2024 Spring Pattern Recognition Homework 4 Announcement

Release Date: 2024/05/22 12:00

Homework 4

- Deadline: 23:59, Jun. 12th (Wed), 2024

- **Kaggle and Report** (70%): Participat in the **Kaggle competition** and write reports**.**

  - Competition (50%): Get good score.

  - Report (20%): Description and implementation related to your method.

- **Handwritten Questions** (30%): Answer questions about deep learning.

  - Answer the questions in the report.

  - You **must use the template** and in **digital-typed** (**no handwritten scan**)
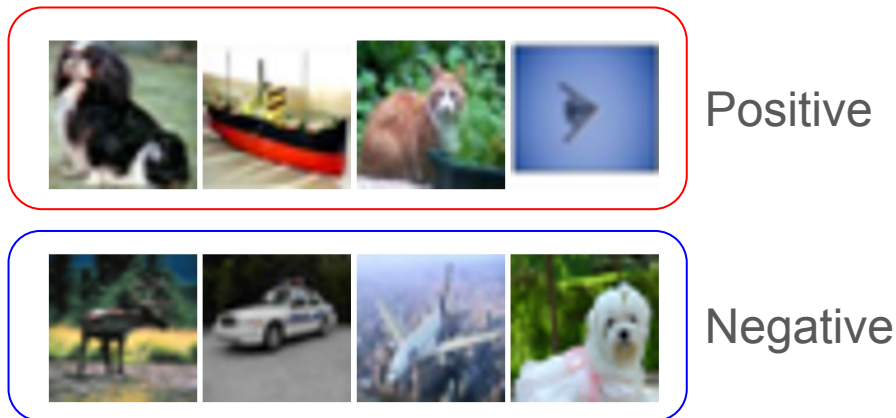
  - In English

Links

- [Questions and Report template](#)

- [Link to Kaggle](#)
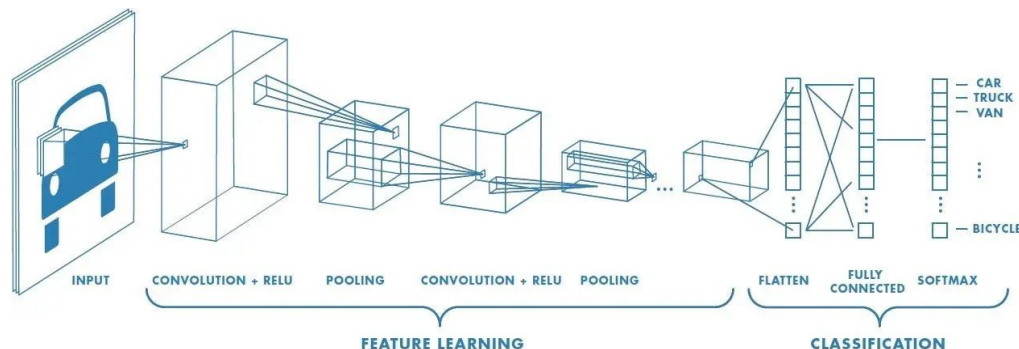
Convolutional Neural Networks for Bag Classification

We hide some target image inside a bag (seqence) of image, FIND IT OUT!

- Positive if a bag contains at least one target, otherwise negative.

Hint

- Multiple Instance Learning
  - Extract features from images first then classify.

Positive

Negative

Join the Competition

- [Link](#)

Download the Dataset

Overview **Data** Code Models Discussion Leaderboard Rules

🔒 Dataset Description

The dataset contains two parts

1. Train

2. Test

For the training set, the label is as its folder name

-- class_0 = 0 (or negative)

-- class_1 = 1 (or positive)

Each `.pkl` file contains 256 images, the shape of each image is (128 × 128) with RGB color space.

Here is the sample code to read file

```
import pickle

with open('abc.pkl', 'rb') as f:
    data = pickle.load(f)
```

Files
500 files

Size
6.29 GB

Type
pkl

License
Subject to Competition Rules

released (2 directories)

⌄ Loading...

Data Explorer
6.29 GB

▸ 📁 released

Summary
▸ 📁 500 files

⬇ **Download All**

Set the Team Name

- You must set your team name as your **student ID**.

Competition Rules

- You are allowed to use any open-source resources/libraries but you must specify them in the report.
  - model architecture (ex: ResNet, ViT, etc.)
  - pre-trained weights (ex: ImageNet)

- **The only rule is that you have to train (finetune) your model by yourself!**

Grading Criteria – Performance (50%)

- Public leaderboard
  - For you as a reference (similar distribution to the private)
- Private leaderboard
  - (25%) Baseline: **accuracy >= 0.76 (Weak baseline)**
  - (25%) Compete with your classmates
    - Tie rule: less submissions rank first

accuracy   0   0.76   best accuracy

point   0   25%   25%+25%

linear interpolation   linear interpolation
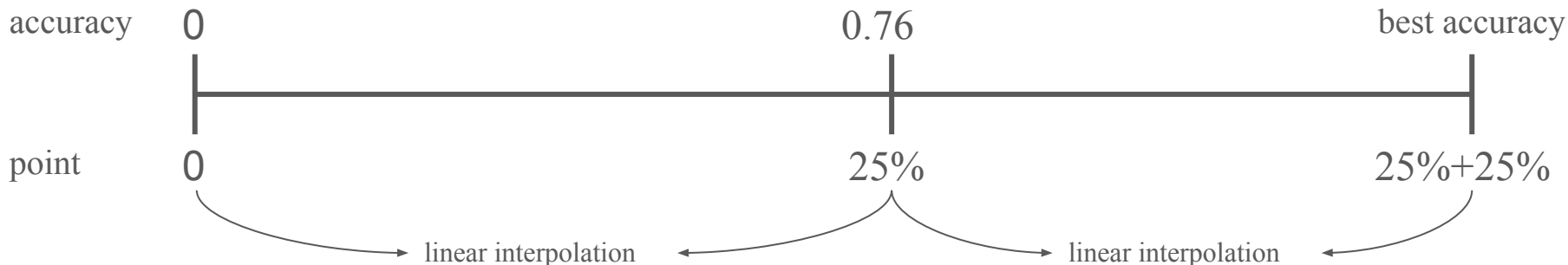
Grading Criteria – Report (20%)

