National Cheng Kung University
Modular Course 2020 Summer Program

代數拓樸與數據分析
Algebraic Topology and Data Analysis

Instructor	Affiliation	Graduation (Ph.d.)
江孟蓉	NCKU Math	University of Illinois at Urbana-Champaign

Course Type	Course Credit	Student Size (Maximum)
Lecture	1	15

Student Background

Students from all college are welcome.

Format of The Course

Lecture 70%，Presentation 15%，Recitation 15%

Grading Policy

Exam 30%，Experimental operation 20%，Participation 20%

Oral presentation 30%：

Each person has to present a recent scientific paper on topological data analysis or explain how to apply topology to a problem of personal interest dealing with data.

Code of Conduct for The Course

Academic integrity is expected of every student.

Course Description

This course aims to discuss one approach to the analysis of large and complex data sets using techniques from algebraic topology.

Timetable and Syllabus

Period	Timetable	Progress Description
7/27(MON)	9:00-12:35	Introduction: Topology and Data
7/28(TUE)	9:00-12:35	Homology
7/29(WED)	9:00-12:35	Persistence
7/30(THU)	9:00-12:35	Case Study: natural image statistics, sensor networks, or case of interest
7/31(FRI)	9:00-12:40	Oral Presentation

Goal of The Course

1. Be familiar with basics of algebraic topology that are useful for data analysis.

2. Be familiar with basic analysis of data using algebraic topology.

3. Have a taste on applications of topological data analysis.

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The Importance, Cross-Over Disciplinary and Contemporary of The Curriculum

Large and complex data sets of various kinds have been produced at an unprecedented rate and understanding them is a fundamental problem in modern science. Using topology to extract structure from data has been gaining importance in pure mathematics, applied mathematics, and computer science; it has seen many applications in biology, chemistry, material science, medical imaging, to name a few.

Remarks

References:

Computational topology by Edelsbrunner and Harer