# Dog Breed Prediction System (Web)

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**Abstract -***Deep learning allows us to train algorithms to handle picture classification challenges in a healthy way. The Convolutional Neural Network (CNN) is a widely used image classification and detection technology. We define a CNN-based method for identifying dog breeds per class image in this paper. Stanford University provided the data set for this investigation. The system extracts characteristics using several models and then combines them to construct a deep net that predicts dog breed based on the greatest probability obtained. The algorithm CNN delivers the most accurate and efficient prediction, according to an experimental technique and comparative analysis of different methodologies.*

*The system predicts with changes to the epoch value, weights, and other data augmentation strategies.*

***Key Words*: Machine Learning, Tensorflow, Classification, CNN, Deep Learning**

## 1. INTRODUCTION

Among pets, dogs are the most popular animals. Customers interested in purchasing a dog can conduct research by observing canines owned by others. It may not always be easy to approach the dog's owner and inquire about the breed. Additionally, it's possible that the dog's owners aren't aware of their dog's breed. We attempted to solve this market need in this paper by automating the process of locating a dog breed via an Android application that allows you to determine the breed of a dog just by snapping a picture of it. CNNs (Convolutional Neural Networks) mimic human vision. In simple terms, we can use our vision to categorise thing. CNN develops software that enables visual identification and recognition by constructing a mathematical model and putting it into practice as an algorithm. CNNs are a subset of deep learning and feed forward artificial neural networks. It functions in the same way as ordinary neural networks, except that every input is a picture. As a result of the assumption, we can hide a few properties from the architecture, making the feed forward function more efficient. CNNs have been shown to be useful at analysing visual data. They use multi-layer perceptrons and, in comparison to other image classification algorithms, usually require less preparation.

### 1.2. OBJECTIVES

Creating a system to predict the breed of the dog correctly with the highest possible accuracy. To perform and build a user interface so as to make a system that makes the Dog breed prediction easy through applications of ML. To implement this project using the machine/deep learning algorithms. To show the information about the predicted dog

## 2. LITERATURE SURVEY

Different papers and articles have been reviewed for this project. Also, their conclusions are summarized in this section. The section present documents that were studied prior and post project development. The mentioned articles provide with a better understanding about structure of the system and how various algorithms could be combined together so as to build a system with higher efficiency.

**Table -1:** Publications Cited:

| Title | Year | Author | Summary |
|---|---|---|---|
| Learning Features and Parts forFine-Grained Recognition22 nd Int. Conference on Pattern Recognition | 2015 IRJET | Jonatn Krause;Timnit Gebru;Jia Deng;Li-Jia Li | Just an overviewof learning how to train different Models. Datasets include collection of their own pictures. |
| Ensemble deep neural networks for domain-specific Image Recognition | 2016 IEEE (ICMEW) | Wenbo Li;ChuanKe | Limited Images were taken into consideration for training. Datasets included were not mentioned |
| Dog Breed Identification UsingDeep Learning | 2018IEEE | Zalán Ráduly;Csaba Sulyok | The dataset which wastaken in consideration is very less, Resulting in lower accuracy ResNet-82.01% |
| Transfer Learning on Convolutional Neural Networksfor Dog Identification | 2018IEEE | Xinyuan Tu;Kenneth Lai | The number ofdog breedtaken for training was limited to 100 images per class. The model used and accuracy gained was SFU/Resnet- |

| | | | |
|---|---|---|---|
| | | | 92.34% |
| Dog Identification using Soft Biometrics and Neural | 2019 IEEE | Xinyuan Tu;Svetlana Yanushkevich | Biometrics used in this project needs device of much higher cost to be involved SFU/DenseNet-90.22% |
| Transfer Learning Approach to Fine Grained Image Classification 2019 Int. Russian Automation Conference | 2019 IEEE | ValentinA. Golodov;Mariya S. Dubrovina; Anastasiya S. Paziy | Limited to European dog breeds. The model used and accuracy gained was SFU/VGG16 -91.78% |
| Identification of Dogs breed for deep learning | 2019 IEEE (IACC) | Rakesh Kumar;Manish Sharma;Kritika Dhawale;Gaurav Singal | Used lesser Epoch value augmentation. The model used and accuracy gained was SFU/Inception model- 85.67% |
| Dog-Breed-classifier for facial recognition by using CNN | 2020 | Bickey Kumar shah;Aman Kumar;Amrit Kumar | Only the Images of Dog face would be taken into consideration. The model used and accuracy gained was SFU/Mobile Net-75.2% |

## 3. TECHNICAL DEFINATION

### 3.1 DEEP LEARNING

Deep learning is a type of machine learning method that employs numerous layers to extract higher-level features from unprocessed data. Lower layers in image processing, for example, may recognise edges, whereas higher layers may identify human-relevant notions like numerals, letters, or faces.

