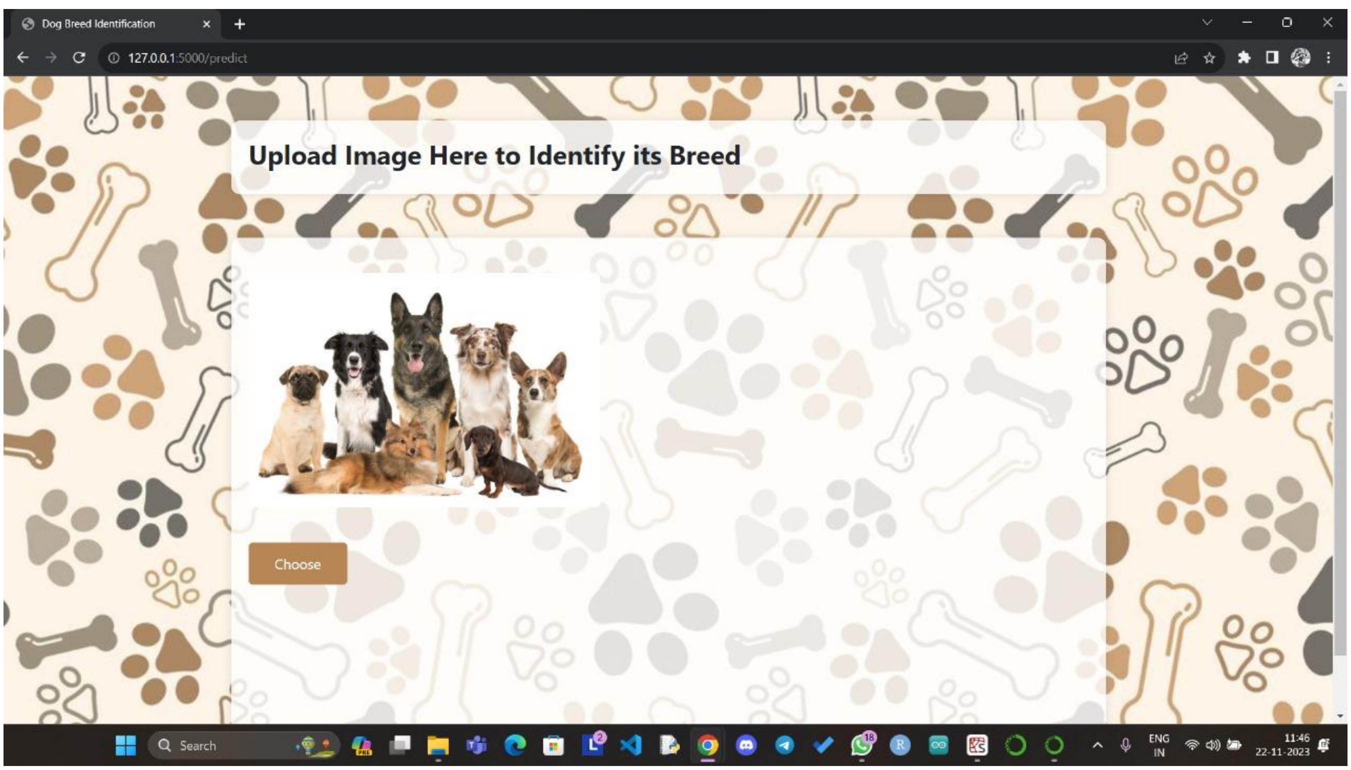
Model Summary:

