

## **New Aim**

Learn useful tools for cognitive science and implement some typical activities of cognitive scientist:

Method: hands-on lecture (=TD). After 15~30 min of introduction, you are given a series of exercises to perform.

## **Creating Visual stimuli with pygame**

<https://pcbs.readthedocs.io/en/latest/running-experiments.html>

## **Programming simple reaction-time tasks with experiment**

## **Manipulation of sound with Praat**

- How is sound represented in the computer. How can it be manipulated. See <http://www.pallier.org/lectures/tpexp2/tp.html>
- Programming an ABX sound experiment with experiment

## **Search a lexical database with R / Learn about regular expressions**

- <https://github.com/chrplr/openlexicon/blob/master/documents/Interroger-Lexique-avec-R/interroger-lexique-avec-R.pdf>
- [https://pcbs.readthedocs.io/en/latest/regular\\_expressions.html](https://pcbs.readthedocs.io/en/latest/regular_expressions.html)
- Zipf law

## **Numerical Simulations with numpy**

### **Statistics by simulations**

- Permutation test and the concept of p-values.
- The issue of multiple comparisons
- Analyses of time-series

## **Réseaux de neurones et/ou automate cellulaire**

\*\* Hopfield network

Read <https://towardsdatascience.com/hopfield-networks-are-useless-heres-why-you-should-learn-them-f0930eabcd> and do not look at the jupyter notebook implementation provided by the author. Try to program a hopefield network and teach irt a few patterns. Only then, check the author's solution.

To go further you can read:

Ramsauer, Hubert, Bernhard Schäfl, Johannes Lehner, Philipp Seidl, Michael Widrich, Thomas A

**\*\* Perceptron**

Read about the Perceptron at <https://medium.com/@thomascountz/perceptrons-in-neural-networks>.  
Implement a Perceptron in Python

For a solution, check : <https://blog.dbrgn.ch/2013/3/26/perceptrons-in-python/>

- Analyse de données neurales (spike trains).

Find examples from Neural Data Science

## Prerequisite and Evaluation:

Prerequisites:

- to have instaled the software described in the documentation
- to have basic knowledge of programming in Python

Evaluation: Pass/Fail.

Being present at each lecture and send us your code (zip file) at the end of each lecture.