### 3.2 CONVOLUTIONAL NEURAL NETWORK

CNN (Convolutional Neural Network) is an acronym for Convolutional Neural Network. Convolutional Neural Networks (CNNs) are a sort of Deep Learning and a unique type of progressing artificial neural network that is activated by the visual brain. The neuron in a layer in CNN is only related to a small area of the layer before it, rather than all the neurons in a completely related manner, so CNN manages fewer weights and a much smaller number of neurons.

### 3.3 ResNet

The structure of this network is built in such way that the convolutional neural network would run in an efficient manner. ResNet is a powerful backbone model that is used very frequently in many computer vision tasks. ResNet uses skip connection to add the output from an earlier layer to a later layer. This helps it mitigate the vanishing gradient problem making it possible to construct networks with up to thousands of convolutional layers, which outperform shallower networks. However, the adding some of deep layers to a network regularly can affect the degradation of the result. It is known as problem of vanishing gradient where in neural networks, while getting skilled via lower backpropagation, relies on the gradient descent, lowering the loss feature to find the lowering weights.

### 3.4 INCEPTION

In a CNN, an Inception Module is an image model block whose goal is to approximate an ideal local sparse structure. Simply said, it lets us to employ many sorts of filter sizes in a single image block, rather than being limited to a single filter size, which we then concatenate and pass onto the next layer.

## 4. PROPOSED SOLUTION

A Dog breed prediction system is built using the convolutional neural network (CNN). The system can be useful for the NGO's who come across a lot of abandoned dogs by knowing about the breeds of the dog. Having the knowledge of dogs breed would prove to be a great asset for the NGO's for treating the dog accordingly. Using the Streamlit module, the system would be more more interactive for the user.

Using Streamlit, a dynamic system could be built for the user convenience. It can be used by the users for their convenience to predict different dog breed.

Around 120 breeds of dog from different parts of the world would be taken into consideration. For training the system a large dataset would be taken into consideration which would be divided into training and testing purpose.

### 4.1 REQUIREMENTS

Anaconda

Anaconda Navigator is a GUI tool that is included in the Anaconda distribution. It allows user to carry out execution of complex projects efficiently. It offers important platform like Jupyter Notebook. Anaconda also provides a command prompt.

Google Colaboratory

Google Colab is a product from Google Research. It is most suitable for machine learning system. Google Colab provides an in-built GUI so as to carry out any User Interface related problems efficiently.

**Technologies used:**

Python

Python is an interpreted high-level general-purpose programming language. Python is dynamically-typed and garbage-collected. Python is preferred for machine learning as it is easy language to code. It also supports essential libraries for conducting the im age classification process.

Tensorflow

TensorFlow is one the important libraries available in python. It is a free and open-source software library for machine learning and AI. It is more oftenly used for carrying out problems using deep neural networks.

Streamlit

Streamlit is an open-source Python library. It is mainly used as for ML. It provides with a dynamic approach towards the sytem.

### 4.2. WORKFLOW OF THE SYSTEM

1. Data Flow Diagram

In corporate statistics, data flow diagrams are used to graphically represent the data flow. DFD denotes the methods used in a model to transfer data from the front to the record garage and generate reports. Logical and physical data float diagrams can be separated. The logical data diagram is a diagram that depicts information using a model to carry out an organization's positive capabilities.

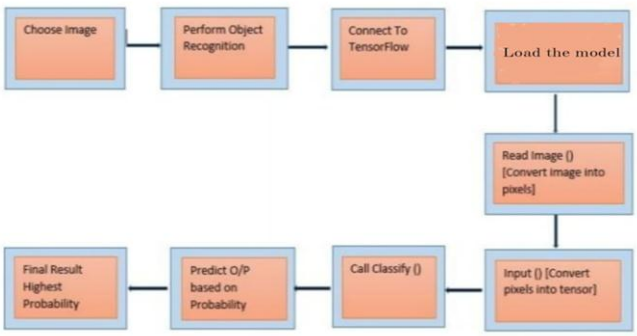


Fig.1- Data Flow Diagram

### 4.3. Data Collection and Preprocessing

Data series is described because the system of collecting, measuring, and reading correct insights for studies the usage of fashionable proven techniques. A researcher can compare their speculation on the premise of amassed facts. In maximum cases, facts series is the number one and maximum crucial step for studies, regardless of the sphere of studies. The technique of facts series is extraordinary for extraordinary fields of study, relying on the specified information.

