Looking for structural sparsity in real-world graphs

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Analysis (and visualization) of massive graphs is currently accomplished via a hodgepodge of ad hoc, often heuristic, methodologies across disciplines, as more rigorous approaches fail to scale. On the other hand, the theoretical community has long known that graph structure can have a huge impact on algorithmic complexity - in fact, this is one of the primary tenets of fixed parameter tractability (FPT). Unfortunately, direct application of these parameterized algorithms is typically infeasible due to large hidden constants in the time/memory complexity and the fragility of existing graph parameters to small perturbations in the network connectivity. In this talk, we discuss initial work looking at how real-world networks might fit into broader classes in the sparse graph hierarchy (including bounded expansion and degeneracy), including algorithmic advances, classification of random graph models, and empirical evaluations. This is joint work with (subsets of) Erik Demaine, Matthew Farrell, Timothy Goodrich, Nathan Lemons, Felix Reidl, Peter Rossmanith, Fernando Snchez Villaamil, and Somnath Sikdar.