



Theory of Network Design

EECS 598, Fall 2023

Instructor: Greg Bodwin

From social networks to road maps to the internet, the modern world is dominated by data represented in enormously large graphs. An effective way to make sense of a massive graph is to create a much smaller one that is “similar” to the original in some critical ways. But how accurately can this be done? Which algorithms for graph compression take on the least error? What structural properties of a network make it easy or hard to sketch in small space?

This is a proof-based course that lies at the intersection of algorithms and graph theory. We will tour through some classic algorithms and cutting-edge work in the area of network design. Topics will include distance oracles, spanners, emulators, preservers, shortcut sets, hopsets, algorithmic applications of these objects, and methods for making these objects tolerant to temporary failures in a network.

Prerequisites: EECS 376 B+ or better, graduate standing or permission of instructor. Mathematical maturity and basic familiarity with graphs will be needed.