SPACE OBJECT IMAGES CLASSIFICATION MODEL USING TRANSFER LEARNING

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Agenda

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Aim

To Build SpaceObject Image Classification Model By Using Transfer Learning to compare traditional machine learning method and transfer learning method.

Motivation

1. Transfer learning is used to improve a learner from one domain by transferring information from a related domain. We can draw from real-world non-technical experiences to understand why transfer learning is possible.
2. Consider an example of two people who want to learn to play the piano. One person has no previous experience playing music, and the other person has extensive music knowledge through playing the guitar.
3. The person with an extensive music background will be able to learn the piano in a more efficient manner by transferring previously learned music knowledge to the task of learning to play the piano. One person is able to take information from a previously learned task and use it in a beneficial way to learn a related task.

Objectives

1. To study and explore transfer learning technology.
2. To built classification model which can able to classify mainly Black Hole,Pulsar Star & White Dwarf.
3. Evaluate and compare the model build using VGG16 pre-trained CNN model and using SVC(Machine learing apporach).

Tools And Technologies

TOOLS

1.GOOGLE COLAB

2. PYCHARM

3. GITHUB

4. STREAMLIT SHARE

TECHNOLOGY

1 PYTHON3

2. TRANSFER LEANING

3. DEEP LEARNING

4. GIT

What is Transfer Learning?

- Transfer learning is a machine learning technique where a model trained on one task is re-purposed on a second related task.
- Transfer learning is an optimization that allows rapid progress or improved performance when modeling the second task.
- In transfer learning, we first train a base network on a base dataset and task, and then we repurpose the learned features, or transfer them, to a second target network to be trained on a target dataset and task. This process will tend to work if the features are general, meaning suitable to both base and target tasks, instead of specific to the base task.

Methodology

Collection Of Data

Preprocessing of Model

Training Of Model

Testing Of Model

Collection Of Data

To train The model we need space object images, so we have downloaded 100 images of each category i.e. 300 images of each class from the browser by using the bing-image downloader.

Bing-image downloader has a function known as download() which can download the images from the browser.

After downloading the images we have add that images into the working directory.

Hence we've created our Custom dataset.

Preprocessing Of Model

There are 5-6 pre-trained models are available on imagenet weights, among those widely used are:

1. VGG16
2. ResNet50.
3. InceptionV3.

VGG16:

This is a 16-layer (convolution and fully connected) network built on the ImageNet database for the purpose image classification. describes the architecture of the model.

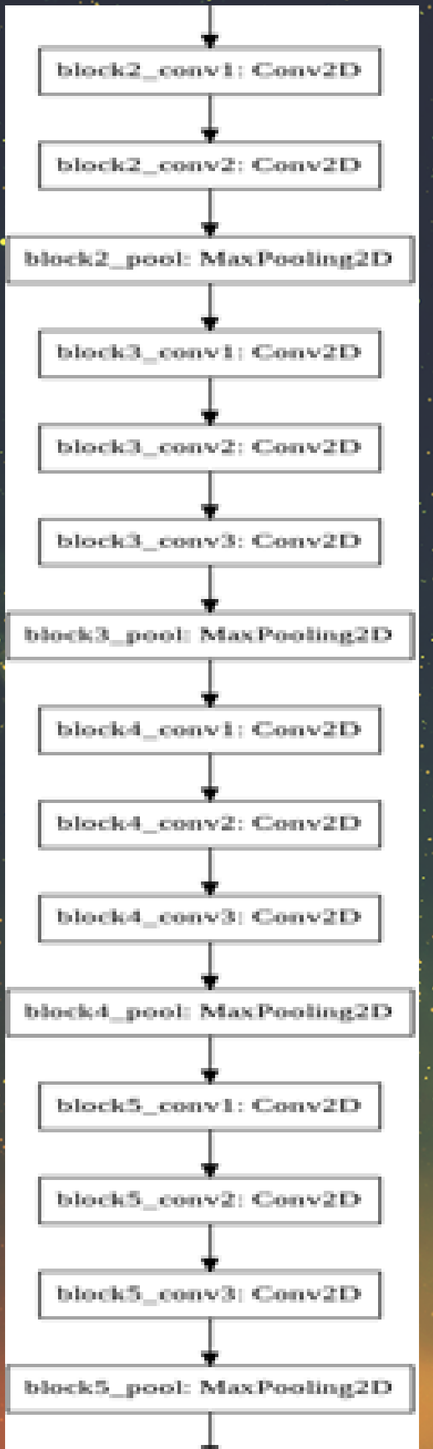
From the image, we can see that there are 13 convolution layers using 3*3 filters along with max pooling and two fully connected hidden layers of 4,096 units in each layer followed by a dense layer of 1,000 units, where each unit represents one of the image categories in the ImageNet database.

Preprocessing Of Model

we've rescale those images and used (224,224) shape to get feed into VGG16 model.

VGG16 Model:
The VGG16 network was not trained to classify different types of space objects. So, here we are going to use VGG16 pre-trained model for training our model.

First, we took pre-trained VGG16 model. After we freeze the last layer to add fully connected layers. In fully connected layer we have added three hidden layers and last layer which has three neurons as per defined categories that are black holes, pulsar stars and white dwarf.



