Virtual Pet Adoption and Breed Identification

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Abstract: - The Previous product provides the citizens to adopt from our website and also allows us to create a social account where people can interact with each other. The Product also allows us to identify the breed in the post using Machine Learning and Deep Learning. We are using this feature to avoid any fraudulent post. The product also has IoT enabled features such as tracking. Index. With the previous product in mind, we improved the product with more accurate model which has 2X speed to classify properly. This model not just improved accuracy but has very less chances of mis prediction. This model gives us 95% of accuracy which is proved to be good and very useful.

Index Terms- Machine learning. Deep Learning, Python, Django, Firebase, MySql, IOT, Streamlit.

INTRODUCTION

The Virtual Pet Adoption System is a website for many pet lovers and socialites. The website allows you to register as a user and connect with other people in the world. The main purpose of this product is to reach people and come together to help all animals in need. Although the website allows you to use the product as a social network, there are many other benefits also. Persons registered with us can share messages about any animal they think needs a home and registered people can respond/react to the messages displayed on the website and communicate with others accordingly. The message will show your pet's location and details such as age, deworming, health status, doctor checkup, Vaccination if any, photo, neutering, and gender. This product also allows you to track animals using IoT devices that the website offers at very affordable prices. The product also comes with a machine learning model which can identify breed of dogs we just need to upload an image and it will classify which breed it belongs to. This model is developed to help know the breed of dog if not recognized by oneself. The model has an accuracy rate of over 90 % which is good and is made using CNN which helps in image related task. Other part of the project is to try to improve the accuracy of model of this project and to do this we have used 2 different model and combined it together for good training and proper prediction. This model proves to provide an accuracy of over 95% which is good from previous model and fast. The only difference is in previous module we take input from user to classify but not in this module, it directly classifies and show us the result. In new module there are over 120 breeds we predicted. To 'make this module complete we have used CNN as in previous one but also used a DNN to process image data. CNN proves to be bit slow while training as compared to DNN. A CNN is a type of DNN. It means that DNNs are really just an umbrella term for a bunch of different neural network architectures, one of which is a CNN.

Convolutional Neural Networks (CNN) as called, are the go-to deep learning architecture for computer vision tasks, like object detection, image segmentation, biometric authentication, among others. CNNs have also been extended to video analysis. There are 3 layers in CNN: Convolutional layer, pooling layer and fully-connected layer. A deep neural network (DNN) is a man-made neural network (ANN) with multiple layers between the input and output layers. There are differing kinds of neural networks but they always contain the identical components: neurons, synapses, weights, biases, and functions. These components functioning like the human brains and may be trained like several other ML algorithm.

For example, a DNN in our case is trained to recognize dog breeds will reconsider the given image and calculate the likelihood that the dog within the image is a certain breed. The user can review the results and select which probabilities the network should display (for a specific threshold) and return the proposed label. Each mathematical manipulation as such is taken into account a layer, and sophisticated DNN have many layers, hence the name "deep" networks.

DNN architectures generate models where the article is expressed as a layered composition of first. The extra layers enable composition of features from lower layers, potentially modelling, complex data with fewer units than a similarly performing shallow network. the sole difference in CNN and DNN is layers. DNN has more layer than CNN which helps in processing information in no

time. Also DNN proves to own good accuracy training than normal CNN.

LITERATURE SURVEY

Pet adoption has been a necessary form of social reform because it allows domestic animals to find new homes and caregivers, particularly for breeds that have not been trained in the wild. However, the majority of adoption sources are either off the internet and working locally or crumbled between various advertisements from various sources. A simple survey of friends and family revealed that they are low-key and that many people are open to pet adoption because they do not have enough reach with other caregivers or NGOs. In this day and age, when everything is online and people are more connected than ever, every aspect of life must be updated. While we perceive greatness, we must not forget those who once assisted us in the formation of a civilization in the first place. This was the general attitude of my team when we were brainstorming ideas for our project.

We were wondering why, when we see all these NGOs and social organizations working for a good cause, they aren't all on the internet and under one banner. Also, people who want to adopt must have a place to go where they can find every detail about the Pet they want to adopt. This was the concept behind this project; we wanted to create a simple tool that would benefit the entire domestic adoption industry under one roof. We chose technology based on our needs and knowledge to create a website that would meet the above concept. A substantial increase within the volume of the pictures out there on-line within the recent years, has managed to obtain heaps of attention towards image classification in business and world.

