MATH-688

Reading group in applied topology I

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Cursus	Sem.	Type
Mathematics		Opt.

Language of teaching	English
Credits	1
Session	
Exam	Oral presentation
Workload	30h
Hours	**28**
Lecture	14
Practical work	14
Number of positions	

Frequency

Only this year

Remark

Fall semester

Summary

The focus of this reading group is to delve into the concept of the "Magnitude of Metric Spaces". This approach offers an alternative approach to persistent homology to describe a metric space across varying resolutions. It can be used to estimate an intrinsic dimension of a metric space, similar to

Content

The main objective is to work through the introductory paper by Tom Leinster, who introduced this concept in 2013: https://arxiv.org/pdf/1012.5857.pdf

We will start our course by defining the notion of the magnitude of a matrix. Motivated by this, we will then proceed with an interlude to revisit the basic concepts of category theory and introduce the idea of an enriched category. This will pave the way to generalize the notion of the magnitude to an enriched category and finite metric spaces. We will then discuss how to proceed to cover more contemporary papers on the subject.

For our interlude on Category Theory, the course will follow definitions from the following books:

- "Category Theory in Context" by Emily Riehl
- "Basic Category Theory" by Tom Leinster
- "Basic Concepts of Enriched Category Theory" by Max Kelly

Keywords

Applied topology, topological data analysis, higher-order networks

Learning Outcomes

By the end of the course, the student must be able to:

- Differentiate a robust understanding of the concept of the Magnitude of Metric Spaces
- Develop familiarity with the foundational principles of Category Theory
- Describe in critical discussions and analyses of seminal and contemporary papers in the domain.

Resources

Bibliography

- Magnitude of compact metric spaces
- Magnitude of a graph
- Magnitude meets Persistence
- Magnitude and Geometric Measure Theory (volume, capacity, dimension)