NEUROSCIENCES

Neurograd+ Summer School in Cognitive Neuroscience 2025

July 1st-4th, Lyon, France

Provisional program

The titles of lectures may not be definitive, and minor
adjustments of the speaker list and schedule may also occur.

Register here:

https://neurograduate.univ-lyon1.fr/summerschool/

Target audience:

Master students of any nationality willing to start a PhD in
cognitive science or neuroscience (in Lyon or elsewhere!)

Day 1 – Open cognitive (neuro)science & data collection

- *8h30-9h*. Registration and coffee

- *9h-9h15*. Welcoming words by the organisers and general introduction.

- *9h15-11h30*. **Lectures**. **Introduction to open cognitive science**.
  - What lies ahead: the long road from ideas to publication
  - Statistical designs & power calculations for reproducible findings
  - Opening science through preregistration, standardization and documentation

  Confirmed speakers
    - Nils Kolling (SBRI, Lyon)
    - Nicola Kuczewski (CRNL, Lyon)
    - Gaëlle Leroux (CRNL, Lyon)

- *11h45-12h30*. **Practical session**. **Collaborative virtual environments**
  - Essential commands to use Git(hub)
  - Get started with Python and JavaScript programming

- *12h30-14h*. **Lunch** with the speakers, open to the local research community.

- *14h30-15h30*. **Lecture**. **Online behavioural testing**.
  - Key tools, principles and challenges for accurate online experiments

  Confirmed speakers
    - Romain Ligneul (CRNL, Lyon)

- *15h30-18h30*. **Practical session. Deploying behavioural experiment**
  - Introduction to jsPsych and Express.js
  - Setting-up a database
  - Recruiting participants on Prolific

- *18h30-20h00*. **Lecture** & pizzas. **Gamification of behavioural tasks**.
  - Studying affective and cognitive mechanisms in ecological contexts

  Confirmed speaker
    - Jacqueline Scholl (CRNL, Lyon)

Day 2 — Data analysis and modeling

- *9h-10h45.* **Practical session. Accessing and preprocessing online data**
  - ➢ Database queries with Pymongo
  - ➢ Getting familiar with Numpy and Pandas
  - ➢ Preprocessing and sanity checks

- *11h-13h.* **Lectures**. **State-of-the-art data analyses and behavioural models**.
  - o Principles of statistical optimization and their application to behavioural modelling
  - o Making models sound: simulations, recovery and sanity checks
  - o Reinforcement-learning and Bayesian models for model-based analyses of brain signals
  - *Confirmed speakers*
    - o Stefano Palminteri (ENS, Paris)
    - o Lionel Rigoux (Max-Planck Institute, Cologne)
    - o Philippe Domenech (INM, Paris)

- *13h-14h.* **Lunch**

- *14h-15h.* **Flash-talks (5 presentation + 5 minutes Q&A)** by local PhD students and postdocs

- *15h-18h30*. **Practical session**. **Fitting and validating behavioural models**
  - ➢ Simulating the task using different reinforcement-learning models
  - ➢ Model fitting using Pybads
  - ➢ Making sense of model comparisons
  - ➢ Model validation

- *18h30-23h30*. **Social event** with students and speakers near the River Rhône.

Day 3 — Towards clinical and real-life applications

- *9h-10h45*. **Practical session. Aligning behavioural and physiological data**
    - ➢ Measuring heartbeat and skin conductance using Arduinos
    - ➢ Synchronization of behavioural and physiological data
    - ➢ Kernel functions and GLMs applied to skin conductance signals

- *11h-13h*. **Lectures**. **Towards real-life applications**.

    - o Large scale data collection in the wild: "Sea Hero Quest" success story
    - o Computational psychiatry in a smartphone
    - o The importance of metacognition in cognitive science
    Confirmed speakers
        - ▪ Antoine Coutrot (LIRIS, Lyon)
        - ▪ Marion Rouault (ICM, Paris)
        - ▪ Quendera (Champalimaud Foundation, Lisbonne)

- *13h-14h*. **Lunch**

- *14h-15h30*. **Lectures**. **Contributions of Virtual Reality, Artificial Intelligence and Closed-Loop system to Cognitive Science and Beyond**

    - o AI toolboxes for (neuro)cognitive scientists
    - o Embodied cognition and peripersonal spaces in VR
    - o Real-time EEG processing between art and science
    Confirmed speakers
        - ▪ Pauline Mouches (CRNL, Lyon)
        - ▪ Stephen Whitmarsh (Paris Brain Institute)
        - ▪ Alessandro Farne (CRNL, Lyon, *to be confirmed*)

- *15h45-17h45* Interactive visit of the Neuro-immersion platform at Impact
    - o Speaker: Clément Desoches (CRNL)

- *Evening.* **Sci-art performance**[1]. **BRAIN (EEGsynth) plays Steady State**

    - o Samon Takahashi
    - o Stephen Whitmarsh

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[1] The performance will likely take place in the early evening in a venue downtown

Day 4 — Hackathon

- A subset of the students (6 to 8) may participate in our 1-day hackathon to extend one of the experiments studied during the practical sessions throughout the first 3 days.

- The core goal of this hackathon will be to adapt the task for mobile devices and make use of their sensors (e.g. touchscreen, accelerometer) to gamify the experience of participants.

- The hackathon will take place between 10h and 19h.

Independently of their participation in the hackathon, students may use this final day to discuss their own personal projects with the tutors, teaching assistants or local speakers. In this case, they should send to the organisers a brief description of your project and the type of guidance or support they would like to obtain before *June 15th*.