With digital pictures taking part in an instance role with reference to the multimedia system content, the method for automation of the classification of pictures becomes an associated open analysis drawback. an awfully general summary of what the term image classification means that would be to easily assign labels to associate input images. If we have a tendency to take any random image wherever we have a tendency to see a picture as an entire, the pc simply sees a grid of pixels. the most goal here is to essentially see if the pc will truly check out the grid of pixels that contains a picture {for instance|as associate example|for example} an dog and truly assign a label to the image speech that this image is of a dog. As straightforward as this method sounds it's such a frightening task for the pc

to be able to predict. To alter educators and analysers around the world WHO would really like to figure with pictures for {educational} research or educational functions,

ImageNet associate a simply accessible image dataset was introduced, a venture by Stanford, Princeton and Yahoo. The shibboleth behind the event of ImageNet was thought-about to be "good analysis wants sensible resources" (Imagenet.org, no date).The ImageNet is associate current project with over ten million pictures with over twenty one thousand sets of labels.

The deep learning design holds 3 main layers which might be the input layer, the hidden layer and therefore the output layer.

The hidden layer among the 3 layers is the most complicated layer. A hidden layer could be a layer that's placed in between the input and output layers. The hidden layer in itself has quite few layers, out of that one in all they would be the convolutional layer on which you apply a filter wherever you outline the dimensions of the filter with the assistance that the layer creates associate degree activation map. every filter that's applied within the convolutional layer, one gets a distinct activation map. A convolutional layer would be a set of the layer, the filter and therefore the activation map.

Next a part of the hidden layer that is usually employed in succession to the convolutional layer would be the pooling layer. The pooling layer additionally consists of a filter of a given size. Currently there square measure essentially 2 kinds of pooling operations that may be performed that square measure gamma hydroxybutyrate pooling and average pooling. Gamma hydroxybutyrate pooling are a few things that may essentially take the most worth from at intervals the filter.

Average pooling just like the name suggests would add up the values at intervals of the outlined filter and divide it by the full range of values i.e. taking a median. Pooling layer is applied to cut back the dimensions of the layer. If there's a convolutional layer before the pooling layer, pooling is applied to every activation map that's within the convolutional layer. the ensuing style of layer would be the continual layer.

This layer is essentially employed in case wherever information|the info|The information} we've got is sequential which might not be of a lot of use within the data of this study. The last style of layer would be a dropout whose main practicality or rather purpose would be to cut back the quality of the model. It's essentially a way that's used for regularization

STUDIES AND FINDINGS

There was a time near about when we were thinking about opening an NGO in the future so we were researching the whole NGO sector, so while doing that we thought of going to an NGO. I had a contact with an NGO which I got when I rescued a dog before, so I called them and we went to that NGO. Now this is where our bind blew after seeing the dogs there, the way they were kept was very inhuman. When we reached home, we discussed about it and then we came up with this idea of creating a virtual adoption centre where people themselves can help the animal directly by removing the middle person (i.e., Sellers, NGO's, Adoption Centereach). The citizens can take this matter into their own hands and help solve this inhuman behaviour. Then there was another problem we faced while working on this that stray animals or pet animals get lost frequently, so we thought of making a tracking device with help of IoT, so if any animal lover in future doesn't want to lose their own pet or a stray pet whom they meet every day and are worried about them then they can buy the device from us at a very affordable price.

METHODOLOGY

Pet Adoption has been a necessary form of social reform, as it makes domestic animals find new homes and caretakers especially for the breeds not trained in the wild. However, most sources of adoption are either off the internet working locally or crumbled between various advertisements of various sources. A simple survey among friends and family made it clear that they are lowkey and many individuals are open to pet adoption because they don't get enough reach with other caretakers or NGOs. In the growing age of the internet where everything is online and while humans are connected more than before, every sector of life needs to get updated. While we perceive greatness, we must not forget the ones that once helped us to form a civilization in the first place. This was the common spirit my team had when we were brainstorming for our project idea. We were asking a simple question while we see all these NGOs and social organizations working towards a good cause, why aren't they on the internet and under one banner?

Also, people who are willing to adopt must have someplace to go where they find every detail of the Pet they are going to adopt. Such was the idea behind this project, we wanted to create a simple

tool that would benefit the whole domestic industry of adoption all under one roof. We selected technology based on our need and knowledge to come up with a website that would satisfy the above concept. We have used the following technology; Django Python SQL Anaconda Django is an open-source framework for backend web applications based on Python — one of the top web development languages. One of Django's main goals is to simplify work for developers. To do that, the Django framework uses: The principles of rapid development, which means developers can do multiple iteration at a time with no starting the whole schedule from scratch;

DRY philosophy — Don't Repeat Yourself — which means developers can reuse existing code and focus on the unique ones. Django is time- and crowd-tested. It has a big, supportive community accessed through numerous forums, channels, and dedicated websites. It's easy to find help when there's a problematic function in the code and to find developers, if in case the company is looking to base out the next project using Django. While Django makes it easy for us to operate a website, it can't be done with the help of python. We have used various python libraries to make an optimum website. The plugins and graphic part of the website are also inscribed in the core python code.