### 4.4 User Interface

The interface is mainly divided into four section

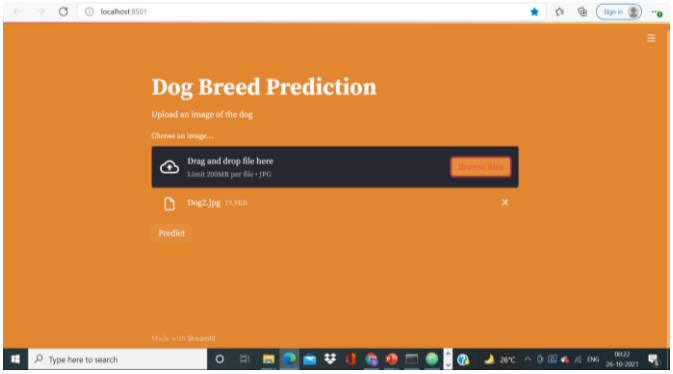


Fig.2 - Interface displayed to the user

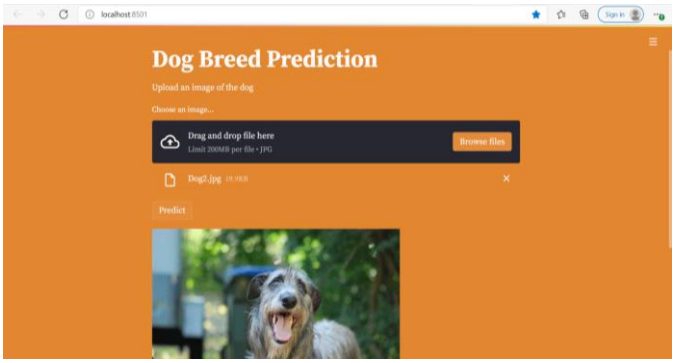


Fig 3 – Displaying the input image

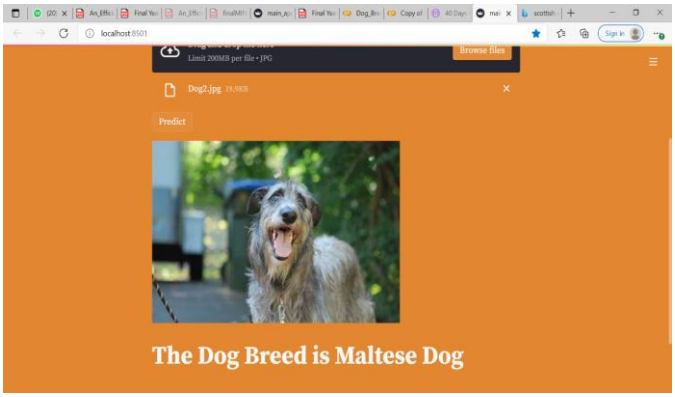


Fig.4 - System predicting dog's breed correctly

## 5 METHODOLOGY

a) In the first phase, we select an image from which we wish to forecast an object. Here, we select a dog image for system.

b) We execute object recognition in the second phase, which will connect to Tensorflow. And which contains around 10,000 photos of various dog breeds for training purpose.

c) The CNN (convolution Neural Network) model, which has been pre-trained, is loaded in the third phase. For comparison, a CNN with two convolutional layers selects a unique combination of activation characteristics and classifiers. Training datasets are used to test the system in the fourth phase.

d) The input image is then passed as an input parameter to ReadImage(), which turns the image to pixels in the fifth phase.

e) Following that, Input() is called, which turns the pixel picture to a tensor.

f) Finally, this tensor picture is created and this tensor image is passed as an input parameter to the classify function, which predicts the output based on probability, with the highest probability value being considered the best predicted breed.

## 6 CONCLUSIONS AND FUTURE SCOPE

Dog breed prediction using deep learning is developed using convolutional neural network to predict the breed of dogs by taking their images as input. This system is easy and convenient for users to predict the dog's breed. The system would predict the dog breeds at a much higher accuracy. We have demonstrated modified approach of the state of art network.

As further work, due to increasing the size of datasets using some optimization methods to find the best hyper-parameters for learning rate in order to reduce the computational time of test set besides the classification accuracy in the test set. Varying epochs can also reduce the time complexity and provide opportunity to have higher level of augmenting in dataset to increase the accuracy of classification on the datasets.

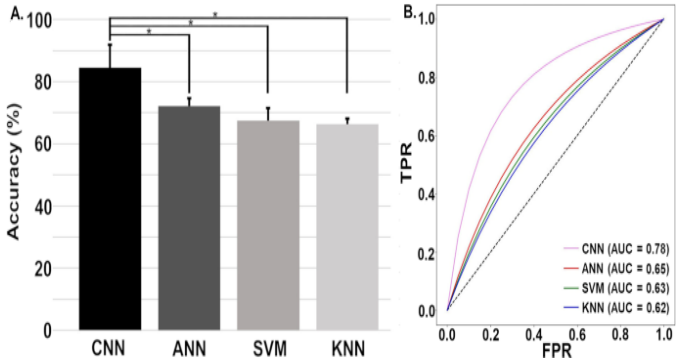


Fig. 5 – Comparative Analysis

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