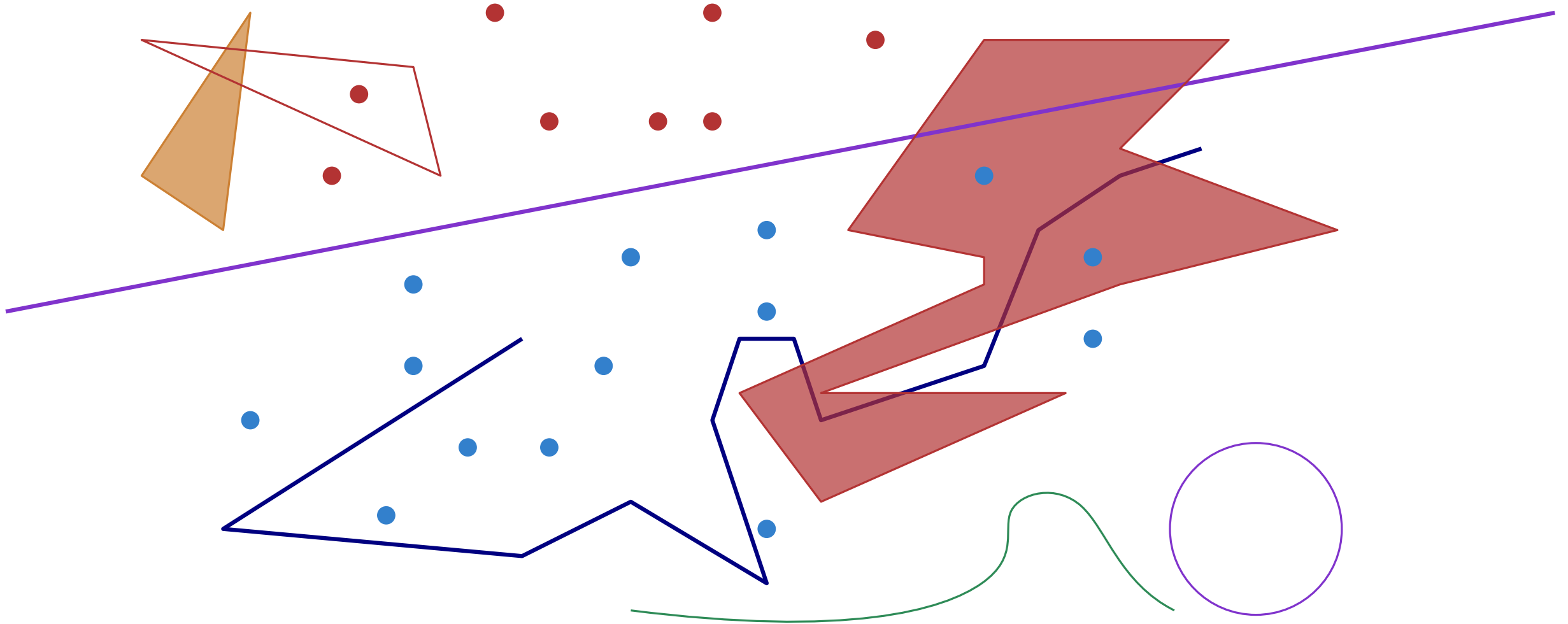


# Geometric Algorithms

