

Lab 0: Submission Workflow and Artemis II Mission Data

Jordi-Lluís Figueras

Matematiska Institutionen, Uppsala Universitet

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Forming the working groups

Groups today

Today we will settle the project groups for the course.

Course guidelines:

- work in groups of about 5 students,
- minimum group size: 4,
- maximum group size: 6,
- only one assignment per group will be submitted,
- work should be distributed so that everyone contributes.

Suggested way to form groups:

- try to balance Python, mathematics, and writing/presentation skills,
- place at least one relatively confident programmer in each group.

Lab 0

Lab goals

- Learn how future course projects should be submitted and organized.
- Start using the LaTeX and Python templates that will be reused in later labs.
- Practice building a small reproducible dataset from a real scientific context.
- Carry out a first computational exploration based on Artemis II mission updates.



Source: NASA, Artemis II launch image

Important practical point

Lab 0

Lab 0 is **not** a submission lab.

The purpose of Lab 0 is to teach the workflow that will be used in future labs and projects.

What will future groups submit?

- One submission per group.
- A report written in LaTeX and submitted as a PDF.
- The Python source files used to generate the numerical results.
- Figures that are either embedded in the report or included as separate files.
- Enough explanation so that another student can understand what was done and why.

Workflow and expectations

- Organize the work so that everyone contributes to data handling, coding, and writing.
- Keep variables, units, labels, and file names consistent across the report and the code.
- Every important quantitative statement should be supported by either a calculation, a figure, or a clear argument.
- Reproducibility matters: another group should be able to run your code and recover your main conclusions.

The role of LLMs in this course

Course principle

LLMs may be used as assistants, but scientific validation and interpretation remain your responsibility.

- You may ask an LLM for code structure, plotting help, or explanations of syntax.
- You should write prompts that specify the data source, variables, and outputs clearly.
- If you use an LLM in a meaningful way, document the prompt and explain what you kept, changed, or rejected.
- Never submit code that you do not understand.

A useful prompting pattern

When asking for help, prefer prompts that clearly specify:

- the data source,
- the variable names and units,
- the plots or summaries you want,
- the level of code complexity you want.

For a concrete example, see:

Prompt file

`examplePrompt.md`

How should you use the prompt file?

- Read `examplePrompt.md` before asking an LLM for code.
- Adapt the file to the exact task you want to solve.
- Remove parts that are unnecessary and add details that matter for your analysis.
- After receiving an answer, validate the variables, plots, and interpretation.

How should you use LLM output?

- 1 Check whether the data was read and labeled correctly.
- 2 Test the code on a small case that you can inspect by hand.
- 3 Verify that plots correspond to the quantities you intended to visualize.
- 4 Simplify or rewrite generated code if it is harder to understand than necessary.
- 5 Record in the report only the relevant prompts and decisions.

Project idea

Instead of simulating a mathematical model, you will build a small practice project around Artemis II mission data.

Your group should prepare three connected outputs:

- a Python script that reads the CSV file and produces the plots,
- a short written report that explains the figures,
- a short beamer presentation summarizing the main points.

The scientific content is simple on purpose. The real goal is to practice workflow, clarity, and reproducibility.



Source: NASA, Artemis II mission patch image

What is the practice project?

Use the supplied dataset, produce a few clear figures, and present the same story in three formats:

- **code:** how the figures were generated,
- **report:** what the figures show,
- **slides:** what your group would present in class.

The three files should be consistent with each other in names, labels, units, and conclusions.

What should you compute first?

Start from the local CSV file and do the following:

- 1 read the dataset,
- 2 inspect the variables and missing values,
- 3 make one plot of distance versus mission day (notice that the information is in miles but we want it to be in kilometers),
- 4 mark important mission events on the plot,
- 5 summarize what the figure shows.

A simple scientific question

A suitable first question is:

Example question

How does the spacecraft's distance to Earth and to the Moon change during the main stages of the Artemis II mission?

This question is simple enough for Lab 0, but still requires careful handling of data, labels, and interpretation.

