COMP 4304 – Course Project (60%)

Project Proposal: Due 11:59pm, Mar. 7, 2025 (20%)

Final Project: Due 11:59pm, Apr. 9, 2025 (40%)

Introduction

You will act as a freelance data visualization specialist.

Your client is Memorial University's Johnson Geo Centre. The Johnson Geo Centre is one of Memorial's public outreach centres, and is the largest science centre in Newfoundland and Labrador.

They are in the process of updating the "Our Future & Space" exhibit in their main gallery. They have asked you to create a poster infographic and an interactive display about artificial satellites in space, which will be put on display during the opening of the new exhibit. The intended audience of your work will be members of the general public that visit the Johnson Geo Centre.

Project Partner

You are permitted to work on the course project in partnership with **one** other student in COMP 4304. This is not a requirement. You are allowed to work on the individually. Though note that the project expectations will be the same regardless of whether you do the project by yourself or with a partner.

Please email me with who is your project partner before you submit the Project Proposal. Also include you and your partner's name in every submission. Only one submission is required per group, but make sure it is clearly identified who is your partner.

Data

You have been provided with the standard satellite catalog (`satcat.tsv`) from the General Catalog of Artificial Space Objects (GCAT) from Jonathan McDowell. This data set has a rich set of stories embedded within it that can be told through your visualizations.

You are permitted to augment your project with additional catalogs from the GCAT or external sources of data that relate in some way to the original data / client's needs.

The GCAT is accessible here: https://planet4589.org/space/gcat/web/cat/index.html

Goals

There are three deliverables for your client:

1. A project proposal (20%)
2. An infographic highlighting relevant stories from the given data set. (15%)
3. An interactive dashboard that allows your client to explore the data. (10%)
4. A 5–10 minute presentation on your final products. (15%)

The goal is to tell the relevant, interesting stories contained within the data. There are many possible avenues that can be highlighted from the data, and it is up to you to find the intersection of what is useful for your audience to understand and what is possible for you to show them.

Infographic Display in the Johnson Geo Centre

One infographic from all project submissions will selected to be printed and put on display in the Johnson Geo Centre for the opening of their new "Our Future & Space" exhibit update. Yes, it will actually be printed and be put on display.

Pro Vice Chancellor's Prize

One project completed by an **individual student** will be submitted for the Pro Vice Chancellor's Prize for Undergraduate Students. This prize is awarded for outstanding undergraduate research essays or video / poster presentations that has been completed as part of coursework. The prize comes with $750 if the student wishes to take it right away, or $1,500 if the student wishes to continue graduate studies at Memorial University in Fall 2025.

The primary assessment criterion for the Pro Vice Chancellor's Prize is that the work be grounded in research. It must be completed be a single student (sorry, no group projects can be considered), and must contain citations from relevant literature. Specific aspects that will be evaluated by the Prize committee include:

- Intellectual rigour and originality.
- Scientifically oriented questioning.
- Integration of existing research.
- Clearly stated methodologies.
- Justification and conclusiveness of results.
- Principles of critical thinking.
- Clear and effective presentation of ideas.

Project Proposal (20%)

Due: 11:59pm, Mar. 7, 2025

Create a project proposal for your client formulating your brief. Identify your originating curiosity (your "why") that will drive your project forward. Explore the data to identify and validate relevant, interesting stories.

Your proposal should contain a few key components.

1. Outline your broad goal (spark of curiosity / why). What angle are you taking on the data and project as a whole?
2. Highlight key results of your initial data exploration. What stories have you found within the data that support your broad goal? You may include initial visualizations produced as the results of your initial data exploration.
3. Clearly state two intended sub-goals, one each for the infographic and interactive dashboards. What do you intend to achieve with each deliverable?
4. Describe the tones (reading / feeling) and experiences (explanatory / exploratory) that you intend to deliver for the infographic and interactive dashboards.
5. Describe your planned next steps for your project. These should describe two out of the three following areas: (1) any deeper exploration of the data you expect to accomplish, (2) refinements to any current visualizations provided as part of the proposal, (3) additional visualizations you envision creating for the final product.

Submit your project proposal as a `.pdf` with standard 8.5×11 inch size (US Letter). Include your name(s) and student numbers. Text should be 12 pt font size. A maximum of 3 pages is allowed.

