Neural Networks and Learning Machines
Getting ready for the Exercises

January 2023

1 Introduction

The mandatory exercises in this course will be in Python using Jupyter Notebooks (a handy IDE for working with python code). To assist our use of neural networks and other machine learning we'll be using the neural networks framework PyTorch along with some other helpful Python Libraries.

This document will guide you in how to get started with these tools on the lab computers in Luleå, on any personal computer you wish to work on, or if you'd like to try out Google Colab. If you find any discrepancies in the document or have any further questions, please send us an e-mail: karl.lowenmark@ltu.se carl.borngrund@ltu.se.

2 Lab Computers

We'll be using Anaconda (or conda) as the platform to support all the frameworks and packages that we'll use in this course. The lab computers should have Anaconda (or conda) installed on them. Anaconda is a platform for running various Python IDEs and managing Python packages. To run Anaconda simply start the Anaconda-Navigator program.

The lab computers already have everything needed to run the exercises installed in the default environment (base). You can check if this is the case by jumping to the ”Using Jupyter Notebook” section and trying to run the first exercise. If it fails then try to follow the instuctions in Personal Computers section (skipping the step where you install Anaconda).

3 Personal Computers

We'll be using Anaconda (or conda) as the platform to support all the frameworks and packages that we'll use in this course. Anaconda is a platform for running various Python IDEs and managing Python packages. As such you'll need to install Anaconda.

Open up Anaconda, go to environments, and click ”Create” to create a new environment. Give it a name (e.g. ”nnlm”) and select Python (not R), select version 3.8, and click” Create”

If 3.8 is not available we can instead create this environment from the command line. Open a terminal and execute `conda create -n nnlm python=3.8` If you cannot execute this command, it may be because conda isn't reachable from the terminal you're using. In this case you can either add conda to your system's *PATH* or you can open a terminal from Anaconda Navigator from which conda should be reachable. You might need to install the appropriate Application to open a terminal from Anaconda Navigator (for example ”CMD.exe Prompt” in Windows).

Now we need to install the proper packages to your new environment, this is easiest to do through the command line, so open a terminal (or console). Start your new environment by executing `conda activate nnlm`

Now that we've started our environment we're going to want to install the following:

- PyTorch - Neural Networks Framework
- SciPy - Useful Python tool kits
- Matplotlib - Graphs and Plotting Library
- scikit-learn - Machine Learning Library
- pandas - Dataset and Database management Library
- gensim - Natural Language Processing (NLP) toolkit
- ipywidgets - Utility package for Jupyter

Everything else we need will be installed automatically by conda when installing these packages.

So let's start with PyTorch. There are several versions of PyTorch one for computers without GPU's and two different versions for computers with GPUs and CUDA Toolkit installed. While GPU is much faster than CPU for training neural networks, in this course everything can be done with the CPU. To install the CPU version of PyTorch exectute

```
>>> conda install pytorch torchvision torchtext cpuonly -c pytorch
```

For the GPU versions check the PyTorch homepage.

The remaining packages are easy to install. Just execute the following commands.

```
>>> conda install scipy
>>> conda install matplotlib
>>> conda install scikit-learn
>>> conda install pandas
>>> conda install gensim
>>> conda install ipywidgets
```

That should be it for installing the environment. Since your environment won't follow you between computers you'll need to redo this setup for every new machine you start using, so it's suggested to stick with the same as much as possible.

Moving on we want to install Jupyter Notebook. Just navigate to the home screen in Anaconda Navigator, switch to the new environment with the drop down menu, and then click ”Install” under the Jupyter Notebook application (You can also try the Jupyter Lab application to see if you like it better).

4 Google Colab

Google Colab is a free in-browser platform for running Jupyter notebooks in the cloud. In Google Colab you don't need to install any environments and can simply execute the notebook as is. Additionally Colab supports parallel editing by multiple programmers (similar to Google Docs).

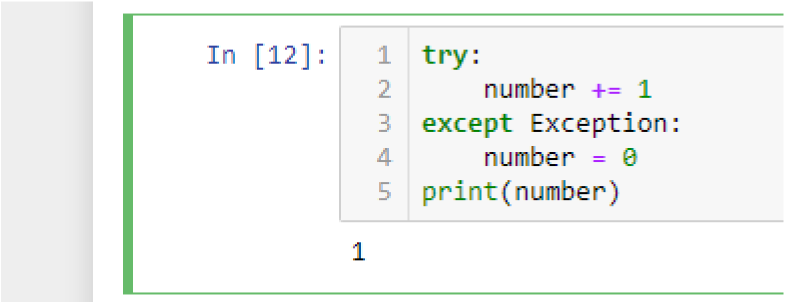
5 Using Jupyter Notebook

Once Jupyter Notebook is installed installed the button will be exchanged for a ”Launch” button used to start the application. Once launched you can navigate the folder structure from within Jupyter Notebook to open any notebook files (.ipynb) like the exercises.

When you launch the Jupyter Notebook application an instance of Jupyter Notebook is opened in your browser. From the main view of the application you can navigate the folder structure to open notebook files (.ipynb) or you click ”New” and create a new file. Files will be opened as additional tabs in your browser.

Notebooks consists of a long stack of cells. A cell either contains some text, a header, or code. The cells with code in them can be executed by highlighting them (for example by clicking on them) and pressing ”Run” on the dashboard. Alternatively one can execute a cell by pressing shift+enter. Variables and imports are maintained between cells and each subsequent run of the cell so if you execute the cell below multiple times the output will be incremented each time. This is comparable to how MatLab scripts work.

For a more in-depth tutorial of Jupyter Notebook you can go here. Since we didn't cover Python programming in this document we will instead recommend the following tutorial. Exercise 0 (which is ungraded) in this course will test you on some basics of Python programming as well as using some basic PyTorch. If you can complete Exercise 0 you should be prepared to take on the rest of the course. If not, please do the recommended Python tutorial and, if that doesn't work, contact a TA for assistance.



```python
try:
    number += 1
except Exception:
    number = 0
print(number)
```

```
1
```

Figure 1: A Jupyter Notebook cell with Python code.