Activity 1: Build a simple analyzer

Use `template/pythonTemplate.py` to create:

- a function that reads the CSV file,
- a function that extracts numerical series,
- a plot of distance versus mission day,
- a second plot or summary table for key events.

Use the supplied local dataset first before making any changes.

Activity 2: Inspect and interpret the data

Questions:

- Which events correspond to outbound travel, lunar flyby, and return?
- On which mission day is the spacecraft farthest from Earth in the supplied data?
- How do distance-to-Earth and distance-to-Moon complement each other in the different mission stages?
- Which choices in the dataset are measured values, and which are curated event descriptions?

Activity 3: Improve the presentation

Choose at least one improvement beyond the first basic plot:

- annotate key events directly on the figure,
- compare distance to Earth and distance to the Moon in the same visualization,
- produce a compact summary table,
- discuss missing values and how your code handles them.

Activity 4: Scientific writing

Use `template/reportTemplate.tex` and write a short report with:

- the data source and variable definitions,
- the computational method,
- the main plots,
- a short interpretation of the mission timeline,
- a note on LLM use, if applicable.

A short clear report is better than a long unfocused one.

Activity 5: Present the story

Use `template/beamerTemplate.tex` and prepare a short beamer presentation with:

- the question you chose to answer,
- one or two main figures,
- the main interpretation,
- one closing takeaway.

The beamer slides should summarize the report, not duplicate every detail.

Practice Project for Lab 0

During or after the lab, each group can work on the miniproject sheet:

- `miniproject/miniproject00.pdf`
- use `template/pythonTemplate.py` as a starting point
- use `template/reportTemplate.tex` for the report
- use `template/beamerTemplate.tex` for the presentation
- use `data/artemisII.csv` as a reproducible local dataset

The goal is to practice a full mini workflow: code, report, and presentation centered on mission data analysis.

What should you do in Lab 0?

In this lab, you should practice preparing the material that would later be submitted:

- the Python source file or files,
- a short draft report in PDF format,
- a short beamer presentation in PDF format,
- generated figures if they are not embedded in the PDF,
- a short note documenting significant LLM prompts, if used.

These materials are for practice in Lab 0 and establish the standard for future submissions.

Main idea

This first lab is about learning how to turn a real dataset into a clear, reproducible scientific submission.

Artemis II provides a timely context, but the main objective is the workflow: clean data handling, transparent code, and concise scientific writing.

About the data

Where does the dataset come from?

The file `data/artemisII.csv` is a curated teaching dataset built from official NASA material.

Main sources:

- NASA Artemis II mission page,
- NASA mission news releases,
- NASA flight day updates during the mission.

<https://www.nasa.gov/mission/artemis-ii/>

<https://www.nasa.gov/news-release/nasas-artemis-ii-mission-leaves-earth-orbit-for-flight-around-moon/>

<https://www.nasa.gov/blogs/missions/2026/04/05/artemis-ii-flight-day-5-correction-burn-complete/>

<https://www.nasa.gov/blogs/missions/2026/04/06/artemis-ii-flight-day-6-lunar-flyby-updates/>

<https://www.nasa.gov/blogs/missions/>

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The event labels in the CSV summarize mission milestones such as launch, outbound travel, lunar flyby, and return.

How were the distances assembled?

The numerical columns were not all obtained in the same way.

- Some distances were stated explicitly in NASA updates, for example the farthest distance from Earth and the closest approach to the Moon.
- To obtain more Earth-distance values without making the file too large, additional entries were sampled from NASA's published Artemis II ephemeris data.
- The CSV is therefore a compact educational dataset: it is based on official mission data, but it is not intended to be a complete trajectory record.

Ephemeris and tracking resources:

<https://www.nasa.gov/missions/artemis/artemis-2/track-nasas-artemis-ii-mission-in-real-time/>

<https://www.nasa.gov/wp-content/uploads/2026/03/artemis-ii-oem-2026-04-07-pre-lunar-flyby-to-ei.zip?emrc=69d616317bdd9>

Acknowledgment

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All mathematical, pedagogical, and course-specific content remains under the responsibility of the lecturer.