

Project Guidelines

The project revolves around the analysis of experimental data from the Allen Institute, specifically focusing on coding visual information in mice. During the experiments, mice are immobilized to observe various patterns, images, and movies. The data collected includes measurements of neural activity across different layers and areas of the visual cortex and thalamus. *Your task is to craft a research question and, through the analysis of this extensive dataset, seek to answer it.*

Students will work in groups and deliver an oral presentation to the class, a short report and a Jupyter Notebook with the code needed to do the analysis.

Coming up with a research question

You are expected to propose a question to study for your project. For this, you can take inspiration from

1. The lessons, lecture notes, and the textbook.
2. Research papers and the literature.
3. Playing around with the data
4. Your own ideas!

Once you have a clear idea of your question, please email us your proposed research question. We will discuss and provide feedback on each group's question **during the lesson on March 4th.**

Calendar

We will have **three online sessions dedicated to the project:**

- **04/03: Overview of the dataset.** We will go through the example notebook, explaining in detail how the AllenSDK works.
- **19/03: Discuss your research question,** project ideas, and potential issues with the data.
- **14/04: Progress follow-up** and problems you might encounter.
- **14/05: Presentation of the projects** to the class
- **18/05: Deadline to submit the written report.**

Do not hesitate to write an email to the TA if you need support with the project at any point.

Evaluation

The project will be up to **16 points** and the evaluation will be based on

- **Quality of the technical analysis. (7 points).** How well is the analysis executed? Are appropriate methods and techniques applied to the given research questions?
- **Discussion of results and limitations. (5 points)** How thoroughly are the results discussed in relation to the research questions? Is there a thoughtful exploration of the limitations of the approach?
- **Clarity of presentation (2 points for report + 2 oral presentation).** Is the information communicated clearly and understandably?

These evaluations will be done through the **oral presentation and the report**. Note that in science it is important not only to have a good knowledge of the topic and make an interesting analysis, but also to be able to put it in a way that can be understood by others. **You also must submit all code used to perform the analysis.**

Structure of the project

Projects will be maximum 2 pages long, not including figures, tables and references. Please note that the goal is to come up with a good scientific question and to use an adequate methodology to answer it. It is not essential to positively answer your research question, but rather to present an insightful discussion your results, being either positive or negative.

As a rule of thumb, both your presentation and report should have a structure resembling this one:

1. Introduction

- Explain the significance and interest of your research topic.
- Provide context by relating your work to topics covered in the course.

2. State your research questions

3. Methodology

- Detail the methodology, analysis, pipeline, or model used in your project.
- Provide a clear and concise overview of the steps taken in your research.
- Include any relevant technical details.

4. Results

- Present your findings in a structured manner.
- Utilize plots and visuals to enhance clarity.
- Highlight key trends, patterns, or insights from the results.

5. Discussion

- Address whether your research questions were successfully answered.
- Explain the rationale behind your findings and discuss their implications.
- Reflect on what alternative approaches could have been taken.
- Acknowledge and discuss the limitations of your chosen methodology.
- Suggest potential areas for future research based on your findings