SYDE 522 Project

Basic Requirements

- OS: Windows
- Python Version: 3.12.2(64-bit)
- Packages

  > All required packages are listed in the `requirements.txt` file.

  - Install packages with command line: `pip install -r requirements.txt`

Python Scripts Introduction

- `DownloadData.py`
  - Download eye diseases images data and trained models from google drive. Create necessary folders. There is a limitation of download file by gdown. If download fail, you may need to download and unzip `Data.zip`, `Saved_Models.zip` and 'Losses_Acc.zip' manually. Make sure the path is correct(`Data/train/*.png`, `Data/dataset.csv`, `Data/all_data.pkl`, `Saved_Models/*.pth`, `Losses_Acc/*.pkl`).
- `DataTransform.py`
  - Class `DataTransform` loads original data sets and splits them into training and test sets. All data sets will be saved into `Data/all_data.pkl`.
  - Class `DataTransformSet` is used to load data sets such as PyTorch data set structures.
- `Models.py`
  - Class `ViT` is implemented by a pre-trained structure of Vision Transformer
  - Class `ResNet50` is implemented by a pre-trained structure of ResNet50 of `torchvision.models.resnet50`
- `Train.py`
  - The scripts of training model processes by provide suitable batch size, learning rate and epochs.
- `Evaluation.py`
  - The scripts of plot training process losses and accuracy of all models and report all final models' accuracy and f1-scores.

Folders Introductions

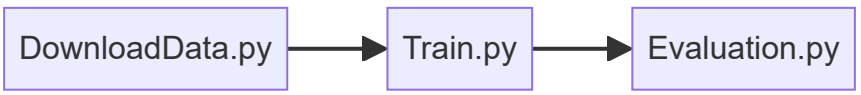
- `Data`:

    - `train/*.jpg`: Including all original image data.
    - `dataset.csv`: Features and labels of our data set.
    - `all_data.pkl`: Saved all images and feature data into a single file for future processing.
- `Losses_Acc`:
    - `*.pkl`: All losses and accuracy during the training processes.
- `Reports`:
    - `Acc_F1.txt`: The final selected models' prediction accuracy and f1-scores.
    - `*.png`: The plot of losses and accuracy during the training processes.
- `Saved_Models`:
    - `*.pth`: Trained models

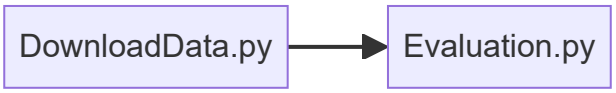
Execution

- Introduction of all scripts
    - Run `DownloadData.py` to get all required files. Download eye diseases images data and trained models from google drive. Create necessary folders. There is a limitation of download file by gdown. If download fail, you may need to download and unzip `Data.zip`, `Saved_Models.zip` and 'Losses_Acc.zip' manually. Make sure the path is correct(`Data/train/*.png`, `Data/dataset.csv`, `Data/all_data.pkl`, `Saved_Models/*.pth`, `Losses_Acc/*.pkl`).
    - For generating data(e.g., resize the training and test set and shuffle the data set), just run `DataTransform.py`. You may select prefer training and test set size or shuffle data set. The file `all_data.pkl` in `Data` folder will be replaced.
    - For training models, just run `Train.py` or change some other value of learning rate, batch size or epochs. The models in `Saved_Models` will be replaced.
    - For model evaluations, just run `Evaluation.py`. The loss and accuracy file in `Losses_Acc` and plots in `Reports` will be replaced.
- Execution options
    - If you want to use new data to train some new models:

    - If you just want to train new models by pre-processed training and test set:



    - If you just want to check current models reports:



Some Parameters Values of Models

> The following tables are recommended hyperparameters of the current data set(in folder `Data/all_data.pkl`) and models(in folder `Saved_Models`). If you want to regenerate the training or test set for training some new models, these values may need to be changed.

- ViT

	Batch Size	Epochs	Learning Rate
Normal	16	15	0.0000008
Diabetes	16	15	0.00000002
Glaucoma	16	15	0.00000001
Cataract	16	15	0.00000001
Age_related	16	15	0.00000001
Hypertension	16	15	0.0000000034
Pathological	16	15	0.00000001
Other	16	15	0.00000003

- ResNet50

	Batch Size	Epochs	Learning Rate
Normal	2	15	0.000002
Diabetes	2	15	0.00000005
Glaucoma	2	15	0.00000005
Cataract	2	15	0.0000001
Age_related	2	15	0.00000005
Hypertension	2	15	0.000000007
Pathological	2	15	0.000000007
Other	2	15	0.00000004