IT1244 project ReadMe

Description

In recent years there has been interest in develping Convolutional Neural Network (CNN) machine learning models that can assist in classifying MRI scans of brain tumors into benign or malignant. Our project aims to build on previous works by experimenting with the application of GradCAM to visualise the decision making done by CNNs as well as exploring different ways to augment our training data to allow the trained model to be more robust and flexible.

Workflow

The workflow is as follows:

- Data preperation which consists of two steps:
  - Preprocessing
  - Augmentation
- Training and analysing the baseline CNN model which consists of:
  - (Training) Creation of model and fine-tuning for optimal hyperparameters
  - (Analysis) Plotting of performance graphs with various metrics used
  - (Analysis) Using GradCAM to visualise model
- Training and analysing the VGG16-ANN model which consists of:
  - (Training) Creation of multiple models with varied number of VGG16's layers frozen
  - (Analysis) Plotting of performance graphs with various metrics used
  - (Analysis) Using GradCAM to visualise model
- Training and analysing the CNN-XGBoost model which consists of:
  - (Training) Creation of model and incorporation of Principal Components Analysis (PCA) into model as well as tune hyperparameters
  - (Analysis) Plotting of performance graphs with various metrics used
  - #Note: GradCAM was not able to be used for CNN-XGBoost

Getting Started

Dependencies

- keras version 2.15.0
- The file should be used in google colab

Ensure file paths to dataset

The first code block specifies the file path to the dataset. If the dataset folder is moved to a different location please specify the new file path to ensure that the program can find the dataset. If the unzipped folder is used without modification then the default file path given will work fine.

Installation of necessary packages

The second code block contains all the import statements

```
'''
!pip install numpy==1.24.3
##remaining import statements...
!pip install tensorflow==2.12.1
'''
```

Remove the triple backticks (') at the top and the bottom of the code block to run the code which installs all the necessary packages. If all packages are already installed you can reapply the triply backticks (as shown above) to prevent packages from being installed again

Executing the program

The code code blocks should be run in order. Each code block is titled according to what it does. An alternative is to click the tab "runtime" -> "runall" to run all the blocks of code in order. There is also a table of contents that can be accessed by clicking the table of contents icon at the top left of the page.

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Version History

- v1.0.0: Final submission