signal_processing_0_preparing_environment

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1.1 CA17137 - A network for Gravitational Waves, Geophysics and Machine Learning

Acknowledgement: Some of the materials for gravitational wave processing are borrowed and adopted from the Gravitational Wave Open Data Workshop #2

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1.2 Agenda

The format of this notebook is as follows:

- **Introduction to jupyter, virtual environments, pandas, plotly, cufflinks, matplotlib…**
  - We'll be working with some python classes that may be unfamiliar.
- **Analyzing some sensory data**
  - Multichannel accelerometer and ECG data
- **Warmup: AR Processes**
  - This is to gain familiarity with AR Processes and/or using the python implementations before working on real data. This may be skipped by those who have the necessary background.
- **Introducing the MHEALTH dataset**
  - This is the real-world dataset that we'll be using in our exercises. A brief introduction is given here.
- **Exercise 1: Modelling and predicting sequential data.**
  - This is a chance to use your knowledge of AR processes in practice.
- **Exercise 2: Time Series Classification.**
  - Here we'll cover a method for classifying sections of a time series.

1.3 Useful links

- Installing python
- Creating virual environments in Jupyter Notebooks for windows with Anaconda
- Managing virtual environments

Installation on Windows (without Anaconda, just regular python): `pip install jupyter pip install ipykernel python -m venv .my_venv python -m ipykernel install --user --name=.my_venv`

1.4 Creating a virtual environment

1.4.1 Install on Mac OS X

To install the requirements on Mac OS X it is recommended to have a virtual environment setup first. To do that run:

Install virtualenv First install virtualenv: `sudo pip install virtualenv`
Then navigate to your project folder:
`cd ~/signal_processing_intro`
And finally run: `virtualenv .venv -p python3.7`
This will install your virtual environment in a folder `~/signal_processing_intro/.venv` with a python version 3.7 which is recommended for this project.

Install project requirements Once you have `virtualenv` installed, activate your virtual environment:

```
source ~/signal_processing_intro/.venv/bin/activate
```

and to install the project requirements run:

```
cd ~/signal_processing_intro
pip install -r requirements.txt
```

1.4.2 Install on Ubuntu

To install the requirements on Mac OS X it is recommended to have a virtual environment setup first. To do that run:

Install virtualenv First install virtualenv

```
sudo apt-get install python3-pip
sudo pip3 install virtualenv
```

Then navigate to your project folder:

```
cd ~/signal_processing_intro
```

And finally run

```
virtualenv -p /usr/bin/python3.7 .venv
```

This will install your virtual environment in a folder `~/signal_processing_intro/.venv` with a python version 3.7 which is recommended for this project.

1.4.3 Using Anaconda

We assume that Python 3 + Anaconda are installed; furthermore the following packages are required:

- numpy
- pandas
- statsmodels
- matplotlib
- scikit-learn
- jupyter (!)

If you don't have a Python 3 installation, we highly recommend installing Anaconda. See installation instructions here.

If an environment is not already available with the above packages, we recommend creating a new one with the following command:

```
conda create -n signal_processing_intro python=3  matplotlib numpy pandas statsmodels scikit-learn jupyter
```

and choose 'Python3 (timeseries)' as the kernel when starting this notebook.

1.5 Required packages

Listed in the requirements.txt file. Install with:

```
pip3 install -r --user requirements.txt
```

To run a following cell (shortcut: `ctrl+Enter` or `Shift+Enter`) and continue with the exercises below.