Proposals will be graded on their:

- Length (3 pages or less). (10 pts)
- Professional presentation (formatting and overall visual appeal). (15 pts)
- Broad goal and identified sub-goals for each deliverable. (15 pts)
- Results of your initial data exploration. (30 pts)
- Initial plans for the infographic and interactive dashboard. (15 pts)
- Planned next steps for the project. (15 pts)

Infographic (15%)

Due: 11:59pm, Apr. 9, 2025

Create an infographic that presents compelling visualizations to the general public visitors at the Johnson Geo Centre.

Your infographic must be created in Python using either Matplotlib and other packages within the Matplotlib ecosystem (e.g., Seaborn) or Plotly and associated packages. You are permitted to take a visualization created in code and apply finishing touches in an image editor, but make it clear that you have made such edits.

The size of your completed infographic must be 24 inches by 36 inches. Portrait and landscape style infographics are accepted. Your infographic must contain at least 3 unique visualizations.

Your infographic will be evaluated on both the final product / visualizations, as well as the code to create them. What is important is that data manipulation or pre-processing and the creation of your visualizations are implemented correctly. That is, your code accomplishes what you intended.

For the coding component (20 pts total):

- Correctness for any data pre-processing or manipulation. (8 pts)
- Correctness for creation of visualizations and final infographic. (8 pts)
- Code executes without errors. (4 pts)

Your infographic and the visualizations it contains will be assessed as follows (80 pts total):

Number (5 pts)	Your infographic must contain 3 visualizations. No more. No less. Do not submit 4 visualizations. Do not submit 2 visualizations, unless you include another visualization to make 3 total visualizations. 5 visualizations is right out.
Originality (15 pts)	A highly original design or degree of customization applied to your visualization designs and infographic composition.
Aesthetics (10 pts)	Choices of colours, styles, and sizes of visual elements.
Annotations (10 pts)	Choices around textual elements. Font, size, weight, amount of text, usefulness.
Cohesiveness (10 pts)	How are elements within each visualization and the infographic as a whole positioned and sized to create cohesion.
Clarity (10 pts)	Visual clarity vs visual clutter. How accessible is the intended interpretation of your visualizations and the infographic. Decisions on angle, frame and focus.
Appropriateness (10 pts)	Alignment of each visualization type with its chosen data and intended interpretation.
Relevancy (10 pts)	The usefulness of the visualizations for your audience.

Interactive Dashboard (10%)

Due: 11:59pm, Apr. 9, 2025

Create an interactive dashboard that allows your client to explore the data to discover interesting, relevant insights. Your dashboard should help them explore and find interesting trends or correlations in the data.

Your dashboard must be created in Python using either ipywidgets inside of a Jupyter notebook environment (run using voila) or through Dash. You are free to create visualizations using Matplotlib, Seaborn, Plotly or any other Python visualization package.

Your dashboard must contain 3 unique visualizations. You must include at least 4 interactive controls (more is permitted).

Your project will be evaluated on the dashboard as a whole, the individual visualizations, and the code to create them. What is important is that data manipulation or pre-processing and the creation of your visualizations are implemented correctly. That is, your code accomplishes what you intended.

For the coding component (20 pts total):

- Correctness for any data pre-processing or manipulation. (8 pts)
- Correctness for creation of visualizations and interactive components. (8 pts)
- Code executes without errors and interactive features have no bugs. (4 pts)

Your dashboard and the visualizations it contains will be assessed as follows (80 pts total):

Number (5 pts)	Your dashboard must contain 3 (and only 3) visualizations. There must be at least 4 interactive controls (more are allowed).
Originality (15 pts)	A highly original design or degree of customization applied to your visualization designs and dashboard composition.
Aesthetics (10 pts)	Choices of colours, styles, and sizes of visual elements.
Annotations (10 pts)	Choices around textual elements. Font, size, weight, amount of text, usefulness.
Clarity (10 pts)	Visual clarity vs visual clutter. How accessible are intended or possible interpretations from your visualizations. Decisions on angle, frame and focus.
Appropriateness (10 pts)	Are the interactive elements useful? Do they add value to the visualizations? Alignment of each visualization type with its chosen data and intended interpretation.
Responsiveness (10 pts)	All interactive elements should execute within 2 seconds.
Relevancy (10 pts)	The usefulness of the visualizations for your audience.