Frank Staals

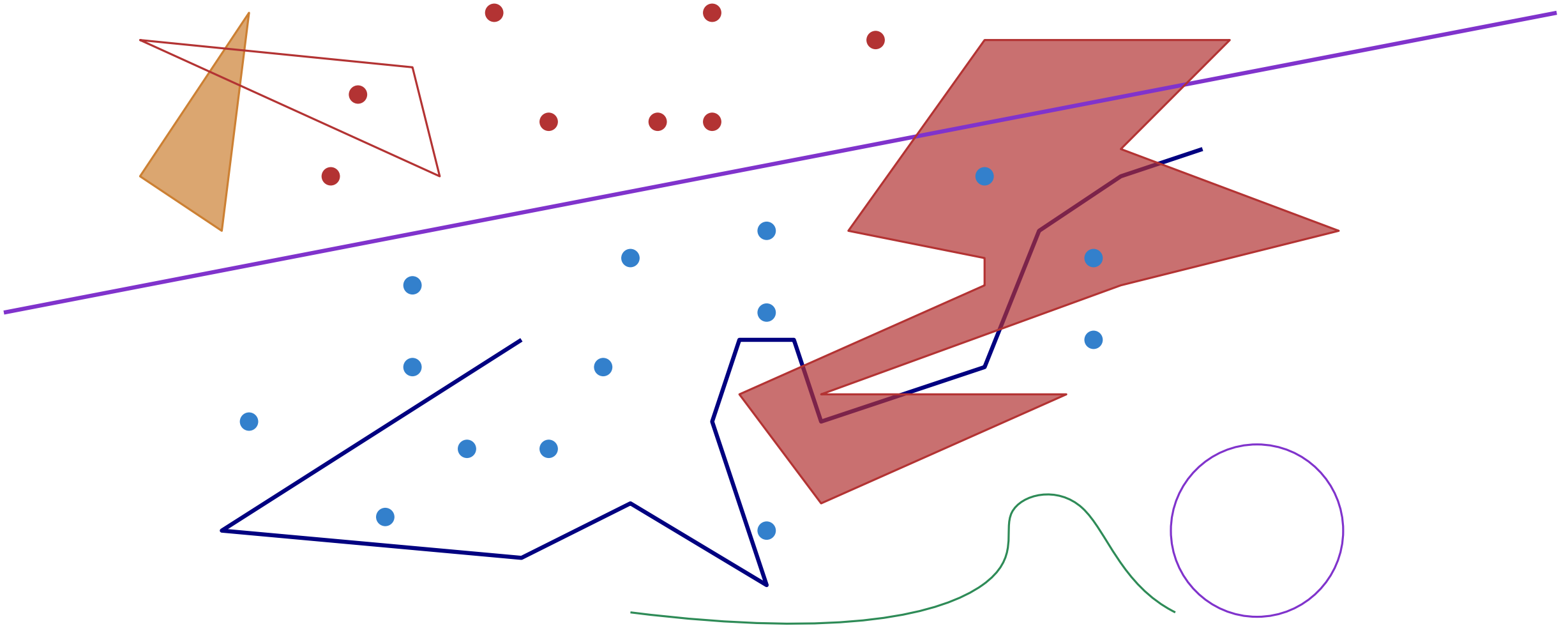
# What & Why?



