Beyond the Hype:
An Introduction to Machine Learning and Neural Networks

Undergraduate Internship 2023

CEMFI

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1 General Information and Schedule

The short course will take place on Thursday, June 29, 15:30 - 17:00, and Friday, June 30, 15:30 - 17:00 and will provide an introduction to machine learning and neural networks. The preliminary schedule for the two sessions is

- Thursday
    1. Introduction to machine learning
    2. Basics of neural networks
- Friday
    1. Introduction to Julia
    2. Implementing neural networks in Julia

Example codes for the session on Friday are available on Moodle. Below you will find a rough guide on how to install Julia. I recommend that you have everything installed before the second session so that it is a bit easier to follow. If you have any questions regarding the short course or the installation of Julia, please do not hesitate to contact me at joel.marbet@cemfi.edu.es.

2 Installation of Julia

Installation of the recommended setup from scratch (for more details, see: `https://www.julia-vscode.org/docs/stable/gettingstarted/`)

1. Install Julia: `https://julialang.org/downloads/`
2. Install VSCode: `https://code.visualstudio.com`
3. Install Julia for VSCode: Go to View in VSCode, then click on "Extensions" and type "julia" in the search box and hit enter. Install the `julia` extension.

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4. Julia packages can then be installed using Julia's package manager if necessary

3 Opening the Lecture Notes (for Friday)

The lecture notes for Friday are contained in a Pluto notebook. To start the Pluto notebook, you need to run the following command in Julia

```
using Pluto; Pluto.run()
```

Once you run this line in Julia, a browser window with the Pluto interface should open automatically. From there, you can open the Pluto notebook `LectureNotesPart3.jl`.

4 Additional Resources

We will only be able to scratch the surface of the field of machine learning. Here are some great resources to learn more:

- Goodfellow et al. (2016), "Deep Learning" (`https://www.deeplearningbook.org`)
- Bishop (2006), "Pattern Recognition And Machine Learning"
- Nielsen (2019), "Neural Networks and Deep Learning" (`http://neuralnetworksanddeeplearning.com/`)
- Murphy (2012, 2022, 2023), Book Series on Probabilistic ML (`https://probml.github.io/pml-book/`)
- Sutton and Barto (2018), "Reinforcement Learning: An Introduction" (`http://incompleteideas.net/book/the-book-2nd.html`)

Note that several of these books are officially available for free. Regarding programming in Julia, I can recommend the following resources

- TechyTok!: `https://techytok.com/from-zero-to-julia/`
  - Excellent tutorial that goes into more detail than we will be able to
- QuantEcon: `https://julia.quantecon.org/`
  - Provides great lectures that start from the very basics of Julia
  - Many economic applications
- Julia Documentation: `https://docs.julialang.org/`
  - Very clear and well organized
  - Performance tips: `https://docs.julialang.org/en/v1/manual/performance-tips/`
  - Noteworthy Differences from other Languages: `https://docs.julialang.org/en/v1/manual/noteworthy-differences/`

        * If you have experience in either Matlab, R, Python or C/C++, it's a good idea to have a look at the respective section

- Plotting with Julia
  - Plots.jl: `http://docs.juliaplots.org/`