You do not need to submit this assignment. However, a serious attempt at all the other assignments is mandatory to grant access to the final exam. Refer to the course manual for more details (section *Overview* on Brightspace).

Learning goals:

- Familiarize oneself with Python and Jupyter notebooks;

- Explore the wide range of BCI applications;

- Familiarize oneself with posting on the Brightspace forum & joining the Discord server;

- Test relevant background knowledge;

Question 1: Before you get started, set up Python and Jupyter notebook

This first assignment mostly sets up the infrastructure we will use in the rest of the course. Please execute the following steps:

(a) Install, if you do not already have done so, the **Anaconda** Python 3 distribution (see here). This provides an easy way of using this course's Jupyter Notebooks as well as easy package management.

(b) Install, if you do not already have done so, the **Poetry** dependency manager (see here). This provides an easy way to download python packages.

(c) Download the "`bci-BKI323_python-env.zip`" file from Brightspace. This contains a folder with the files that we are going to use to create our environment. Extract the folder from the zip file.

(d) Open an Anaconda prompt (terminal), either directly or via the Anaconda Navigator. Navigate to the folder you extracted the "`bci-BKI323_python-env.zip`" file to

(e) Execute the command `conda create -n bci-BKI323 python=3.10 pip` to create a new conda environment with name "`bci-BKI323`". The environment should also work with more recent python versions up to '3.12'.

(f) Next, execute `conda activate bci-BKI323` to activate the environment you created.

(g) Now that you're in the environment, execute `conda install -c conda-forge poetry` to install Poetry, a package manager.

(h) Then execute `python -m poetry install --no-root` to install all the python packages that we will use in the course.

(i) The above steps only have to be performed once to install. For subsequent sessions, make sure to activate the correct environment (using `conda activate bci-BKI323`), and then type `jupyter notebook` to open up Jupyter Notebook using that environment. Alternatively, one can open Jupyter Notebook via the Anaconda Navigator (NB: activating the correct virtual environment in the navigator is done with a drop-down menu).

Question 2: Form groups to make the assignments with

We recommend that you work on the assignments in groups of four students. Once you have found your team partners, please enroll for a group on Brightspace. You will make the assignment together with this group.

Question 3: Make a forum post about a neurotechnology application

We will use the Brightspace forum for some parts of the course. We have set up separate pages for individual weeks, with topics separating course content (asking questions about e.g. the lecture) and assignments (asking questions about the assignments). To get into the habit of posting frequently on the Brightspace forum, let's make a forum post right away:

(a) Find an interesting application of neurotechnology, post a link to it (e.g., a blog post, article, podcast, video, etc.) in the assignment forum of Week 01. Describe the application in around two sentences. As the subject of your posts, use a sensible title that explains the body. In this exercise, use something like 'Assignment 1: group <number> <your application>', where you fill in your group and the application you found.

(b) We encourage to answer each other's questions. Comment on at least one of the applications of other groups with interesting additional information, or a critical question.

(c) Next to Brightspace, we provide a Discord server for when you have a quick question and to provide a common place for groups to meet and discuss assignments outside of the workgroups. Check out the assignments on Brightspace for a link to the server.

Question 4: Go through our tutorial notebooks

We provide two little tutorials for you to grow more familiar with the basics necessary to successfully apply signal processing and machine learning using Jupter notebooks. To start a Jupyter notebook, simply open a terminal (Linux or MacOS) or command window (Windows), and then type `jupyter notebook`. Alternatively, you can open the specific Anaconda prompt (terminal), which can also be used to start a jupyter notebook via the same `jupyter notebook` command. This starts up the Jupyter notebook GUI in a browser, where you can browse the directory from which you called Jupyter notebook. You can also first change your directory to a folder that contains the notebook files, and then start the GUI using `cd <directory>`. Note, later assignments will provide template notebooks that you will work with and later submit on Brightspace. In this assignment, you do not need to submit anything to Brightspace (other than the forum post from the exercise above).

(a) Go through our introductory tutorial on Jupyter notebooks and Python:
`assignment_01_jupyter_notebooks.ipynb`.

(b) Go through our introductory tutorial on MNE data loading and plotting:
`assignment_01_mne.ipynb`.

Question 5: Test and refresh your background knowledge

It is likely that you all have different backgrounds. In this exercise we're trying to level the playing field a bit.

(a) We have provided an 'entry exam' type document for self evaluation. Go over this exam-like document and try to answer all the questions to the best of your ability. We will also provide the solutions for you to check your answers after the deadline.

(b) Did you encounter parts that you found challenging? Then we highly recommend that you brush up on those topics.

- For **linear algebra**, we recommend 3Blue1Brown's excellent Essence of linear algebra series (click here) for intuitive visual explanations about important linear algebra topics or Kahn Academy (click here) for more explanations and examples on how to do computations. We also recommend brushing up on the following concepts if you have trouble explaining any of these or don't know how to compute with them: vectors, matrices, inverse matrices, matrix transformations, eigenvalue decomposition. Additionally, reference is made to the matrix cookbook.
- For a quick rundown of **machine learning** fundamentals, we recommend this Towards Data Science blog post (click here). Note, we will further explain certain topics mentioned during the course.
- Some **signal basics** are given by these Stanford lecture notes (click here).

Question 6: General comments on the assignments

These will be valid throughout the course:

(a) Make sure that you do not upload any "by-products" to Brightspace (e.g., class files or executables or any stuff from your local environment). Also never ever upload large data files. In all assignments, only upload the accompanying Jupyter notebook(s) that you have edited.

(b) When you encounter implementation problems proceed as follows. First do the obvious Google search: very often, this leads to a page describing exactly the problem you are having and the solution for it. Then search/read our forum (or Discord) to see if someone has already asked a similar question. Then you are very welcome to ask a question on the forum (or Discord) yourself. In general: please ask before you spent a lot of time on minor implementation issues.