Course Report WASP Graduate School

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Name of course, WASP Topological Data Analysis
Semester: Fall 2025

Number of registered students: 33 + 4 not WASP students
Answering frequency (course evaluation): 21%

Examination results

Number of students examined: 35
Fail: 0 %
Pass: 100 % (all who submitted the report)

Brief summary of student viewpoints and suggestions

Results of WASP base-line quantitative questions

- What is your overall rating of the course 4.25
- Did you enjoy the course? 4.38
- Was it time well spent? 3.88
- *…<other selected quantitative results>…*

Answers to free text-questions to be (shortly) summarized under "Strengths" and "Weaknesses"

- What was the best aspect of the course?
    - Very interesting topic! The professors are engaging, they seem so passionate and excited to teach us this course.
    - The substantial focus on theory, while keeping in view applications and python toy examples. The frequent parenthetical presentations on adjacent views on TDA by Florian and Martina. Very engaging presentations by all lecturers.
    - Interesting material, good balance between covering the theory in sufficient depth but skipping long/technical proofs. The level of mathematical knowledge and maturity assumed was exactly right for me.
    - Networking and exposure to "real-world" research topics of TDA. I liked the ending parts where we have seen the "cutting-edge" of the field.
    - The mix between formal, advanced mathematics and applications.
    - Nice and knowledgeable professors and TA. Good overall thought behind the course
    - Nice theory
    - I liked that it was a math heavy course
- What would you suggest improving?

[1] *The report should be written by the examiner together with the teachers and possibly others, such as teaching assistants*

    - The course was sometimes very dense and made it difficult to fully grasp certain ideas. However, given the complexity of the material, the professors did a great job at explaining it overall.
    - The exercise sheets seem to be a bit of a waste. Exercises where either to complex for the time given to prepare them or I was too tired to seriously consider them. I would prefer if one of the presentation assignments had been replaced with a (group?) assignment on the exercises. If the presentation evaluation must be maintained, instead of general TDA topics, students could present solutions. That being said, it was the second of the two assignment presentations that I did not really connect with most.
    - I felt that there could be some more intuition for the applied side of the course, e.g. what kind of data sets would we expect to have a nonempty H1 homology, when is TDA useful, etc. Also, in general, I felt there was a slight mismatch between the lectures which focused a lot on the theory (and only had a few short parts on applied/programming examples) and the assignment which feels more applied. I felt the lectures prepares well for studying some theoretical questions in TDA (to the extent a single course can do this) but less for doing an applied project in TDA. On the other hand, we will learn the applied things in the project, so one can argue that in this way we in the end have the best of both worlds.
    - It is too theoretical to me, with no huge mathematical background (I am physicist transitioned to computational biology). It would've been more interesting to be "more" engaged in the application (with jupyter notebooks) and learning the theory out of necessity. It is only my take and I understand this is not how math courses go in general.
    - Lectures a bit unstructured. A little bit too much ”trying to coming up with what the lecturer wanted to say during the lecture rather than preparing how the material should be presented” leading to unstructure and hard to follow. Too little connection with modern learning.
    - The first lecture just repeated stuff we were supposed to read at home and thus was somehow a waste of time. I would prefer (normal) homework exercises instead of a project.
    - It would be nice to spend more time on exercises during the stockholm visits to have change to understand the material. Also more short breaks during the lectures, having a 2.5hour non stop lecture with a lot of math makes it impossible to follow.
- What advice would you like to give to future participants?
    - The course has a lot to offer if you are interested in engaging with it.
    - Make sure to study linear algebra and metric spaces before the course if you don't have at least a mathematics bachelor. Knowledge of abstract algebra (e.g. some familiarity with commutative diagrams) is also useful.
    - Have fun, enjoy the lectures and engage in conversations. People are very helpful, but you need to come up with right questions! Don't stress too much, as long as you are interested you are on the right track. I assume everybody who selects the course is interested.
    - Make sure you're mathematically interested, but if you are then you will find the course interesting! Familiarity with homology is a plus to really understand whats going on in the course.
    - Do not expect to directly input this to your learning pipelines, rather see it as a good mathematical introduction to TDA.

- Other comments. Is there anything else you would like to add?

    - No, just thank you for the course. I enjoyed it overall. All the best!
    - I also liked the structure with a smaller project in the beginning and a larger project in the end.
    - Exercise session stressful, too much powerpoints, too bad pens when actually drawing on board, too bad lecture hall at KTH. But good intent of course and nice.

- **"Strengths" according to students[2]**

- Engaging lectures and content
- mix between formal, advanced mathematics and applications
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"Weaknesses" according to students[2]

- too theoretical
- Lectures a bit unstructured.
- I would prefer (normal) homework exercises instead of a project.

Comments from teachers on the implementation and outcome of the course[3]

- Students have been evaluated by projects. After submitting , the project is read and returned to the students for adjustments. This sometimes is repeated even 3 times. The idea is not to examine if students memorized definitions etc., but rather if they can summaries the content and use it in some practical setting. We have been impressed with the projects.

Proposed changes/comments/measures

[2] *Based on both quantitative results and key viewpoints from students' free-text answers*
[3] *Including changes effected during the course*