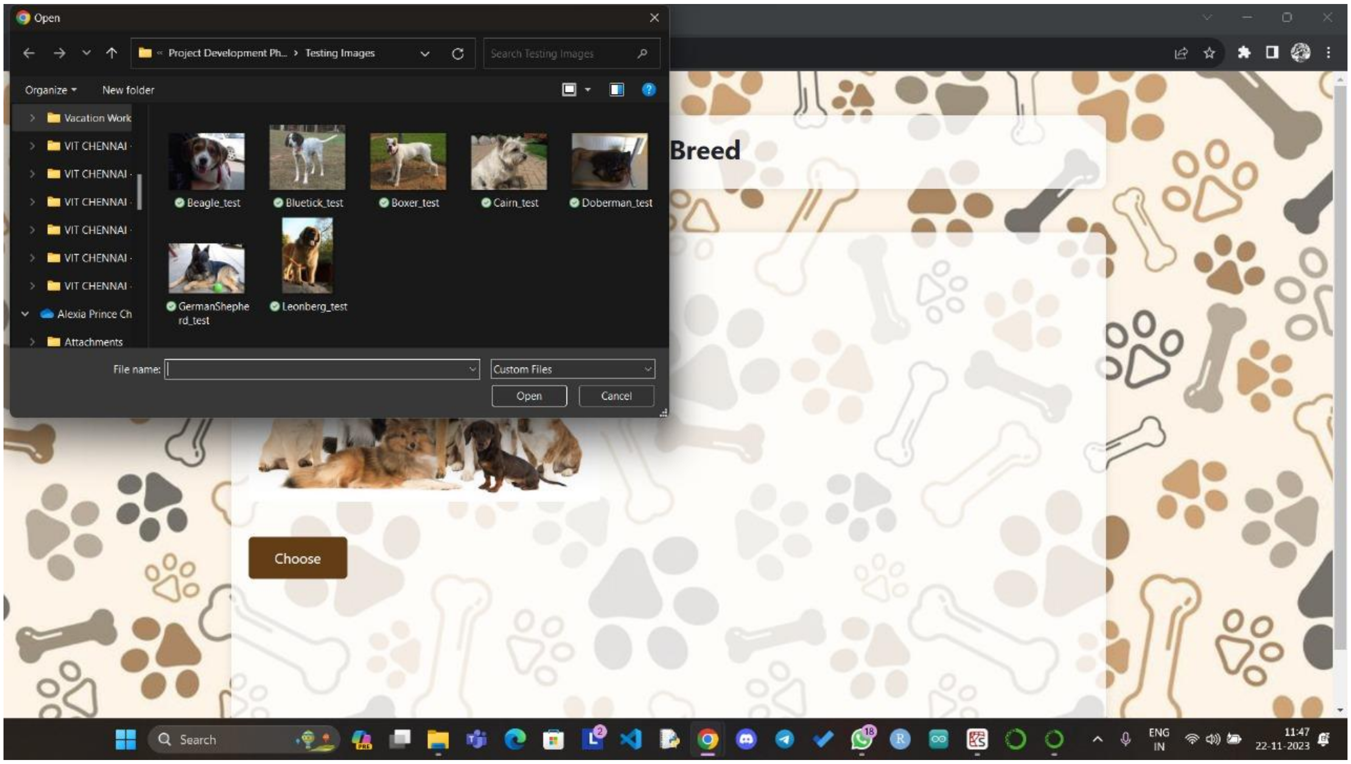


9. RESULTS

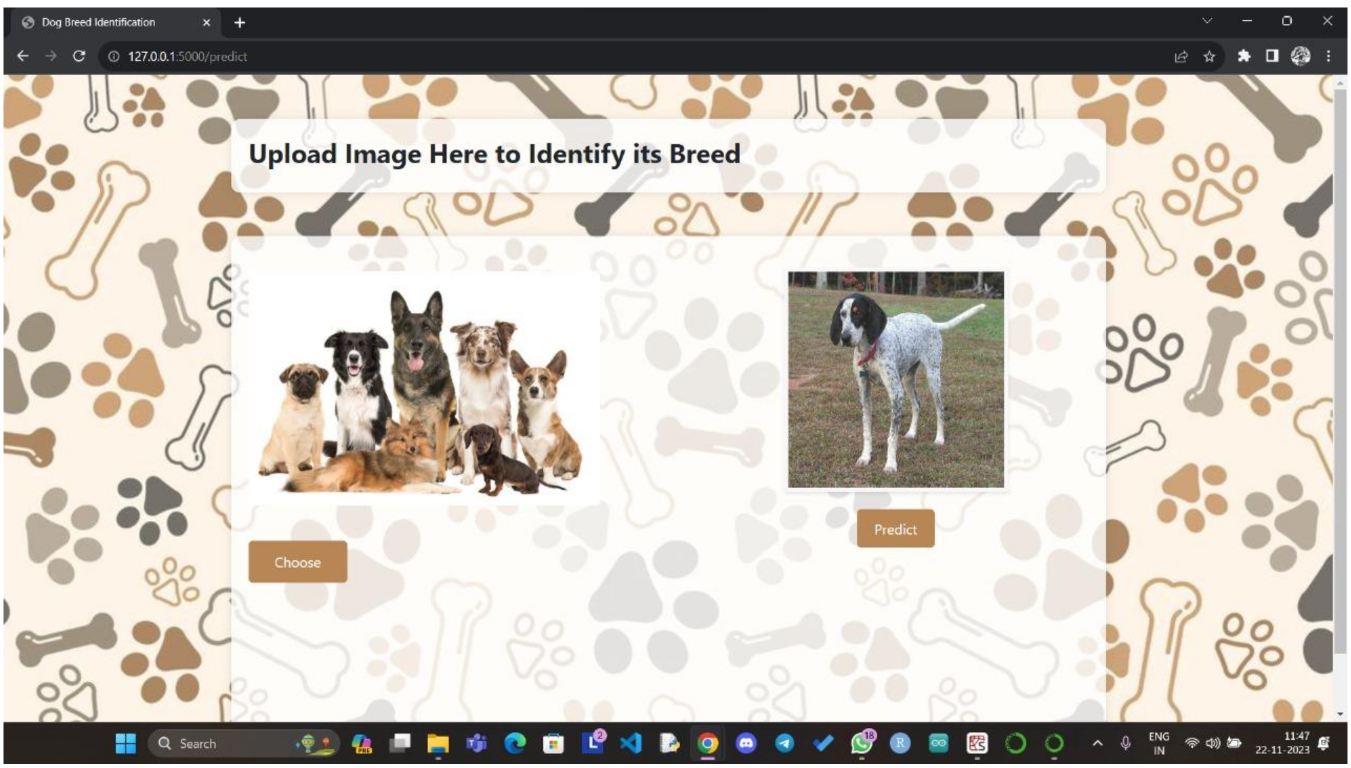
9.1 Output Screenshots



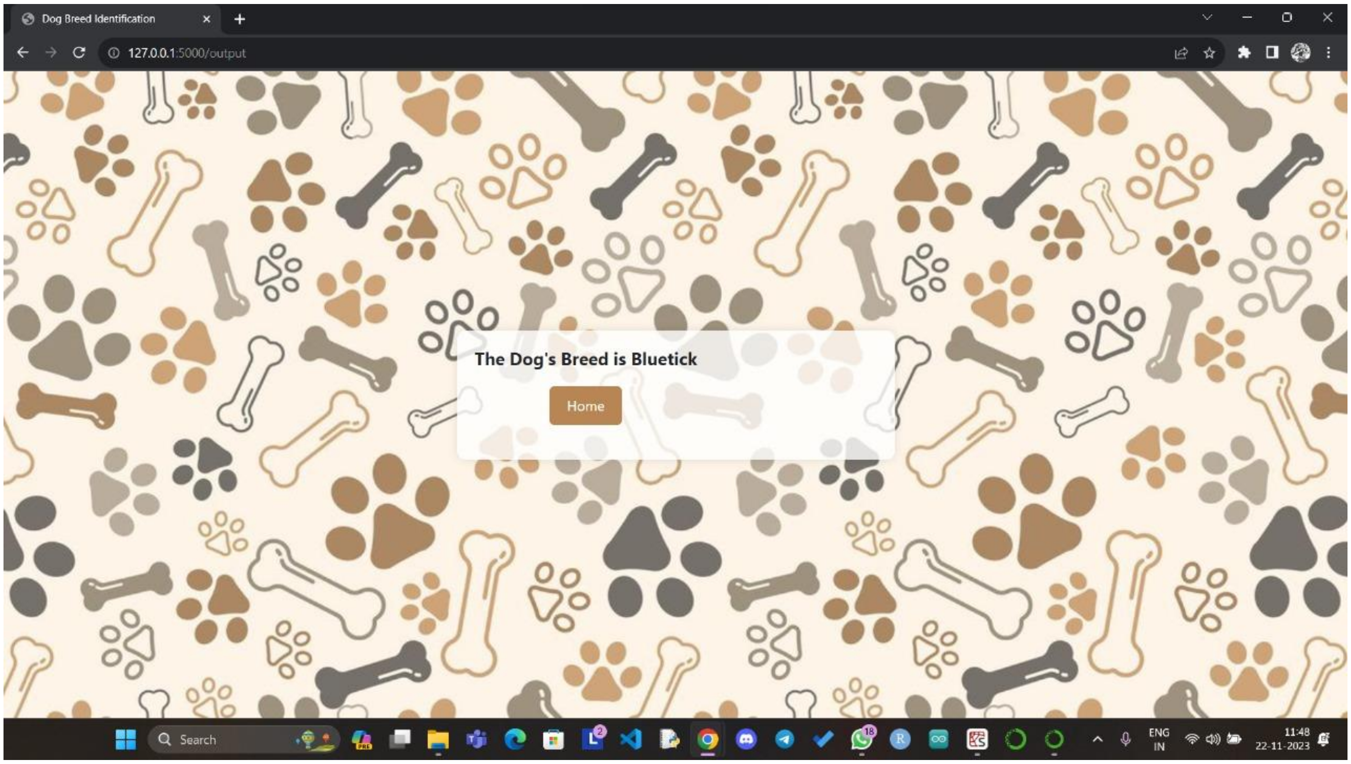




Open
Project Development Ph... > Testing Images
Search Testing Images
Organize
New folder
Vacation Work
VIT CHENNAI
Alexia Prince Ch
Attachments
Beagle_test
Bluetick_test
Boxer_test
Cairn_test
Doberman_test
GermanShepherd_test
Leonberg_test
File name:
Custom Files
Open
Cancel
Breed
Choose



Dog Breed Identification
127.0.0.1:5000/predict
Upload Image Here to Identify its Breed
Predict
Choose



10. ADVANTAGES & DISADVANTAGES

ADVANTAGES	DISADVANTAGES
To accurately identify and classify dog breeds.	Frustration with the lack of accessible and reliable breed information.
High level of confidence, robustness to diverse images, and generalizability to new or unseen data.	Fear of limited resources and tools for accurate breed identification.
Pre-trained models are often readily available and accessible.	Fear of misidentifying a dog's breed, which could lead to incorrect care or treatment.
