# IDENTIFYING DOG BREEDS USING CNN MODELS

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**ABSTRACT_**One of the multiclass classification problems is image recognition or image processing, which involves identifying the breed of dog in a given image. Both deep learning and machine learning are paying close attention to image processing. Using this method, the image is processed so that the computer recognises its features and can categorise it. The suggested system makes use of deep learning techniques, such as CNNs (convolutional neural networks). CNN is frequently used in a variety of contexts. Performing various procedures on larger datasets is beneficial. Canine variety distinguishing proof is a novel utilization of Convolutional Brain organizations. Because dog breeds share many similarities with other classes, it is hard to identify or classify them, which makes it hard to identify them. Conv2D array, relu, Maxpooling2D, Flatten, Dropout, and Dense are just a few of the many layers that can be found in the study of Convolutional Neural Networks. These layers help us better comprehend the architectural layer of a neural network. In this task, we will perceive how to utilize Keras and Tensor Stream to construct, train and test a Convolutional Brain Organization fit for recognizing the type of a canine in a provided picture. This is a problem with supervised learning. There are approximately 120 distinct dog breeds represented here, and the dataset contains 20600 images of dogs. These images are loaded, normalized, and transformed into a NumPy array. To ensure the highest level of precision, we employ a batch size of 128 and 100 epochs.

## 1.INTRODUCTION

In the past few years, Deep learning has been focused on many fields, such as image processing and natural language process. Particularly Convolutional Neural Networks (CNN) increased high accuracy in the image processing field. This Convolutional Neural Network has become most famous for image classification problems. When compared to other classification techniques, CNN has unique features that start from raw data and thereby apply the modeling technique. CNN works like human vision, firstly we can classify things using our vision. We can present CNN in the form of an

algorithm by building a mathematical model. Convolutional neural networks are effective in analyzing visual imagination. They use multi-layer perceptron's and require less preprocessing when compared with other image classification algorithms. CNN has at least one fully connected layer preceded by the desired number of fully convolutional layers as a standard multi-layered network. One of the benefits of CNN is that it is translation invariant, also referred to as shift invariant or space invariant artificial neural networks.

There are three main layers used in the CNNs, namely the convolutional layer, pooling layer, and fully connected layer, (CONV-POOL-FC). Each layer can be repeated a required number of times to accomplish the desired output. CNN's divide the images into smaller parts/features and match them individually.

- The input image comprises raw pixel values represented in a matrix format (m x m x r, m rows, n columns, r channels, for an RGB image r=3).
- CONV layer computes the output of neurons connected to the local region by computing the dot product of the sub-image and k-filters (size - n x n x q) and finding the average value to obtain k-filtered images.
- POOL layer performs a down sampling operation along the spatial dimensions i.e., it takes the stack of filtered images and reduces the size of the image matrix to give an optimal output image.
- FC layer will compute the class scores, resulting in a volume of size [1x1x a]

