October 11, 2022

CISC3024 -- Pattern Recognition Project

Deep Learning Model for Image Classification

Function demo is due to Friday, 10am November 11, 2022

Final report is due to Friday, 10am November 11, 2022

Final presentation is on Friday, 23:55pm November 11, 2022

1. Objective

In this project, students will have a chance to obtain hands-on experience in design, training, and testing a deep learning model for image classification. This project aims to obtain insight into how deep learning models perform pattern recognition tasks. It is important for students to understand the underlying mechanisms and assumptions of deep learning models widely used in pattern recognition problems.

2. Description

Students are encouraged to form a team of two members to complete this project. Each group should design a deep learning model for image classification via **Python** programming, including:

1) data preprocessing

2) neural network design

3) training and testing the model

Besides, each team is required to write a report and prepare a PowerPoint presentation to show what you learn in this project. Your grade will be assigned based on the performance of your online model (a link of your jupyter notebook is required), report and presentation.

3. Image Classification

3.1 Satellite Image Dataset

The resources of Satellite Image Classification can be found from the following website.

https://www.kaggle.com/datasets/mahmoudreda55/satellite-image-classification

The "Remote Sensing Image-RSI-CB256" dataset [1] has 5631 images with 4 different classes mixed from Sensors and Google map snapshot.

3.2 Design a Model

You are expected to design a deep learning model that can classify the image into the proper class. You should use **Pytorch** [2] to design the neural network architecture. You can find some code examples on the Kaggle page [1]. It is simple for you to implement via following the guidance of the tutorial. You can also design a more complex model to improve classification performance, for example, VGGNet [3].

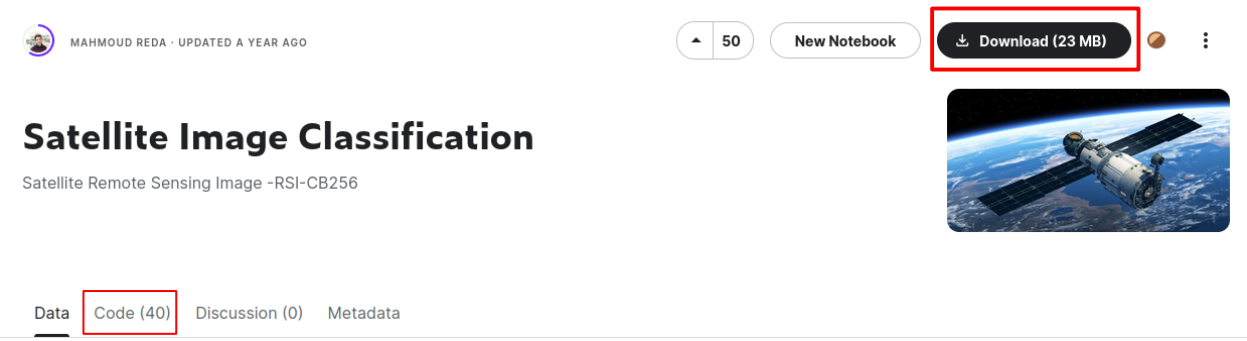
3.3 Train and Save Your Model

After design the model, you should train it on the RSI-CB256 dataset. You should define the loss function and the optimizer. Then you should feed the images and labels to the model and optimize it. You should train your model until the loss value in training data is minimal. You should save your model after training.

3.4 Evaluate model performance

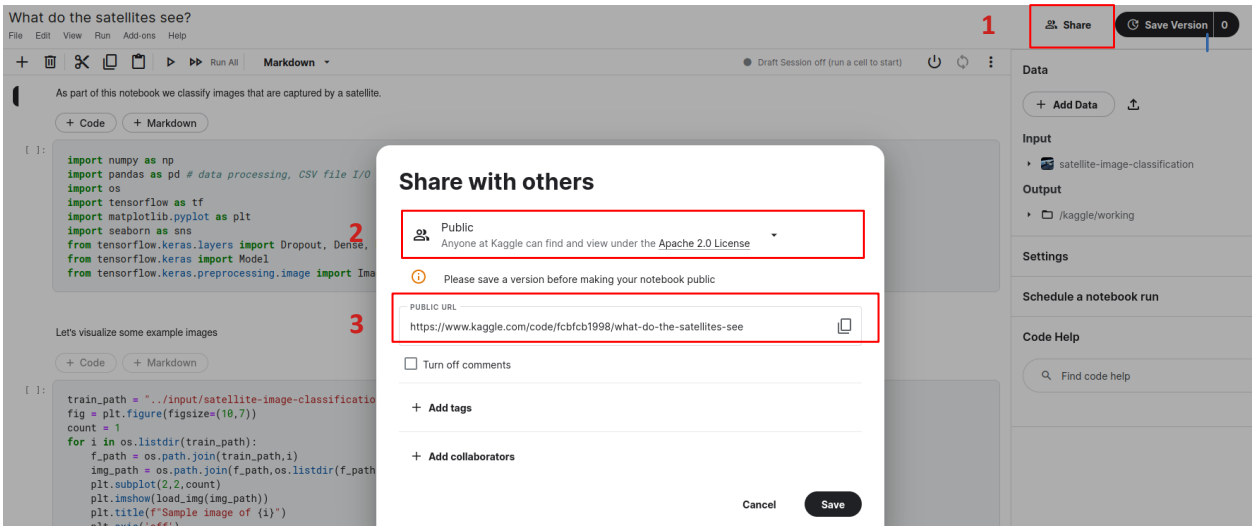
You are expected to evaluate the classification performance of the saved model in the test images. You can input an image and see if it is classified correctly. You can also compute the classification accuracy on the whole test data. If you design two or more models, you can evaluate each of them and compare their performance.

3.5 Guideline of Kaggle



You can easily Download the dataset on top right corner. The code examples can be found by clicking the Code button on bottom left corner.

After clicking one code, use the “Copy&Edit" button to run the code for your own.



To submit your code, you click the “share” button on the top right corner, change the access to “Public”, and then copy the public URL.

4. Submission and Requirements

A link of your online model (jupyter notebook), report and PPT should be submitted to TA before the deadline. One report and PPT are required for each team. Contributions of each team member should be clearly described in your report.

5. Grading

Evaluation will be based on your demo performance, quality of report, and explanation of your algorithm.

- Demo performance 20%
- Final Report 40%
- Presentation 40%

Reference

[1] Satellite Image Classification: https://www.kaggle.com/datasets/mahmoudreda55/satellite-image-classification

[2] Pytorch: https://www.pytorch.org

[3] Simonyan K, Zisserman A. Very deep convolutional networks for large-scale image recognition[J]. arXiv preprint arXiv:1409.1556, 2014.