



## Succinct Graph Structures

### EECS 598, Winter 2021

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? What methods of graph compression take on the least error? What structural properties of a network make it easy or hard to accurately express in small space?

This class will develop the theoretical underpinnings of graph compression algorithms in a mathematically rigorous, proof-based way. Topics will include graph spanners and distance preservers (which compress graph distances), block models and regularity lemmas (which compress graph cuts), and spectral sparsifiers (which compress graph spectra). Other topics may be set dynamically, based on active student interest and feedback.

*Prerequisites:* Graduate standing or permission of instructor.

*Advised Prerequisites:* EECS 203, EECS 281, Math 217 (or equivalents). Students should be comfortable with mathematical proofs, basics of graph theory, and basics of linear algebra.