AI Programming with Python Project

Image Classification (102 Flower Categories) using PyTorch Models

This repository contains the project code for **Udacity's AI Programming with Python Nanodegree program**. The project involves building an image classifier using PyTorch and converting it into command-line applications: train.py and predict.py. The image classifier is designed to recognize **102 different species of flowers** from the provided dataset.

Project Overview

Image Classifier Development

- **Notebook**: Image Classifier Project.ipynb
    - Used **VGG16** or **DenseNet121** from torchvision.models pretrained models.
    - Loaded a pre-trained network and defined a new, untrained feed-forward network as a classifier.
    - Utilized **ReLU activations** and **dropout**.
    - Trained the classifier layers using **backpropagation**.
    - Tracked loss and accuracy on the validation set to determine the best hyperparameters.

Command-Line Applications

- **train.py**: Trains the image classifier.
- **predict.py**: Predicts flower species from an input image.

Command-Line Applications

train.py

Trains the image classifier. The following arguments are available:

- **data_dir**: Provide data directory. *(Mandatory, Type: str)*
- **--save_dir**: Provide saving directory. *(Optional, Type: str)*
- **--arch**: Use vgg16 (default) or densenet121. *(Optional, Type: str)*
- **--learning_rate**: Learning rate. Default value: 0.001. *(Optional, Type: float)*
- **--hidden_units**: Hidden units in the classifier. Default value: 512. *(Optional, Type: int)*
- **--epochs**: Number of epochs. Default value: 5. *(Optional, Type: int)*
- **--gpu**: Option to use GPU (CUDA). *(Optional, Type: str)*

predict.py

Predicts flower species from an input image. The following arguments are available:

- **image_dir**: Provide the path to the image. *(Mandatory, Type: str)*

- **load_dir**: Provide the path to the checkpoint. *(Mandatory, Type: str)*
- **--top_k**: Top K most likely classes. *(Optional, Type: int)*
- **--category_names**: Mapping of categories to real names. Provide the JSON file name. *(Optional, Type: str)*
- **--gpu**: Option to use GPU (CUDA). *(Optional, Type: str)*

Dataset

The dataset contains **102 flower categories**. Each category has a set of images for training, validation, and testing.

Usage

Training the Model

Run the following command to train the model:

python train.py data_dir --arch vgg16 --epochs 5 --gpu cuda

Making Predictions

Run the following command to predict flower species:

python predict.py image_path checkpoint_path --top_k 5 --gpu cuda

License

Acknowledgments

- Udacity for providing the dataset and project guidelines.
- PyTorch for the deep learning framework.