

CS 6170: Computational Topology

Course Syllabus

Spring 2017

Instructor: Dr. Bei Wang Phillips
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Course Information

Meeting Time: Tuesdays, Thursdays, 9:10am - 10:30am

Classroom: WEB 1248

Textbook: *Computational Topology: An Introduction by Herbert Edelsbrunner and John Harer*

Web page: <http://www.sci.utah.edu/~beiwang/teaching/cs6170-spring-2017.html>

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Course Description

Topological Data Analysis (TDA) is an emerging area in exploratory data analysis and data mining. It has had a growing interests and notable successes with an expanding research community. The application of topological techniques to traditional data analysis has opened up new opportunities beyond just the statistical settings. The goal of TDA is to understand complex datasets, where complexity arises from not only the massiveness of the data, but also from richness of the features. The objective of this class is to enable the students to become familiar with these new methods in TDA, from theory, algorithm and application perspectives.

The course is going to focus roughly 1/3 on theory, 2/3 on practice (1/3 practical algorithms and 1/3 applications), with the data domain including material science, combustion simulation, biology, marketing, etc.

Successful completion of the course will enable the students to pursue new research directions in the field of TDA and/or apply the most recent topological techniques to related areas such as data analysis, computer graphics, geometric modeling, mesh generation, and data visualization.

Course Grading

- Lecture scribe (5 points, 5%)
- Assignments and quizzes (40 points, 40%; plus additional 10 bonus points)
 - Quiz 1: 2 points
 - Quiz 2: 10 points
 - Quiz 3: 10 points (and 5 bonus points)
 - Quiz 4: 8 points (and 5 bonus points)
 - Miniproject: 10 points
- Final project proposal (10 points, 10%)
- Final project report (30 points, 30%)
- Final project presentation (15 points, 15%)

Scale for assigning letter grades is as follows (based on points). This scale might be curved based on overall class performance, while ensuring fairness to all.

A 100-93 **A-** 93-90

B+ 90-87 **B** 87-83 **B-** 83-80

C+ 80-77 **C** 77-73 **C-** 73-70

D+ 70-67 **D** 67-63 **D-** 63-60

E 60-0

Assignment Policies:

- Both in-class quizzes and take-home assignments are to be done individually (unless the assignment is a mini-project that allows small groups). Discussing topics is allowed; however, copying of each others work is considered cheating and will result in a failing grade. If a student is suspected of cheating, they may be asked to answer randomly selected homework questions in a public session to verify that they have actually mastered the material as claimed.
- There will be a call for assignments to be submitted. Assignments must be turned in at the beginning of class (i.e. at the time requested) on the day in which they are due.

Most assignments should be submitted via Canvas as PDF files; if the assignment includes programming, source code should also be submitted via Canvas. Students are expected to submit completed assignments by the due date and time. To get full credit for an assignment, it must be turned in through Canvas by the start of class, specifically 9:10 am. Once the deadline is missed, those turned in late will lose 10% of its total points for each subsequent hour until it is turned in. Therefore, assignments will not be accepted more than 10 hours late, and will be given 0. For assignments involving programming, if the programs do not execute, no partial points will be given. Please take advantage of TA office hours. Please allocate sufficient time for completing the class assignments

- For assignments (not including the final project), students can have a one-time two-day extension without penalty; please use this exception wisely.
- For assignments, typesetting (Latex, MS Word, ... even a typewriter if you can find one) is preferable. Assignments deemed unreadable will be rejected at the time of collection; they can be resubmitted, but with the late penalty applied per the previously mentioned policy.