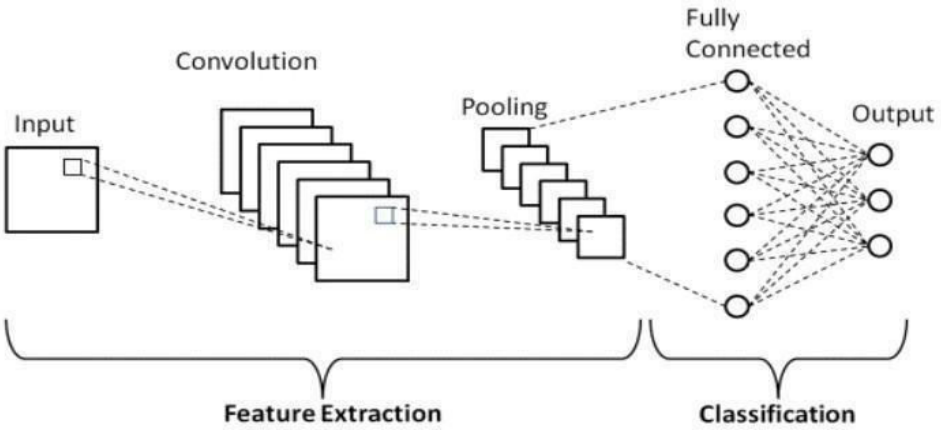



**Fig:** 1.1 BASIC CNN ARCHITECTURE

Dogs are considered to be man's best friend and they act as the best pet. They can be easily trained and used as service dogs to help handicapped persons and guide them. They are also used for military purposes. There were almost 350 dog breeds all over the world. They require care, food, and a habitat environment depending on the breed and for this reason, we are going to identify the breed of the dog. Our project is to identify different dogs from different breeds. Our dataset is downloaded from Kaggle: Dog Breed Identification. There is a total of 20,000+ images of dogs in our data set. We separate our dataset into two parts for training and testing. Since our dataset is too large, we use Keras and Tensor Flow to build, train and test a convolutional neural network capable of identifying the breed of a dog in a supplied image

## 2.LITERATURE SURVEY

This problem statement has been extensively studied over the past 5 years by researchers and automotive companies in a bid to create a solution, and all their solutions vary from analyzing the Dog breed identification using different methods some of the research was as follows.

The work of K. Mulligan et al [1] and P. Rivas et al [2] in the year 2019, July, conducted dog breed identification with the help of Exception Convolutional Neural Network architecture. This paper is mainly focused on classification tools. The dataset is downloaded from Kaggle. This classification is worked on CNN and Exception with multilayer perceptron. The methods used for Exception and MLP. Experimented on 120 unique breeds over 10,200 images of dogs. From this project, a confusion matrix was created over training and test set. Its major drawbacks were generating a diagonal pattern and the values incorrectly predicted. The methods were not passed through cross- validation. Achieved accuracy of 54.80 %. Later with the performance matrix, changing and increasing the number of splits utilized by both Log Loss and balance accuracy. After doing this achieved the correct prediction of describing the image belonging to which type of breed.

The work performed by Wenting Shi et al [3], Jiaquan Chen et al [4], Muyun Liu et al [5], and Fangyu Liu et al [6] in the year 2019 mostly focused on pattern recognition of which object belongs. This project is based on image or pattern recognition of identifying the dog's breed. Four models were used in this project such as ResNet18, VGG16, DenseNet161, and AlexNet. Data Augmentation was used to

increase the number of training data parameters. Conducted some experiments by using Data Augmentation, Transfer Learning, Stochastic Gradient Descent (SGD), Adaptive Moment Estimation (Adam), and parameter tuning. By comparing the four models Densenet161 gives the best accuracy. Comparing Loss Analysis, and Accuracy Analysis by designing a model using

50 epochs achieved an accuracy of 82.36% from the Densenet161model. The major drawback is by using VGG16 over fitting occurs. In Y. Liuetet al [7] all research paper, the authors perform domain adaptation, a branch of transfer learning, to adapt the data distributions of source and target so that the classification could be more efficient in a cross-subject scenario.

In this research paper, Zalan Raduly et al [8], Csaba Sulyok et al [9], Zsolt vadaszi et al [10], and Attila Zoldc et al [11] in the year 2018 implement a fine- grained image recognition problem. Used multiclass classification, Inception ResNetv2, mobile trained model. The dataset is taken from the Stanford dog dataset. The training data is split into train and validation folds. Fine-tuning and 5 – fold cross validation was also used in this project. This project consists of various experiments in CNN architectures, Data Augmentation, Learning and hyper parameters, and Frozen graphs. Accuracy, precision, recall, and confusion matrices were used to predict the accuracy of different methods and take the best one. Used one of the software called “sniff” for the prediction of trained Convolutional neural networks. Two different CNN architectures were used in this project. One is NASNET-A mobile architecture and Inception ResNet v2 deep architecture. By using Inception ResNetv2 we get an accuracy of 90.69%.

