ATML Tutorial 01

Advanced Topics in Machine Learning
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Adam Bielski

ATML Tutorials

- Focused on programming
- Implementing machine learning algorithms in Python and PyTorch (deep learning library)
- Bring your laptop and **download the materials** from ILIAS before the tutorial

Why Python for ML?

Lots of powerful C or Fortran backend libraries:

- Numpy (numerical computation with multi-dimensional arrays)
- Scipy (efficient numerical routines for integration, optimization, ...)
- Matplotlib (2D plotting library)
- Pandas (high-performance data structures and data analysis tools)
- Tensorflow
- **PyTorch**

Getting started with Python

- You will need to have Python on your machine with some common scientific libraries
  - Needed for the assignments
  - We recommend you install Anaconda: https://docs.anaconda.com/anaconda/install/
  - A Python distribution with all the required libraries pre-installed

Installing Python packages

- You can use either **conda** or **pip** to install packages
- e.g. **conda install pytorch**
- Possible to create *virtual environments* with different packages
  - `conda create --name atml python=3.8`
  - `conda activate atml`
  - `conda install numpy matplotlib jupyter Pillow jupyter jupyterlab`

Jupyter notebook

- We'll use a **jupyter notebook**
  - Interactive output
  - Writing code in cells
  - Good for learning / writing interactive code
- **python-tutorial.ipynb** on ILIAS
- Download and run in the command line / terminal
  - **jupyter notebook** or **jupyter lab**

Google Colab

- Jupyter notebook **online**
- Free access to **GPUs** (necessary for fast training of deep learning models)
- One session limit - 12 hours
- Will be needed for the assignments!
- Requires google account
- https://colab.research.google.com/
- Python tutorial: https://colab.research.google.com/drive/1cUJds-plbUmOzhfsVL8KhTIfY8-jyHre
    - Click **Open in playground**

Google Colab / ML Application examples

Sample projects running with GPU (just running the models, no training)

- Image Colorization - DeOldify - https://github.com/jantic/DeOldify
  - **https://colab.research.google.com/github/jantic/DeOldify/blob/master/ImageColorizerColab.ipynb**
- Object Detection - YOLOv3 - https://github.com/abhinavsagar/google-colab-notebooks
  - **https://colab.research.google.com/github/abhinavsagar/Google-Colab-notebooks/blob/master/object_detection.ipynb**
- Image generation - BigGAN - **https://colab.research.google.com/github/tensorflow/hub/blob/master/examples/colab/biggan_generation_with_tf_hub.ipynb**
- Other examples: https://github.com/tugstugi/dl-colab-notebooks

Cats vs Dogs example

- Download and open *cats_dogs_template.ipynb*