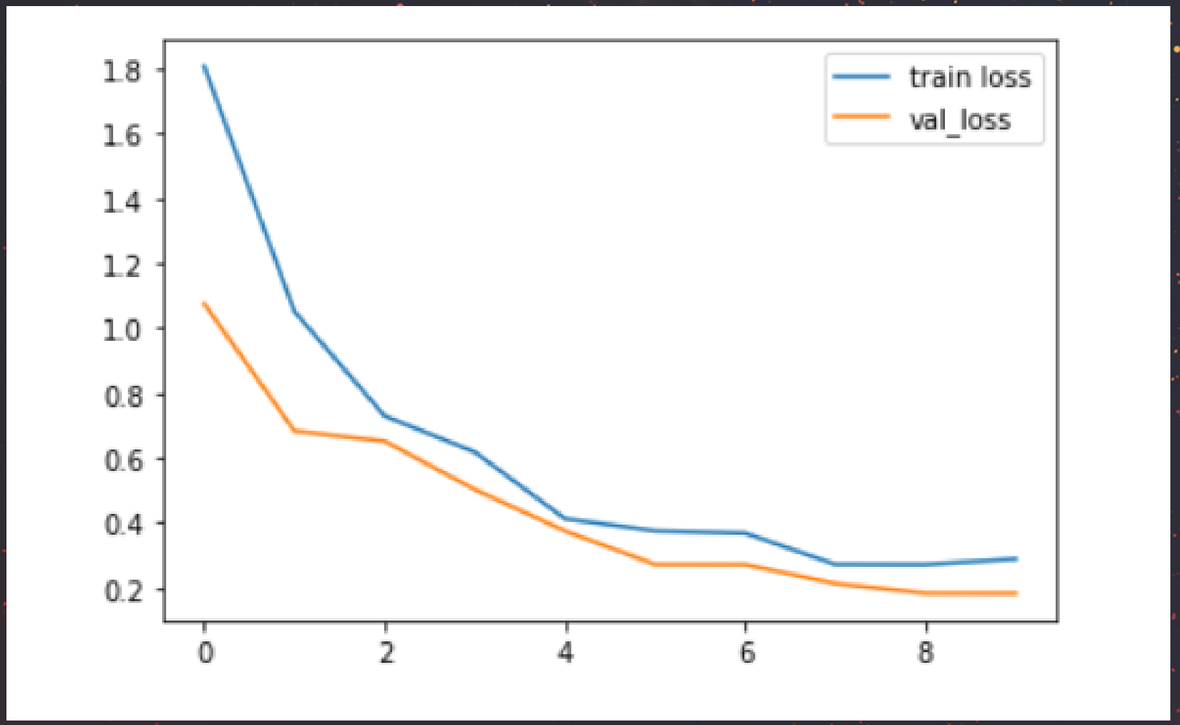
Model Training

Steps used to Train the Model are:

- We've used Tensorflow Framework to Build CNN model.
- Splited Data Into training and testing with image Augmentation.
- Compile and Fit the Model.
- We try 20 to 30 epochs to avoid overfitting, and we find the better result for 10 epochs so here we use 10 epochs.
- After getting the good accuracy we save that model using keras. Save() function for further frontend building.

Model Testing

Prediction Vistualization



We kind of did research to improve accuracy and tried how image classification will work without CNN for that we tried using Support vector Classifier and we got accuracy,

- Without CNN using SVC-----> 50%
- Using VGG16 CNN model-----> 93%

Result

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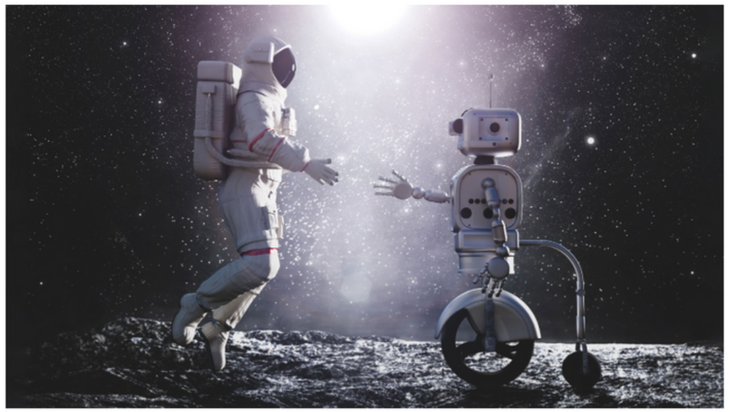
- App

SpaceObject Classification WebApp ⭐



The APP is actually made for recognition of space objects

Description..

The app mainly classifies black holes, pulsar stars and white dwarf

Because, They formed after the death of any neutron or super red giant star having higher chandra shekhara limit

Navigation
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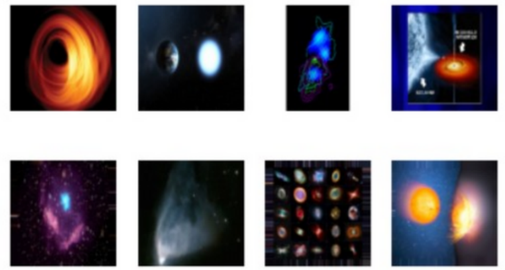
The App classifies 3 category of objects i.e. multiclass classification over custom dataset using VGG16 Pre-traind Model

We have taken 100 images of each class and make a folder for further usage

show images



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Please upload an image file

Future Scope

- Classification occupied tremendous space of AI/Computer Vision
- They are used in medical,agriculture,remote sensing,disaster control etc..
- In our model we'll try to add more star categories, and we'll try to built an android/web application of that...
- On small Scale: our application will help astro seekers to classify the dead stages of an star...
- On large Scale: 1. we can make an android application to classify all dead states of any star...

Any Question or Suggestion ??

THANK YOU