Vijaya Kumar et al [12] and B. Bhavya et al [13] focused on fine-tuning pre- trained models in the year 2019. This project was implemented by using Image classification, Transfer learning, Convolutional Neural Networks, Vgg16, Exeception, and Inception V3. Finally, a multi-class classifier named logistic regression was used to identify the breed of the dog. The major drawback is by using CNN we need to have a large amount of dataset and images to reduce this drawback they used transfer learning to train the model to provide the best solution for this. The results that are produced by transfer learning are better than the results produced by Inception v3.Because a Multinomial linear classifier was applied to pre-train the model in transfer learning. From this project, we can conclude that Convolutional neural

networks with transfer

learning provide a very better solution for different image classifications. But in thistype of project when there is a need to rebuild the project from the scratch it is difficult to start because it requires a lot of time and cost by using CNN, so weuse (DCGAN). Proposed Data Augmentation is more effective when compared to standard Augmentation. The major drawback is it generates both realistic and unrealistic images. The proposed approach was to apply DCGAN to CNN Data Augmentation. DCGAN has both a generator and a discriminator to create images. From this method, we can generate many more images and increase the efficiency of the CNN model. Using this model, we canachieve an accuracy of 82.7%.

## 2.1 INFERENCES FROM LITERATURE SURVEY

From the literature survey, Traditional classification makes the classification or identification less effective. To overcome this problem, we need to use pre- trained Convolutional Neural Networks for better efficiency and accuracy. CNN is a class of deep learning and gives good accuracy when there is a large dataset. When Convolutional Neural Networks work with transfer learning.

Hiroki Watabe et al [14] and Hiroki Watanabe et al [15] in the year 2017 implemented CNN by using Data Augmentation and Discriminative Generative Adversaria Network

different pre-trained models such as Exception, Augmentation, and Transfer Learning, and different layers of CNN such as RESNET18, VGG16, and DenseNet161 give us better results. From this, I came to know that CNN is the best method for image classification and they are known for their ability to reduce the computational time and adapt to different variations of images.

## 2.2 ERENCES FROM LITERATURE SURVEY:

This project examines how to use Keras and Tensor Flow to build, train and test a Convolutional Neural Network capable of identifying the breed of a dog in a supplied image. By using different methods such as LeNet-5, VGG16, and Exception, by predicting the model and finding the accuracy of the model. Later on, building a website with flask which will be more user-friendly for the end user to identify the breed of the dog.

## 3.PROPOSED SYSTEM

We present a novel approach to accurately classifying dog breeds in images by utilizing the powerful capabilities of the Exception Architecture in this project, which is titled "Dog Breed Classification using Deep Learning." Our Python-based deep learning model performs admirably, with training accuracy of 91.34 percent and validation accuracy of 89.45 percent, respectively.

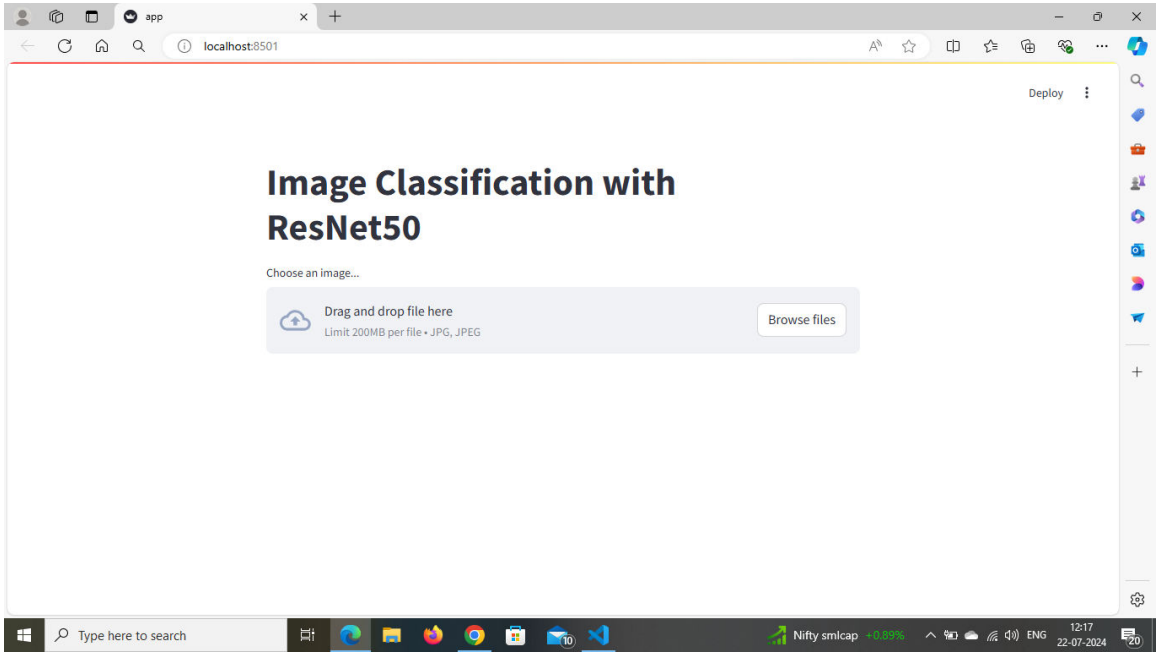
The core of our procedure lies in a cautiously organized dataset containing 7,515 canine pictures, enveloping a great 133 different canine variety orders. Our model is able to distinguish intricate differences between various dog breeds thanks to its exceptional generalizability and robustness, which it uses to take advantage of the vastness of this dataset. We are able to achieve a higher level of feature extraction and representation by implementing the Exception Architecture, which enables our model to identify intricate patterns and features within the images, resulting in its remarkable classification prowess.