Python is an easy-to-understand language that is the most user friendly according to us. Well, we all know the capability of python. People who haven't come across it yet might be living under the rock. The database was our main concern when it came to our security. No user wants its data leaked. Also, it should be easily accessible for the code with not too many encryption keys. We started testing with Apache as we were not feeling secure with the inbuilt feature of SQL that comes with Django, but soon with a few integration bugs and data loss, we realised SQL was our best shot. It was simple, lenient and always worked without bugs in the backend. Finally, Anaconda is not just an IDE as we wanted a cross-platform IDE that would fit under one roof, also the fact we weren't sure what libraries to use and virtual environment to create were all made easier with Anaconda.

In the proposed model we've got used Keras, tensorflow, cv2, seaborn and lots of more such libraries but the most working comes from keras and tensorflow . Keras is employed as a python interface for artificial neural network and acts as interface for tensorflow library. It contains numerous functions of most used neural-network building blocks like layers, objectives, activation

functions, optimizers, and a number of tools to create working with image and text data easier to simplify the coding necessary for writing deep neural network code. TensorFlow may be a free and open-source software library for machine learning and artificial intelligence. It is often used across a spread of tasks but incorporates a particular specialize in training and inference of deep neural networks.
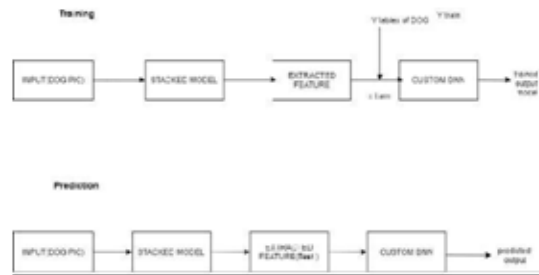
PROPOSED SYSTEM

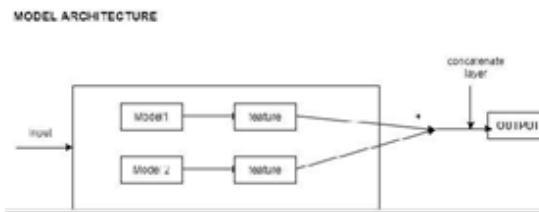Fig: - Training and Testing Phase

Fig: - Model Architecture

IMPLEMENTATION

We had previously made a web application which is used to identify breed of dog given as an input. We had used various libraries for making the project. Our Project was made using Django, machine learning. Here machine learning was used to made a classifier model to predict the animal breed and Django was used to make website for virtual pet adoption. The Website contain modules where we can register new user. There are two types of user though, one is owner (owner of dog) and public(as someone who is looking for adoption.) As an owner we have rights to add pet details, views details of pets, make an enquiry of pet via chat services made available and for Public profile it can view pets details posted by owners and also enquiry about the pets via chat provided. The application proved to be very user friendly and tested with live audience.

TensorFlow can be used in a wide variety of programming languages, most notably Python, as well as Javascript, C++, and Java. This flexibility lends itself to a range of applications in many different sectors.

Now the main attraction for the project was the breed analyser made using machine learning. The

modules use's many libraries such as streamlit which is used to make customized web application and pytorch which is used to application such as computer vision and natural language processing and the project is written in Python and to keep track of everything a database is created and connect so that we can keep details of owner and as well as adopter.

In PyTorch we've used api called tensor to store and operate homogeneous multidimensional rectangular arrays of numbers and a category called torch which is package contains data structures for multi-dimensional tensors and defines mathematical operations over these tensors. Additionally, it provides lot of utilities for efficient serialization of the Tensors and arbitrary types of it, and even other useful utilities. we 've got used a base class called torch.nn where nn stands for neural network which is defined as a series of algorithms that endeavors to acknowledge underlying relationships in an exceedingly very set of data through a process that mimics the way the human brain operates. We have used PIL which is used to validate image editing capabilities and JSON known as (JavaScript object notation) is a text- based standard format used to represent structured data based on JavaScript object syntax.

