

e-ReproNim: A shared approach to teaching open and reproducible neuroimaging

Terminology

Assessment

- Formative assessment - refers to units of work that students do, either in class or at home, that are designed to support individual reflections about aspects of the material. The students output is evaluated and commented on by the convenor, but the assessment does not feed into the final mark evaluating the module.
- Summative assessment - refers to units of work that students do to evaluate the extent to which they have understood and integrated the content of the module; this typically takes the form of graded coursework or exams, as per each Institution's policies.

Convenor - refers to the person in charge of delivering content in the context of the modules.

Module – refers to the formal unit of training organised locally that composes a programme. These are typically lectures, tutorials, workshops or other activities that count towards ECTS credit allocation.

Programme – refers to the degree programme or course that students are registered to, in the academic year 2022-23.

Key information

Institutions	Programmes	Local convenors	Local contact
Univ. of Reading (United Kingdom)	MSc in Cognitive Neuroscience FENS NENS website	Dr Etienne Roesch Dr Nicholas Hedger	e.b.roesch@reading.ac.uk
Univ. of Geneva, EPFL (Switzerland)	MSc in Neurosciences, PhD Program in Neuroscience (EDNE) and the Lemanic Neuroscience Doctoral School (LNDS) FENS NENS website	Dr Michael Dayan	michael.dayan@fcbg.ch
Nicolaus Copernicus Univ. (Poland)	BSc/MSc in Cognitive Science FENS NENS website	Dr Karolina Finc Dr Michał Komorowski	finc@umk.pl

Project overview

Purpose and aims

The purpose of the project is to develop a shared, multi-campus, online learning experience for MSc and PhD students on the programmes of the NENS Cluster, to enhance the teaching of reproducible practices in neuroimaging.

The root causes of the so-called “reproducibility crisis”, which has so far been more prevalent in psychology and neuroscience, stem in large part from statistical issues, like inadequate statistical designs, as well as poor computational training; problems that are only likely to worsen as data grow larger, become more widely shared, require decentralised collaborative work, and advanced techniques are imported from fields of engineering, like machine learning. The successful integration of such practices into routine clinical and theoretical neuroimaging thus requires students in neuroscience to acquire skills that typically fall outside of ordinary curricula, like data curation and annotation, remote collaborative pipelines or shared “cloud” computing infrastructures, as well as the practical and deep understanding of what it means to conduct and interpret research in a reproducible way.

We propose a blended pedagogical approach that includes shared instructional material (videos, tutorials, tools) and multi-campus online events, including an online conference over 3 days, for students to present their personal research projects, and participate in a brainhack event during which students work in teams, remotely, on projects to the benefit of the neuroimaging community at large.

e-ReproNim aims to provide students with the opportunity to learn reproducible research practices from experience, scaffolded by the complementary expertise available in the three programmes, creating ideal circumstances to explore the challenges and solutions to issues of reproducibility in neuroscience, in the form of demonstrably robust training methods. We aim to:

- Co-design and document the pedagogical process of delivering the training;
- Create opportunities for interaction for our respective cohorts of students;
- Co-create a repository of material, including slides, exercises and methods, to the neuroscience community.

Learning outcomes

Each Institution, programme and module have their own expectation of learning outcomes (LO), which are described in their respective specification documents (available on the project website: <https://repro.school/portfolio/e-repronim-fens-nens-cluster-2022/>). More generally, by the end of the project, we expect students will be able to:

- Demonstrate a deep understanding of issues of reproducibility in cognitive science, psychology and neuroscience, including of the root causes to the so-called “reproducibility crisis” that relate to statistics, pipelines supporting data gathering and the research ecosystem in general;
- Explain the steps involved in the pipeline that permits the recording of brain signals, identify and explain the challenges of reproducibility that may arise;
- Select, explain and apply appropriate analytical pipelines to the analysis of

neuroimaging signals in a robust and reproducible way.

- Communicate about research clearly and confidently to a wide range of audiences, and situate their own research practice within current practices in neuroscience.

Training content

Institutions in the Cluster pool the resource and material they use into a shared repository, available from <https://repro.school/portfolio/e-repronim-fens-nens-cluster-2022/>

This shared material consists of two types, which the community can use and contribute to as they see fit:

- 1) Class content: including slides, scripts and notebooks, stored in our Github repository (<https://github.com/repro-school/training-fens>)
- 2) Participatory exercises: including group or individual activities designed to exemplify particular aspects of reproducibility in science and support a discussion with the students. These exercises will be made available on the project website at <https://repro.school/category/exercise/>

Structure

The project spans the academic year 2022-23, across three programmes and cohorts, in three different Universities. Each programme must follow its own timeline and calendar as per local arrangements for students. The teaching itself of shared material is asynchronous, meaning that students will be taught different content at different times, however, we have organised milestone events and meetings online, throughout the year where students progressively interact with each other and put in practice what they have learned so far.

The project finishes with a 3-day conference during which students present their research, and participate in a brainhack event, in groups composed of students of all 3 institutions, working on projects to the benefit of the European neuroscience community.

Assessment

Formative assessment

Each programme participates in the development of the shared material that is used for formative assessment, such as participatory exercises or homework.

Summative assessment

Each programme has its own policies and follows its own summative assessment.