

# Geometric Graphs

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## Abstract

Geometric Graphs are graphs that arise from a geometric setting. They can be abstractly defined as follows: Given a set of geometric objects (ex. points, lines, rectangles, circles, ...), the vertices are the geometric objects and there is an edge between two objects if some geometric condition is satisfied. Many problems in geometric graphs find applications in graphics, GIS, wireless networks, sensor networks and computer networks. In this talk, we will discuss various combinatorial and algorithmic questions on geometric graphs. We will cover three broad classes of geometric graphs:

- PROXIMITY GEOMETRIC GRAPHS: In these graphs, the objects are usually points and there is an edge between two points if some proximity condition is satisfied. Delaunay graph [3] is a classic example in this class. We will explore the delaunay graph and some of its variants [4].
- INTERSECTION GEOMETRIC GRAPHS: In these graphs, there is an edge between two objects if they intersect. Interval graphs [2] is a classic example. We will explore some algorithmic questions on intersection graphs in 2D.
- DISTANCE-BASED GEOMETRIC GRAPHS: In these graphs, the objects are usually points and there is an edge between two points if some distance condition is satisfied. Unit distance graph [1], unit disk graph are classic examples.

## References

- [1] Paul Erdos. On sets of distances of  $n$  points. *American Math. Monthly*, 53:248–250, 1946.
- [2] Peter C. Fishburn. Interval graphs and interval orders. *Discrete Mathematics*, 55(2):135–149, 1985.
- [3] Steven Fortune. Voronoi diagrams and delaunay triangulations. In *Computing in Euclidean Geometry*, 193–233, 1992.
- [4] J.W. Jaromczyk and G.T. Toussaint. Relative neighborhood graphs and their relatives. *P-IEEE*, 80:1502–1517, 1992.