- Implementation details (10%)
  - Model architecture & hyperparameters (5%)
  - Training strategy (5%)

- Experimental results (10%)
  - Evaluation metrics and learning curve (5%)
  - Ablation Study (5%)
    - To prevent submission counts that affect final rank, you can run ablations on individual validation set split from training set by yourself.

Numpy & PyTorch

- Numpy Tutorial: [Link](#)

- PyTorch Tutorial: [Link](#)

  - Free to use any modules and functions

Environment

- Python version: 3.9 or higher

- If you have a GPU

  - Conda

  - Miniconda

  - virtualenv

  - …

- If you don't have a GPU

  - Google Colab

Handwritten Questions (30%)

2-1 (10%)

Why Sigmoid or Tanh is not preferred to be used as the activation function in the hidden layer of the neural network? Please answer in detail.

2-2 (10%)

What is overfitting? Please provide at least three techniques with explanation to overcome this issue.

Handwritten Questions (30%)

2-3 (10%)

Given a valid kernel $k_1(x, x')$,prove that the following proposed functions are or are not valid kernels. If one is not a valid kernel, give an example of $k(x, x')$ that the corresponding K is not positive semidefinite and show its eigenvalues.

a. $k(x, x') = k_1(x, x') + \|x\|^2$
b. $k(x, x') = k_1(x, x') - 1$
c. $k(x, x') = k_1(x, x') + \exp(x^T x')$
d. $k(x, x') = \exp(k_1(x, x')) - 1$

(reference: page 15 of 6.kernel_method.pdf)

Report

- Please follow the report template format. (-5pts if not use the template)
- Link

Submission

- Compress your **<u>code</u>** and **<u>report</u>** into a **.zip file** and submit it to E3.

- Report should be written in English. (-5 pts if not English)

- <STUDENT ID>_HW4.zip

  - [YOUR CODE] (Make sure it is well-organized and can be executed)

    - Training code, Inference code, README, etc (README should contains how to setup your env and run the code)

    - Model weights: <STUDENT ID>_weight.txt (which contains a link to your google drive & ensure the permission is granted)

  - <STUDENT ID>_HW4.**pdf** (NO .doc, .docx or others format)

- Don't put the <u>data</u> (e.g. train.csv / test.csv) and <u>model weights</u> into submission file

  - -10 pts if you put the wrong things into zip file

Kaggle Submission Reproduction

- Your inference file should be able to reproduce your kaggle submission.

- You will load the model in your inference file (with the model weights you provide) and then generate your kaggle submission file.

- For python file (inference.py)
  - It will be checked on our lab's servers. (NVidia 2080Ti, cuda 11.3)
  - Please provide a **environment setup instruction** which can help us quickly rebuild your environment and accurately reproduce your results.

- For jupyter notebook file (inference.ipynb)
  - It will be checked on Google Colab.
 - Please include the necessary **pip install instructions** in the first cell.

17

Other rules

- **Late Policy**: No Delay allowed this time. (delayed, a.k.a. submission closed)
  - **You will get 0 pts on HW4**

- **No Plagiarism**: You should complete the assignment by yourself. Students engaged in plagiarism will be penalized heavily. Super serious penalty.
  - 0pt for the assignment or failed this course, etc
  - Report to academic integrity office

AI-Assistant

- Not recommended but no forbidden

- Copy-and-Paste answers from the AI-Assiant will be seen as Plagiarism
  - However, you can have your own answer first then rephrase it by AI-Assiant.

- Some questions might be parts of final exam, make sure you understand the concept

You dare use my own spells against me, Potter?
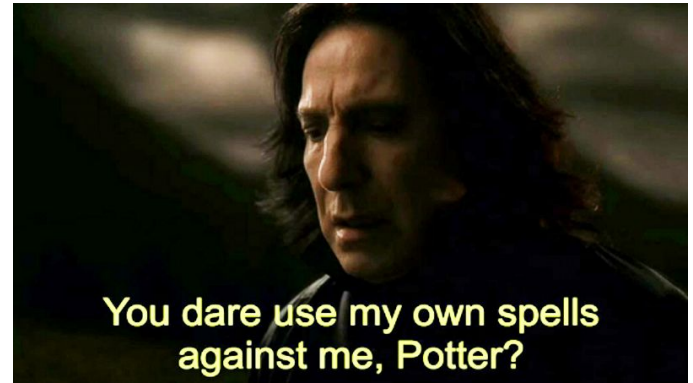
FAQs

- If you have other questions, ask on **E3 forum** first! We will reply as soon as possible.
    - If the E3 discussion area still have issues, feel free to write email to TAs (And remember to cc all TAs).

Have Fun!

Machine learning students at the beginning of a project

vs.

Machine learning students at the end of a project