Deep Learning in Neuroimaging and Beyond

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Date: December 11th, 9h-17h

Location: Amphithéâtre “le groupe Maurice”, CRIUGM

Summary: This course will introduce participants to deep learning methods and include several hands-on lessons to familiarize students with deep learning software libraries and methodology.

Deep learning is one of the most promising avenues towards achieving artificial general intelligence, and a strong new tool for the analysis of neuroimaging data. This course will offer an introduction into the theory behind how representations are automatically learned from data, and offer students an introduction into how to use the Keras library to formulate and solve a variety of deep learning problems using hands-on examples.

Learning Objectives:

1) Understand how **representations are learned** in deep neural networks,
2) Implement a **convolutional neural networks in Keras** on neuroimaging data
3) Learn how sequences and **time series** data can be represented with recurrent architectures

Morning (9h - 12h30)

- Introduction to Deep Learning
- Convolutional Neural Networks in Keras
- Hands-on: automatic MRI segmentation of gray/white matter
- Hands-on: build a U-Net with Keras

Afternoon (13h30 - 17h)

- Introduction to Recurrent Neural Networks
- Natural Language Processing & word embeddings
- Hands-on: natural language processing tutorial
- Hands-on: genomics transcription tutorial

Requirements

- Basic familiarity with programming in Python is an asset, but not a requirement.
- Examples will be presented in Google Collaboratory, and participants should create a Google account to run & write code along with the instructors: https://colab.research.google.com.
- For students who wish to continue their analyses after the course, Python 3.x should be installed with the Keras package.