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Infinite geometric graphs

A new generation of models for complex networks has led to renewed interest in geometric graphs, that is, graphs where the vertices are points in a metric space, and existence of edges depends on the distance between vertices. We study a class of infinite graphs that occur as the limits of common geometric graph models.

We study graphs whose vertex set is a countable, dense subset of a metric space, and that satisfy the geometrically e.c. property, which is a geometric version of the existentially closed property that defines the infinite random graph. We establish that graphs with the geometrically e.c. property are uniquely defined by the property and the "shape" of the vertex set in certain metrics, while there are infinitely many non-isomorphic geometrically e.c. graphs with the same vertex set in other metrics. We also establish a strong connection with locally random geometric graphs: graphs whose vertex set is a subset of a metric space, and pairs of vertices that are within a threshold distance of each other are connected independently at random with probability p.

This is joint work with Anthony Bonato.