# Project Design Phase I
## Solution Architecture

| Date | 23 November 2023 |
|------|------------------|
| Team ID | 592677 |
| Project Name | Dog Breed Identification Using Transfer Learning |
| Maximum Marks | 4 Marks |

## Solution Architecture:

**The proposed solution architecture for the dog breed identification project consists of three main components:**

**Component 1: Data Preprocessing and Feature Extraction**

This component is responsible for preparing the image data for the machine learning model. It includes tasks such as:

Resizing and normalizing images to a consistent size and format

Enhancing image quality and reducing noise

Augmenting the training data by creating variations of existing images

The goal of this component is to provide the machine learning model with high-quality, consistent data that will improve its accuracy and generalization ability.

**Component 2: Model Selection and Fine-tuning**

This component involves selecting a pre-trained convolutional neural network (CNN) model and fine-tuning it for the specific task of dog breed classification. CNNs are a type of machine learning model that are particularly well-suited for image recognition tasks.

The fine-tuning process involves adjusting the weights and biases of the pre-trained model to better represent the dog breed dataset. This process is typically done using an iterative approach, where the model is trained on a subset of the data, evaluated on a separate validation set, and then adjusted accordingly.

**Component 3: Model Evaluation and Deployment**

This component is responsible for evaluating the fine-tuned model's performance on a separate test dataset and deploying it into production. The evaluation process involves measuring the model's accuracy, precision, and recall on a variety of dog breed images.

Once the model has been evaluated and found to be satisfactory, it can be deployed into production. This may involve integrating the model into a web application or mobile app, or making it available as an API for other developers to use.

## Interactions between Components

**The components of the solution architecture interact with each other in the following ways:**

The preprocessed image data generated by Component 1 is provided as input to Component 2 for model training and fine-tuning.

The fine-tuned model generated by Component 2 is provided as input to Component 3 for model evaluation and deployment.

The interactions between the components ensure that the data flows through the system in a logical and efficient way.

This solution architecture provides a robust and scalable approach to dog breed identification. By using a pre-trained CNN model, we can leverage the power of deep learning without having to train a model from scratch. Additionally, the fine-tuning process allows us to tailor the model to the specific task of dog breed classification. The use of separate training, validation, and test datasets ensures that the model is evaluated fairly and that it generalizes well to unseen data.

Users → Website

Output displayed on web page

RAW Image Input

Image Processing

Data Collection → Data Preprocessing

External Data Sources

Outlier Handling

Train Test Split

Null Value Handling

Model Selection

Model Building

Model Training

Model Evaluation

Save Model

Cross Referencing Db ← Model Computation

Possible classification based on probabilities

Server

Database