# What & Why?

**Geometric Algorithms:** Algorithms involving **geometric objects**.

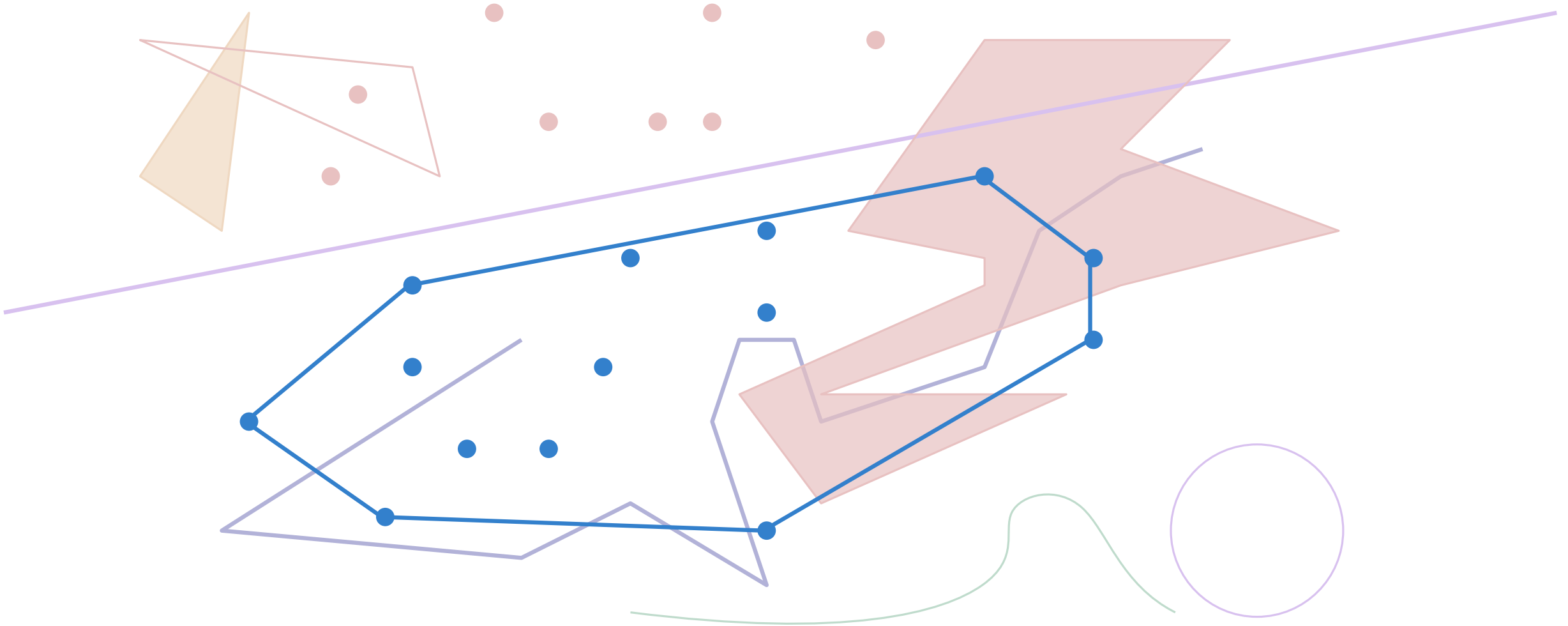
e.g. points, lines, triangles, disks (balls), planes, polygons



# What & Why?

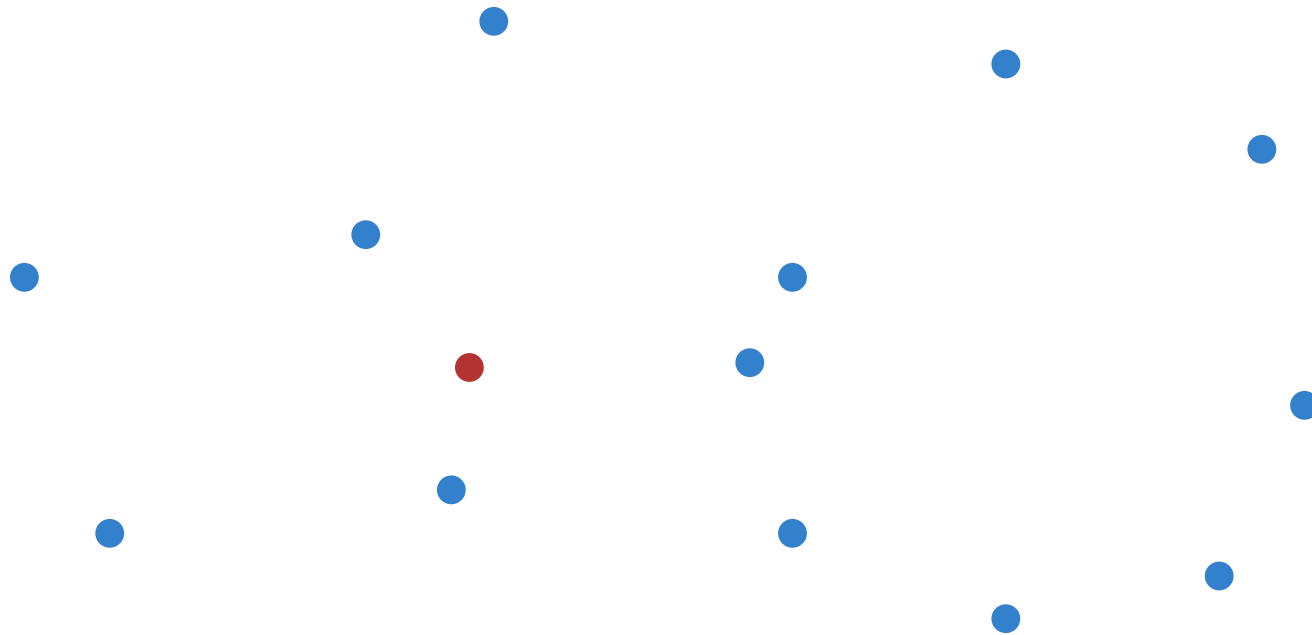
**Geometric Algorithms:** Algorithms involving **geometric objects**.