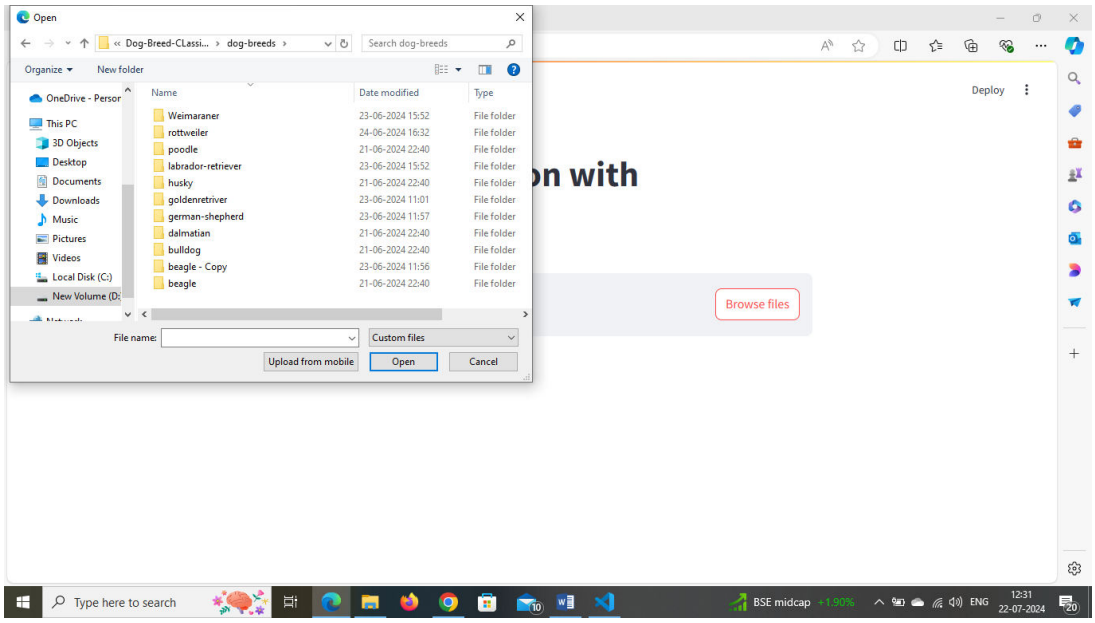
Our model effectively learns from the dataset and captures the subtle nuances that distinguish one dog breed from another because it makes use of this cutting-edge architecture. Our approach outperformed conventional methods in tackling the difficult task of dog breed classification, as demonstrated by the obtained results. The high preparation and approval correctnesses show the model's capacity to learn and sum up successfully, in any event, when confronted with a broad scope of canine varieties

