Praktikum Deep Learning CV+NLP SoSe 2023

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Praktikum Deep Learning

Goal: develop Deep Learning systems to solve real tasks
understand and implement research papers

What: multiple programming projects in groups

Setup: Python, Pytorch, Huggingface

Minimum requirements:

- Deep Learning
- Basics of Machine Learning
- Python

Timeline

1. First basic project: detecting generated images
   - Goal: get used to Pytorch and ecosystem (1-2 weeks)
     implement and train a basic image classifier and test alternatives (2 weeks)
   - Duration: 4 weeks starting today
   - Points: 25% (+best group gets a bonus point)
2. Second basic project: something with text retrieval
   - Goal: same
   - Duration: 3 weeks, starting immediately after 1st basic project
   - Points: 25% (+best group gets a bonus point)
3. Interesting project
   - Goal: do something more interesting, (maybe) building on top of a previous project
   - Duration: the rest of the semester
   - Points: 50%
   - Topics: robust generated image detection, deep image watermarking, semantic parsing with ChatGPT?...

Grading

- Reports
- Presentations + questions
- Code:
  - Should be commented, well-organized and easily runnable
  - Results should be reproducible
- Criteria:
  - Understanding of concepts
  - Ability to implement them
  - Ability to choose interesting experiments and questions
  - Interpreting results
  - Teamwork

Development environment

- Python
- PyTorch:
  - Go over ALL basics first: (starts here: https://pytorch.org/tutorials/beginner/basics/intro.html)
  - And try them out
- Huggingface
  - Pre-trained models
  - Datasets
  - Code (diffusers, transformers)
- Git
- Reports: Latex (check out Overleaf ← free online collaborative latex)

Environment: Python and PyTorch

- Use conda (or virtualenv): https://docs.conda.io/projects/conda/en/latest/user-guide/install/index.html
- Make a Github(/GitLab) project and use git
  - commit and push **all** your work under **your** name
  - Tips:
    - Create new branches for new things or changes and merge
    - Check out Git's cherry-pick
- Pytorch:
  - Installation: https://pytorch.org/
  - Tutorials: https://pytorch.org/tutorials/
  - (Course: https://www.coursera.org/learn/deep-neural-networks-with-pytorch (?))

Environment: Hugging Face

- https://huggingface.co/
- Datasets: https://huggingface.co/datasets
- Models: https://huggingface.co/models
- Really easy to use

Practical

- Use Google Colab for the top-level script
  - Easy to analyze things and collaborate live
  - Extremely easy to reproduce
  - FREE compute!
  - Keep Colab script as short as possible!
  - Works with external code:
    - Even private repo: https://felixbmuller.medium.com/connect-a-private-github-repository-with-google-colab-via-a-deploy-key-cca8ad13007
- ⇒ use repo to write code
- ⇒ import this code in Colab for training and plotting
- Whenever using anything, make sure you can explain what it does and how to reasonable level of detail

First project: detecting generated images

Goal: given some image, determine whether it's real or generated using Stable Diffusion

Timeline:

1. Go over pytorch basics (1 week)
2. Implement baseline binary image classifier (1 week)
   - starting dataset: DiffusionDB subset for fake, Imagenet**te** for real
   - starting model: Resnet50
3. Run experiments + write report (1 week)
   - remember to use train/valid/test split
4. Try improve (1 week):
   - more data (OpenImages?)
   - other models (Vision transformer?)
   - perturbations (blur, JPEG, crop, zoom, …)

First project: continued

- After four weeks (after 9 May):
  - Short report (~2 pages)
    - What and why
    - Results
  - Short presentation (~5min): explain report, answer questions, go over code
  - Code:
    - Github + Colab notebook + pre-trained model
      - At least one notebook for just prediction (keep training code separate)
    - Notebook must load a model you trained and easily run on new Dataset
      - (more specs later)
- Leaderboard:
  - I'll run your notebooks on my dataset
  - Leading group: bonus point
- We'll try to meet weekly

Next week

- Send me email with teams (or if you need one) before Friday
  - We will change teams for every project
  - 3-4 per team
- Go over pytorch basics, set up environment

Questions