Final Project: Image Similarity

Due Dates, Deliverables

Groups will be the same as in Midterm Project 1 and 2 (unless your instructor explicitly told you otherwise).

Due	Activity
check mycourses	Method Name + Method Paper choice due (spreadsheet link in mycourses)
check mycourses	Colab Notebook Link (spreadsheet), Youtube Link (spreadsheet) due

Overview

This is the final project of the course. In this project, you will conduct experiments involving 2 methods chosen by you to establish the similarity between pairs of images. For instance, given two images of dogs, we would consider them to be similar. Conversely, given an image of a dog and and an image of a cat, we would conside them to be dissimilar.

The main choice to make are the (2) methods and they are required to have associated published papers. It is fine to combine ideas from multiple methods/papers and even add new ideas you come up with on top of the existing published methods. In the presentation, you will be expected to explain in as much detail as possible the methods chosen and the tuning/modifications you perform. You are free to choose any data or load pretrained states as long as you are able to explain how they were trained. Experiments will be conducted on TinyImagenet test split, based on accuracy.

Methods choice

You will need to choose two methods and fill their name and paper link in the spreadsheet (link in mycourses).

The methods are required to have an associated paper published. It is fine to have a paper published in arxiv. Use scholar.google.com to search for published papers.

No two groups (even from other sections) can choose the same methods. This means, for instance, if a group picks a pretrained ViT and use them no other group can do the same. If you believe you made significant modifications to an existing method and another group picked the methods, consult with the instructor to make sure it is acceptable.

It is fine to have more than 2 methods in your experiments.

Pre-project

Make sure you:

- Choose 2 methods category by the due date

Check mycourses for the due dates.

Implementation requirements

- Code should be in a single Jupyter Notebook file

For development purposes, any IDE or environment is allowed, however at time of submission the group need to make sure that the program is organized and submitted as a **single ipynb file**.

- Code should be runnable in the Google Colab environment

Before the submission, the group need to make sure that the code will be able to run in the Google Colab environment. Any instructions (e.g. the need to use a kernel with a GPU) need to be present as part of the ipynb file itself.

- Instructions and code to obtain and Pre-process the data should be available

Make sure the data used in this project is available publicly in some storage platform (e.g. Google Drive) without the need to logon. The ipynb should provide code to download and uncompress the data required for the training and inference of the model. If the license of the dataset does not allow you to publish the processed data, provide clear step-by-step instructions on how to obtain the data.

- You can only use functionality from ANY library or source.

Using any library such as pytorch, numpy, scipy is allowed. If you use code from others, you are required to cite the source.

- You should not make your project implementation public

While it is fine to have the Google Colab freely accessible, you should not make the link itself public. This includes adding the ipynb or the link to any code repositories. Not following this will be considered academic dishonest conduct, subject to university, department and instructor policy and sanctions.

Training

You can use any data to train your model, except the data that will be used for testing purposes (TinyImagenet test split).

It is also acceptable to load pretrained models as long as you specify the data and the details on how the model was trained (optimizer, hyperparameters, how many epochs, how the data was sampled).

The code to load a pretrained model and/or obtain data and preprocess it should be present in your Colab Notebook.

Evalution and Visualizations

You should use this dataset: https://huggingface.co/datasets/slegroux/tiny-imagenet-200-clean

- Train / Validation Plots

Show figure(s) with the evolution of the model (e.g. loss, accuracy) over epochs while it is being trained, for all methods you experiment with. For this, you do not need to show the performance in the test split.

- Hyperparameter / Model Tuning Plots

Show figure(s) with the evolution of the model training (e.g. loss, accuracy). You can also present the final performance in a validation split or and the final test performance with different hyperparemeter or design choices.

- Main Evaluation

Show figure(s) of your chosen methods presenting the accuracy. Optionally you can present any additional metrics you find relevant.

The main evaluation of your methods will be done based on accuracy, for the **test split of TinyImagenet**. You are required to obtain the data and use only the test split.

It is fine if you want to generate more detailed figures/graphs/analysis, for instance, you might want to show differences of performances among different classes

You will consider your inputs to be pairs of images, so you need to test all possible combinations of two images in the test split of TinyImagenet, including a pair of the same image twice. If the pair of images belong to the same class, they will be considered to be similar images. Conversely, a pair of images from distinct classes will be considered to be dissimilar.

Your methods will be predicting this similarity and a correct prediction means that your methods was able to predict when a pair of images that belong to the same class (similar images).

The accuracy is defined as the proportion of correct predictions. A correct prediction happens when the model prediction matches the ground truth (the labels present in the test split).

Deliberables, Presentation and Peer Feedback

- You will fill the spreadsheet with a youtube link to **a recording of your presentation** by the due date. No need to use mycourses dropbox. You can have the video unlisted, but it is required to be accessible by anyone with a link, with no login required.
- You will fill the Colab link in the spreadsheet by the due date. No need to use mycourses dropbox. You can have the colab publicly accessible by anyone with a link, with no login required.

Presentation

- You presentation can last at most 12 minutes.
- You must use slides. It is fine to use additional tools/ resources, e.g. showing visualizations, animations and demonstrations, but slides are mandatory.
- Every teammember needs to present.
- Prefer to have yourself appear in the camera. You can do this using zoom. Turn your camera on and share your screen.
- The recorded presentation needs to be accessible without logins.
- Use youtube.
- Paste the link of your recorded presentation on the project spreadsheet

Peer Evaluation

- Each student is required to submit the peer evaluations by using the peer feedback form (link available in the spreadsheet).
- One form submission is required for each group you evaluate. For instance, if your section has 8 groups, you need to submit 7 evaluations.
- You are not required to evaluate groups from other section(s), but you are welcome to.
- You will not evaluate your own group.
- The group that performs the best (based on peer feedback) will get an automatic 100 for the project presentation grade.
- The presentation needs to cover the following topics
    1. Data/datasets used, preprocessing choices.
    2. Detailed explanation of the first chosen method.
    3. Detailed explanation of the second chosen method.
    4. Evaluation figures and analysis of your results.

Grading rubric

Possible deductions

General

- Late submission (up to 100% of grade)
- Lack of individual participation in the team work (up to 100% of grade)
- Any requirement listed not met

Expectations

Code

- Code runs on Google Colab without modifications
- Data was able to be downloaded just by running the ipynb cells or by following instructions
- Model/Methods chosen have associated published papers
- Evaluation data correctly used
- Evaluation approach (pairwise accuracy) was implemented
- All expected visualizations present
- Different groups did not implement the same approach (50% grade penalty if this is not observed.)

Presentation

- Recording Link is posted in spreadsheet
- Recording is accessible without login
- Presentation length is/was less than 12 minutes
- All group members presented
- Peer feedback completed
- Peer feedback scores