

CMSC 754 - Computational Geometry

Lecture 1: Introduction

What is Computational Geometry?

- Subfield of algorithm theory involving discrete geometric structures

- points, lines + line segments, polygons, spatial subdivisions

in 2-dimensional
3-dimensional
low dimensional
high dimensional

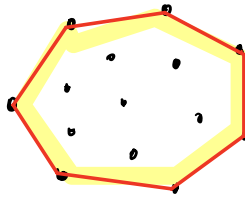
more
↓
less

Features:

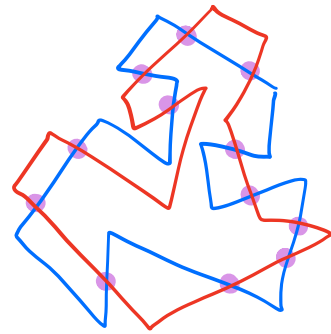
- Worst-case asymptotic complexity
deterministic + randomized
- Rigorous - provably correct + efficient (in theory)
- Discrete inputs/outputs
- Combinatorial-based analysis
- "Simple" geometry - flat, Euclidean
- low dimensionality

Topics:

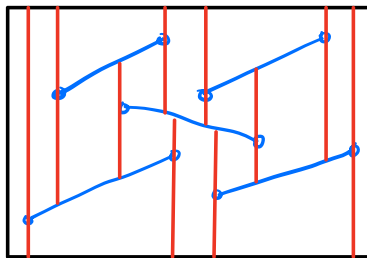
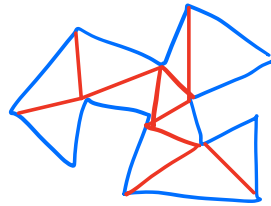
- Convex hulls →



- Intersections

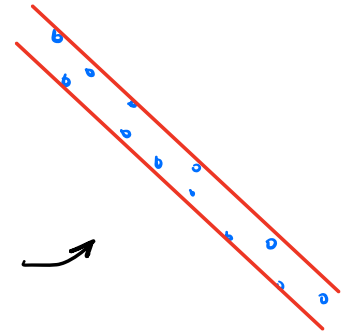


- Triangulations
+ spatial subdivisions

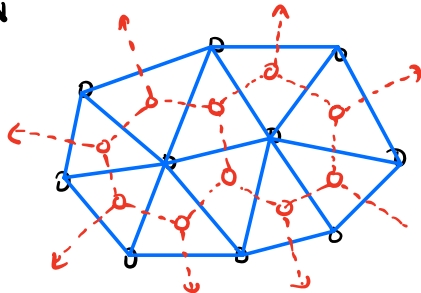


- Point location ↗

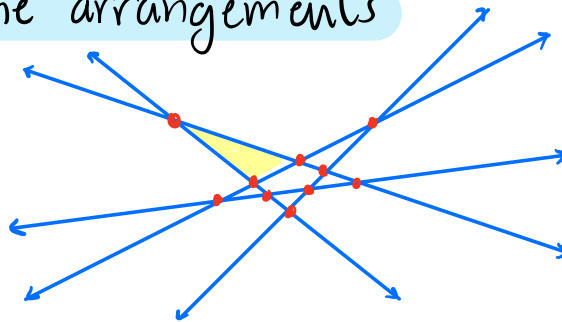
- Linear programming + duality →



- Voronoi diagrams + Delaunay triangulations



- Line/hyperplane arrangements



- Search + Data Structures

- Approximation

- ϵ -nets
- ϵ -kernels + coresets

- More? High dimensional geometry
Computational topology