Video Presentation (15%)

Due: 11:59pm, Apr. 9, 2025

Give your client a 5–10 minute presentation on your final products. Both the infographic and interactive dashboard should be discussed.

Your presentation is your opportunity to tell the stories contained within your visualizations to the client. How should your client understand your visualizations? How can your client use the interactive elements in your dashboard? What insights about the data can you deliver?

Do not walk your client through your code in your presentation. They are not interested in the underlying code, but instead how useful the infographic and interactive dashboard is for them and their audience to understand the data.

Your video presentation will be assessed as follows (100 pts total):

Length (15 pts)	Your presentation should be between 5–10 minutes. Videos over 10 minutes will receive no marks on this aspect. Videos under 5 minutes will receive half marks.
Explanations (35 pts)	Clarity of explanation of the visualizations and interactive elements. Will the client be confused about how to perceive a visualization, understand particular interpretations, or use interactive controls?
Cohesiveness (35 pts)	Overall cohesiveness of the presentation. There should be a logical structure and flow.
Impact (15 pts)	Impress your client and make your presentation memorable.

Infographic, Dashboard and Video Presentation Submission

For the infographic, submit <u>one</u> Jupyter notebook that contains everything needed to create your infographic from the original data set.

For the interactive dashboard, submit <u>one</u> Jupyter notebook or Python script that contains everything needed to create your dashboard.

Your pre-recorded video presentation can be in an uploaded video file or a YouTube link.

Do not compress your files together into a single archive (especially not rar format – you will lose marks if you do that).

If you have made any edits of your final infographic using an image editor, make it clear that you have done so, explain what edits you have applied, and include your final edited infographic in your submission.

Late submissions will be subject to a 10% penalty for each 24 hours past the deadline.

FAQs

Can the same visualizations be re-used between the infographic and interactive dashboard?

Yes. There is no restriction on how visualizations may be used or re-used between the infographic and dashboard. Though keep in mind that the infographic obviously does not allow for interactive visualizations, and the goal of the dashboard is to allow a user to explore interesting facets of the data.

Do all the visualizations in the dashboard have to have an interactive component?

No. It is permissible for 1 or 2 of your dashboard visualizations to not have any interactive controls. The only requirement is that there are at least 4 interactive controls (widgets) combined across all 3 visualizations.

Does it matter the quantity of data represented in the visualizations?

No. It is perfectly fine to use large amounts of the data or to surgically select smaller stories. It is completely up to you how much or how little of the data set you want to show. The size of the stories told through your visualizations is not important. What is important is that you create interesting, relevant visualizations that demonstrate the concepts you have learned in this course.

Do both partners need to be present in the video presentation?

No. The presentation can be given by just one student. There is no requirement that both present.

Do cameras need to be on for the video presentation?

No. I do not see a reason to force anyone to have a camera showing themselves for the video presentation. You are welcome to have a camera feed of yourselves, particularly if you think it is of benefit to your presentation, but it is not a requirement.

Is one infographic really going to be selected to be put on display in the Johnson Geo Centre?

Yes.

What are the chances of actually winning the Pro Vice Chancellor's Prize?

I don't know. Probably slim. This is a new element to the course project that I have added this year. I think it would be great if someone from the course were to win, but I cannot estimate the likelihood of that. Submissions for the Prize are made from across the university, and it is highly competitive.

Attribution

Submissions should include an attribution section indicating any sources of material, ideas or contribution of others to the submission.

Submissions must represent your independent work.

You are encouraged to use any resources to help with your solution, but your solution must represent independent work. If your submitted work includes unacknowledged collaboration, code materials, ideas or other elements that are not your original work, it may be considered plagiarism or some other form of cheating under MUN general regulations 6.12.4.2 and academic penalties will be applied accordingly.

Avoid academic penalties by properly attributing any contribution to your submission by others, including internet sources and classmates. This will also help distinguish what elements of the submission are original. You may not receive full credit if your original elements are insufficient, but you can avoid penalties for plagiarism or copying if you acknowledge your sources.

Github

I encourage you to store and version your work on GitHub. It is good practice to do so as everyone uses git in the real world.

However, **it is a requirement that git repositories containing assignment material be private.** University regulations (undergraduate 6.12.4.2) consider it cheating if you allow your work to be copied. There will be zero tolerance for this.