Could be utilized in various applications, such as pet identification, veterinary assistance, or animal shelters to aid in dog breed recognition.	Anxiety about the welfare of dogs in shelters and their chances of adoption if breed information is unclear.

More generalized, reducing the chances of overfitting, especially in scenarios with limited data.	Frustration with the complexity of dog breed identification and the time it can take.

11. CONCLUSION

The proposed solution aims to develop an accurate and reliable dog breed identification system using transfer learning with the VGG19 architecture. This system will take an input image of a dog and predict its breed, providing valuable information to dog owners, veterinarians, adoption centres, and researchers.
Accurate dog breed identification can help potential pet owners better understand the specific needs and characteristics of a breed, ensuring a better match between dogs and owners. It can educate the public about different dog breeds, promoting responsible pet ownership, and dispelling misconceptions and stereotypes associated with certain breeds.

12. FUTURE SCOPE

The future scope for a dog breed identification project using transfer learning is promising. Advancements in deep learning techniques will likely lead to more accurate and robust models. Optimizing these models for mobile and embedded systems could enable real-time applications in pet-related services, like veterinary clinics or smart cameras for pet monitoring. Expanding beyond dog breeds to recognize other animals or finer species classifications could be a future direction, aiding wildlife conservation or animal care. Ethical considerations, dataset quality improvements, collaborations with veterinary science, integration into smart home systems, and applications in education, entertainment, adoption, and animal welfare represent potential avenues for this technology. Ultimately, the future lies in enhancing accuracy, addressing ethical concerns, and integrating breed identification into various domains to positively impact pet care, animal welfare, and technological advancements in computer vision.

13. APPENDIX

GitHub & Project Demo Link:

Github link:

https://github.com/smartinternz02/SI-GuidedProject-601517-1699176574

Project Demo Link:
https://drive.google.com/file/d/1zoHr_kxf0snj7Qoo9Q84nnoOu5dzIbLR/view?usp=sharing