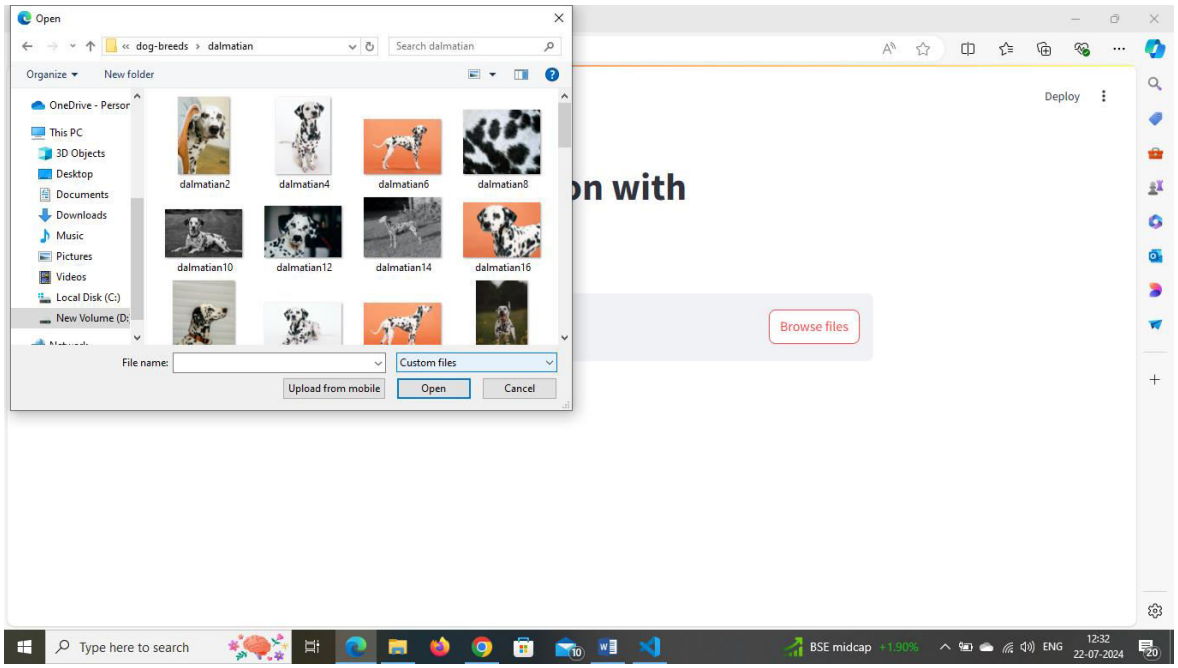
### 3.1 IMPLEMENTAION

- Split the dataset into training and test datasets and create accuracy and value accuracy of the model and plot the accuracy model between them.
- Predicting the accuracy score of the model and we take the best one as our model and save it.
- We use the best model for the prediction of dog breeds.
- By saving the model, creating some HTML files with python code using the flask application, and creating an eb application for the prediction of dog breeds.

