

Please upload your proposal as a single PDF to Gradescope by 11:59 pm on **Thursday, Dec 4**.

You can access the \LaTeX source here: .

Final Project Report Guidelines

Purpose. The final project demonstrates your ability to apply methods from Topological Data Analysis (TDA). Projects may be applied, theoretical, or survey-based.

Submission guidelines.

- **Due:** Dec 4, 11:59 pm (upload to Gradescope as a single PDF).
- **Length (excluding references):**
 - Undergraduate: **4+ pages**
 - Graduate: **7+ pages**
 - Survey projects: **10+ pages (undergrad)** or **15+ pages (grad)**
- **Format:** \LaTeX , 12pt font, 1-inch margins, single spacing.
- **Code and Data Submission:** If your project involves code or data, include either:
 - a link to a GitHub repository, **or**
 - a zipped folder containing your scripts and data, uploaded to Gradescope together with your report.

Include a short `README.txt` describing how to run your scripts (e.g. software versions, main file to execute, etc.).

Suggested Report Structure

You may adapt this structure as needed, but be sure to cover all key aspects.

1. Title and Team Members

2. Abstract

A paragraph containing a concise overview of goals, methods, and findings.

3. Introduction and Motivation

What problem did you study? Why is it interesting, and why is TDA an appropriate approach?

4. Data

Describe datasets used (source, size, key preprocessing, etc.). If synthetic, explain how you generated it. If external, include a link or citation. If applicable, mention any preprocessing or challenges (e.g., noise, dimensionality).

5. Methods

Describe the TDA methods used (e.g., persistent homology: which filtrations, parameters; Mapper: cover and clustering choices; persistence images/landscapes; distances such as bottleneck or Wasserstein), and any complementary methods (dimensionality reduction, clustering, statistical tests, ML models).

Report used software (e.g., `ripser`, `GUDHI`, `giotto-tda`, `scikit-learn`, Python, etc.), and provide GitHub link if applicable. A good source for available TDA software is <https://sites.google.com/ucsd.edu/dsc214tda>.

6. Results

Present your main findings with clear figures and captions. Typical items: persistence diagrams/barcodes, persistence images/landscapes, summaries (Betti curves, lifetimes), comparisons across conditions, classification/regression performance if applicable, and statistical significance when relevant.

7. Discussion

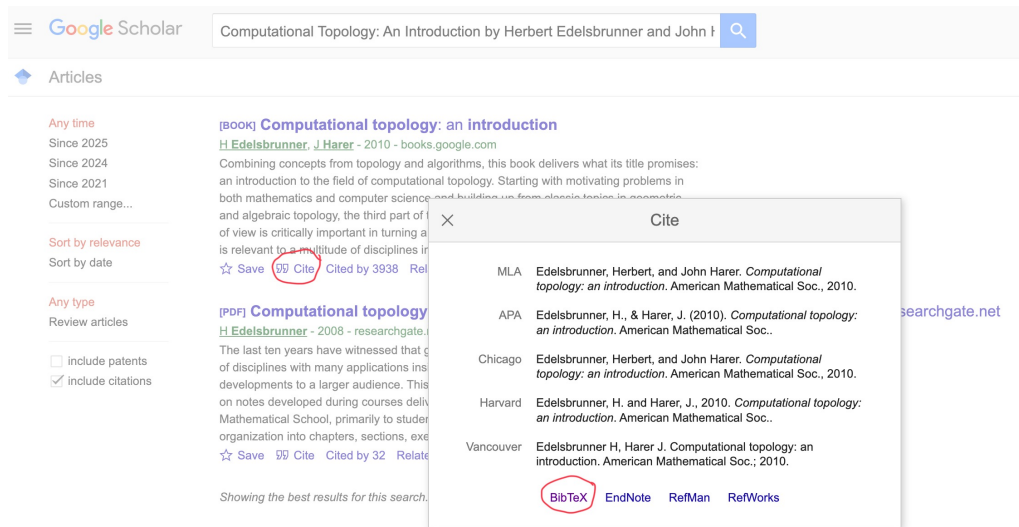
Interpret your results and relate them to your original research question.

If applicable, discuss limitations, failure modes, and possible improvements.

8. References

Use a consistent citation style (BibTeX preferred). Example usage of BibTeX:

- In the main document, cite references like this: `\cite{edelsbrunner2010computational}`.
- In the bibliography file (`references.bib`), add entries of the papers you cited. The easiest way to get BibTeX entries is from Google Scholar: search for the paper, click the quotation mark icon, then select BibTeX.



- At the end of your report, include the bibliography with:

```
\bibliographystyle{plain}
\bibliography{references}
```

9. Acknowledgment of AI Tools

If you used AI tools (e.g., ChatGPT) for coding or writing assistance, you **MUST** include a note describing how they were used.

Grading Criteria

The project will be evaluated using the following approximate weights: motivation and clarity of the problem statement (20%), appropriate use of TDA methods (25%), quality of analysis and interpretation (25%), presentation including figures, writing, and structure (15%), and reproducibility / code organization (15%).

Tips for Success:

- Begin writing early; update your report as results evolve.
- Use the report to explain your reasoning and insights, not just to display code output.
- Structure your report clearly with sections and headings. **On the next page:** an example L^AT_EX report template (feel free to change the structure as you wish).

Acknowledgment of AI assistance: This guideline was drafted and revised with help from ChatGPT (OpenAI, 2025) to improve structure, clarity, and formatting.

TDA applications

Ling Zhou

November 4, 2025

Abstract

This is a brief summary of the report's content.

1 Introduction

This is the introduction section where the problem statement and motivation are discussed.

2 Data

This section describes the datasets used in the project.

3 Methodology

This section describes the methods and techniques used in the project.

Example citation [1, 2].

4 Results

This section presents the main findings and results of the project.

5 Discussion

This section interprets the results and discusses their implications and the main takeaways.

References

- [1] Tamal Krishna Dey and Yusu Wang. *Computational topology for data analysis*. Cambridge University Press, 2022.
- [2] Herbert Edelsbrunner and John Harer. *Computational topology: an introduction*. American Mathematical Soc., 2010.