e.g. points, lines, triangles, disks (balls), planes, polygons



# An example

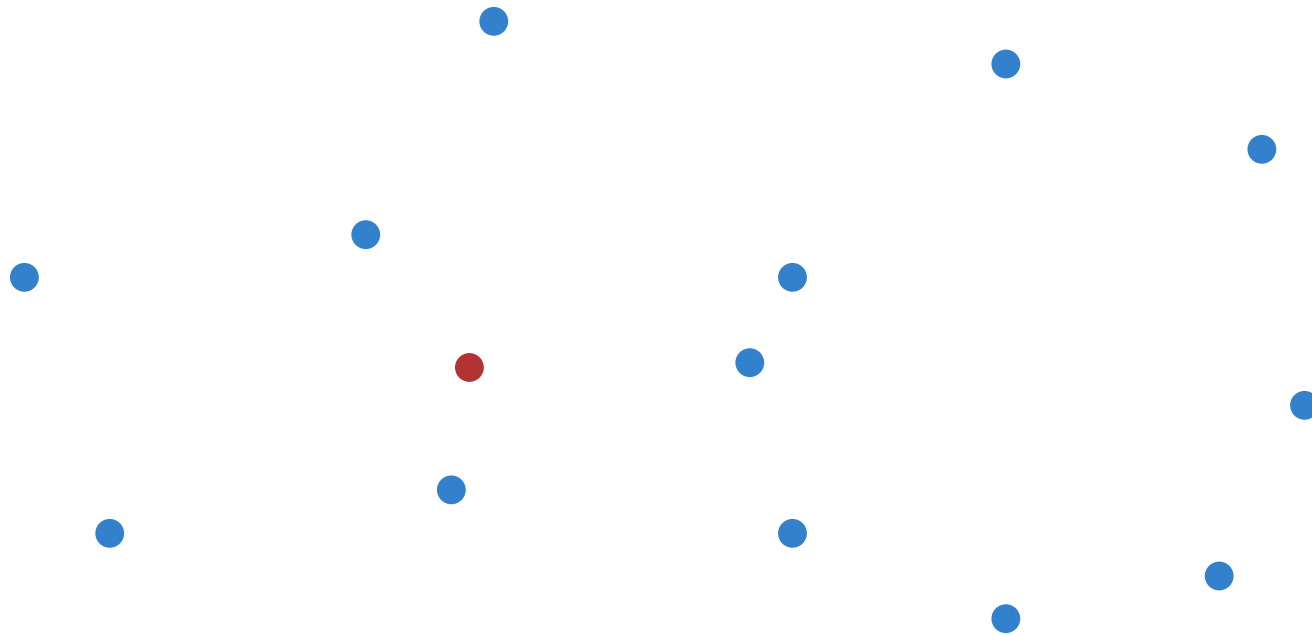
**Problem** Store the locations  $P$  of post offices s.t. we can quickly find the post office closest to a query point  $q$ ?



# An example

**Problem** Store the locations  $P$  of post offices s.t. we can quickly find the post office closest to a query point  $q$ ?