It is an insubstantial format that is used for storing and transmitting data. It is effortless for humans to work as to perform writing and reading and it is very convenient and easy for machines to examine and create. We have used torchvision which is a package consists of popular datasets, model architectures, and common image transformations for computer vision where we have used its subclass transform and models, here transform is used to resize, convert an image into a tensor and then normalize the image with standard deviation and mean. After the normalization step then it's the time to number different classes of breed so it became easy for the model to classify properly. The model we have used in Django project was inception v3 which is a convolutional neural network for assisting in image analysis and object detection, and it is a start as the module for Googlenet and used ReLU as an activation function. The model used previously gives an accuracy rate of 0.9 ~ 90% which is good.

In the proposed new model, which also uses CNN which is formed by a stack of layers that transform the volume which is an input volume to an volume which is an output, through a differentiable function. There are 2 main parts to CNN, first is feature extraction and secondly classification. First

part has 3 layers, convolutional layer which performs mathematical operation between input images and a filters of particular size N*N. The output is known as the Feature map which gives us information's about the image such as the corners and edges. Later, this feature map is fed to other layers to learn several other features of the input image, pooling layer which is to reduce the size of the feature map to reduce the computing costs. This is performed by reducing the connections between layers and independently operates on each feature map. Fully Connected Layers which is a layer which consists of the biases and the weights along with the neurons, which is further used to connect the neurons available between two different layers. These layers are usually present before the output layer is present and help in forming the last few layers of a CNN Architecture.

In this model we have used different libraries like Keras, tensorflow, CNN, DNN and predefined models like VGG and ResNet and a dataset of 10,000 images for training as well as testing phase. First the images in the dataset is named and given ids to identify properly and get trained. Once the model is loaded and make datat Frame for it. The next step is to design architecture model for feature extraction where we ResNet50 and DenseNet121.

There is an input layer before that it resize the image with 3 dimensions. After preprocessing the image with resnet and densenet with weight as imagenet and pooling as avg and then we combine both the model and save the model. After creating architecture we then create feature extractor with our predefined model with batch size of 20 and we have used some calling function for extreme training.After this step we now create a model for training using dense neural network where we used optimizer "adam" which is a gradient descent method that is based on adaptive estimation of first-order and second-order moments and categoral_crossentrophy which is a loss function for multi-class classification model where there are two or more output labels with batch size of 128, epochs=60 and validation split of 10%. After this step we will then plot the model which is then predict and identify images properly.

Here it means that dataset is split in ratio of 90 and 90% for training and 10% for testing., batch size means there will be a batch of 128 images and epoch means the number of training passes. Although this model takes some times to complete but it has an accuracy of 95% which is much better than previous model.

Training Phase:
The model was trained for 60 epochs with adam optimizer and using categoral_crossentrophy as loss function. The model works well with 60 epoch and saved to be used in next phase.

Testing Phase:
After the training phase was done the model had provided us a promising test accuracy set with low loss rate. This model proves to be very accurate than previous module with 95% accuracy and proves to be helpful to others.

COMPARISON OF MODELS

The points the distinguish this new model with old model:

1 Accuracy Rate is 95% where previous model accuracy is 90%.
2 This model directly classifies with images provided in dataset i.e., no need to upload images.
3 The accuracy of model is increased by mixture of 2 different model namely VGG and ResNet where as we used only inception v3 in previous model.
4 This model uses softmax activation function whereas previous model uses ReLU.

LOSS & ACCURACY CURVES
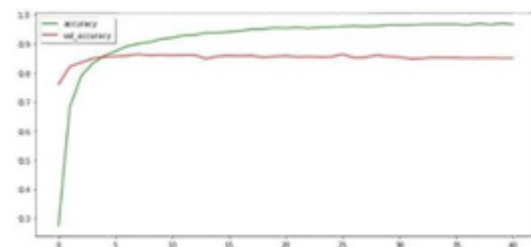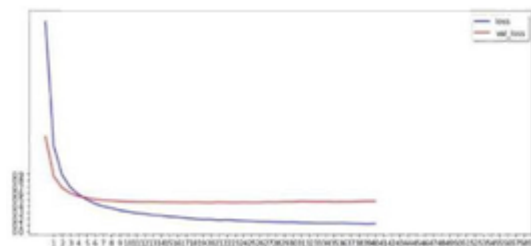
CONCLUSION

We have successfully implemented a solution for efficient Pet Adoption. The website itself is the key to many problems that are overshadowed due to lack of reach or communication differences. This website also provides details of the vital stats,

which are necessary decision factors during any adoption. We tried on creating the best accurate model and it proved to be helpful. Our vision is that it will create a hub where there will be no corner but everyone working in a full circle for a good cause. Furthermore, we think it's not an innovative but a necessary solution to a very underrated yet important problem.

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