

Syllabus

Lecturer: Elena Grigorescu

1 Schedule

Tu/Th 9-10:15 pm, Krannert Building G007

2 Instructor

Elena Grigorescu, elena-g@purdue.edu, office hours by appointment.

3 Description

Sublinear time algorithms allow one to read only a small fraction of the input. They play an important role in the design of algorithms for big data and are typically randomized algorithms generating approximate solutions. This course will introduce techniques for designing and analyzing sublinear time algorithms including combinatorial and graph algorithms, and algorithms for error-correcting codes and other algebraic objects. These algorithms provide extremely fast approximations for classical optimization problems and also for decision problems studied in the so-called property testing model.

Prerequisites: There are no specific course requirements other than some mathematical maturity. Some familiarity with discrete math and algorithms would be useful.

4 A partial list of topics

Introduction to sublinear models of computation. Szemerédi's regularity lemma. Testing triangle freeness in dense graphs. The "triangle removal lemma". Testing triangle freeness in Boolean functions. Testing monotonicity of functions. Locally testable/decodable codes. Testing membership in the Hadamard code (testing linearity). The Fourier analytic method. Communication complexity. Application to Property testing lower bounds.

5 The project

This is a research oriented course, in which you are expected to conduct a semester-long research project on a topic on sublinear algorithms of your choice. You will be working in groups of at most 3, and will be often presenting papers and your research progress throughout the semester.

6 Grading

30% for class participation/discussions. 70% for the project