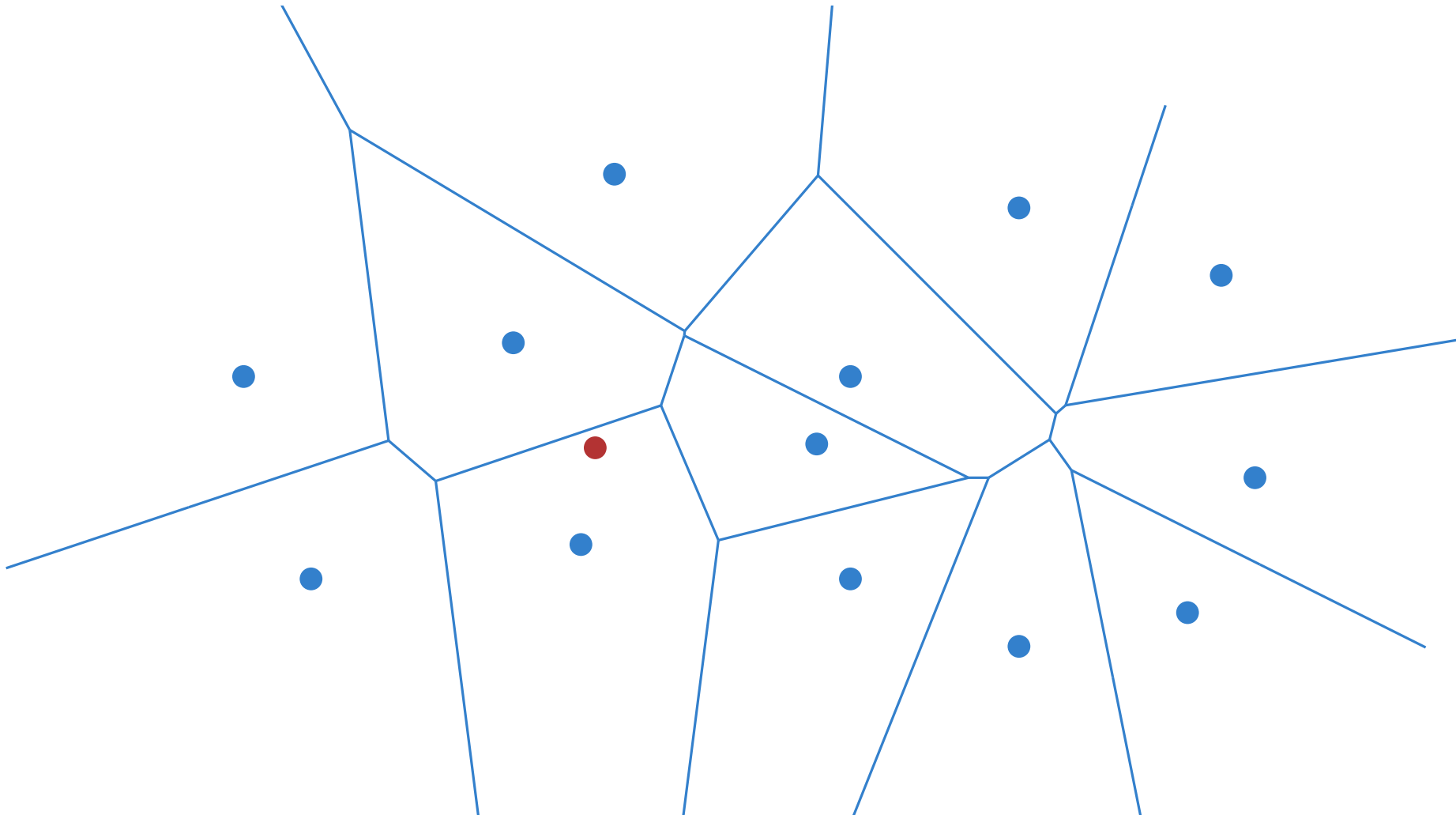
**Naive** Go through all  $n$  points  $P \Rightarrow$  running time  $\Theta(n)$



# An example

**Problem** Store the locations  $P$  of post offices s.t. we can quickly find the post office closest to a query point  $q$ ?

**Solution** 1. Build an **Voronoi diagram** of  $P$   
2. preprocess it for point location queries



# An example

**Problem** Store the locations  $P$  of post offices s.t. we can quickly find the post office closest to a query point  $q$ ?

**Solution** 1. Build an **Voronoi diagram** of  $P$   
2. preprocess it for point location queries  $\Rightarrow O(\log n)$  time queries

