CSPC54
Introduction to Artificial Intelligence and Machine Learning

Assignment

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Topic: Astronomy Image Classifier.

We built a CNN model for the purpose of an astronomy image classifier. The details of the algorithms used in the project were specified in the previous document. In this final report we provide a brief description of the project codes and the concluding remarks.

Looking at the code:

a. We import the necessary framework like tensorflow (An Ml framework developed by Google) and necessary libraries like keras, matplotlib etc…
b. We mount the directory that holds the required dataset.
c. We preprocess the image. First we remove corrupted images and convert them all to png format for better processing. We do normalization and resizing the images.
d. We decide the batch size, validation split and get the training and testing dataset ready.
e. We create a sequential model having convolution, pooling ,flatten and dense layers with as many nodes as needed.
f. We compile the model and run it for a fixed number of epochs. We see some signs of overfitting from the validation accuracy begin less.
g. We do data augmentation and add drop out layers for regularization.
h. We compile and run the model again to find if there is any improvement.

Challenges faced:

We faced issues with the dataset. The dataset originally obtained from Kaggle had 6 classes (planets, galaxies ,nebulae ,constellations ,stars and cosmos) of which some images were misplaced and some others made no sense. We tried to refine the dataset but the similarity among classes made it less successful. Galaxies are made up of stars, dust, gas, dark matter, and black holes, while nebulae are made up of dust and gas, mostly hydrogen and helium. Both nebulae and galaxies appear as fuzzy blobs in the night sky. Cosmos means "universe".So we removed the cosmos class.

Further we tried to make the model explainable using saliency map (visualization technique highlighting the most important regions of an image). It makes the predictions made by the model explainable and helps us to understand the model better so that improvements can be made. But our saliency map was very less helpful to us on that aspect.

The final accuracy obtained after adding drop out layers and data augmentation is around 60%.

We tried to create a model similar to Alexnet architecture. AlexNet consists of 5 convolutional layers followed by 3 fully connected layers. The network also includes activation functions, pooling layers, and dropout for regularization. AlexNet is a pioneering convolutional neural network (CNN) architecture that significantly advanced the field of computer vision. It gained fame after winning the ImageNet Large Scale Visual Recognition Challenge (ILSVRC) in 2012. However the approach led to an accuracy of mere 47%.

Future scope:

We wish to further improve the performance of the model and make it explainable in near future.

Closing Remarks:

We obtained immense knowledge through various online platforms and Google Colab being the most important one. We thank our professor Dr.Rajeswari Sridhar for being supportive throughout the project and the course.