## 4.RESULTS AND DISCUSSION

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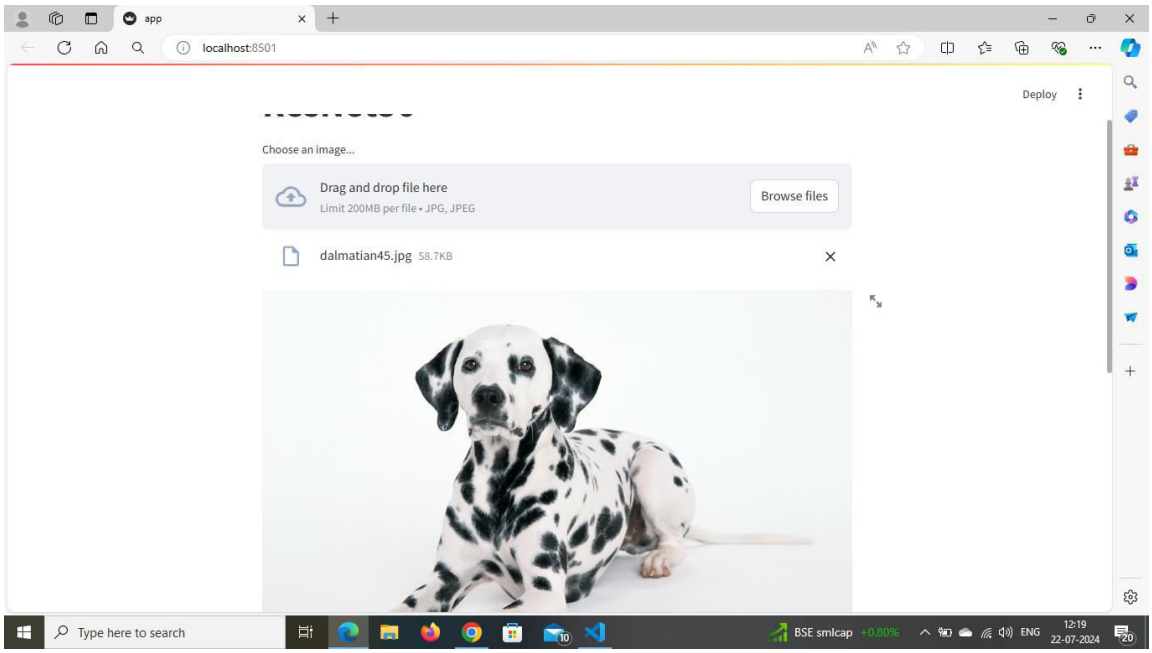
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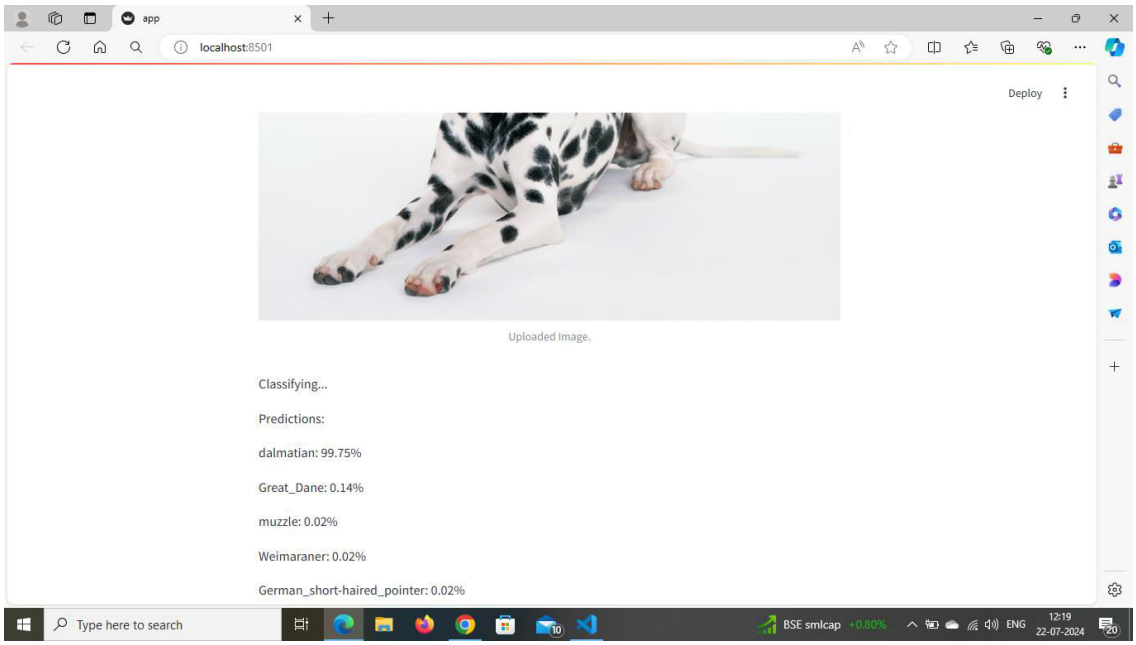


## 5.CONCLUSION

Two unique convolutional brain network designs have been introduced: the Inception Resnet V2 deep architecture and the mobile NASNet-A architecture. A specific image classification problem was used to test the architectures: that of identifying distinct dog breeds. The Stanford Dogs dataset is used to fine-tune the pre-trained networks. Even for the smaller, mobile-friendly CNN, which achieves results with only 10% less accuracy than the deep Inception Resnet V2 model, the outcomes are encouraging. Sniff!, our software-based application of the fine-tuned convolutional neural networks, has also been the subject of our presentation: a mobile application that, even without an Internet connection, can identify a dog's breed from an image. Convolutional neural networks can be enhanced through: Generative Adversarial Nets (GAN) [4] were used to expand the training dataset, train other convolutional neural network architectures, add more popular dog breeds to the dataset, use detectors to locate multiple dogs on an image, and improve server and mobile classification.

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