VIT UNIVERSITY
(Estd. u/s 3 of UGC Act 1956)
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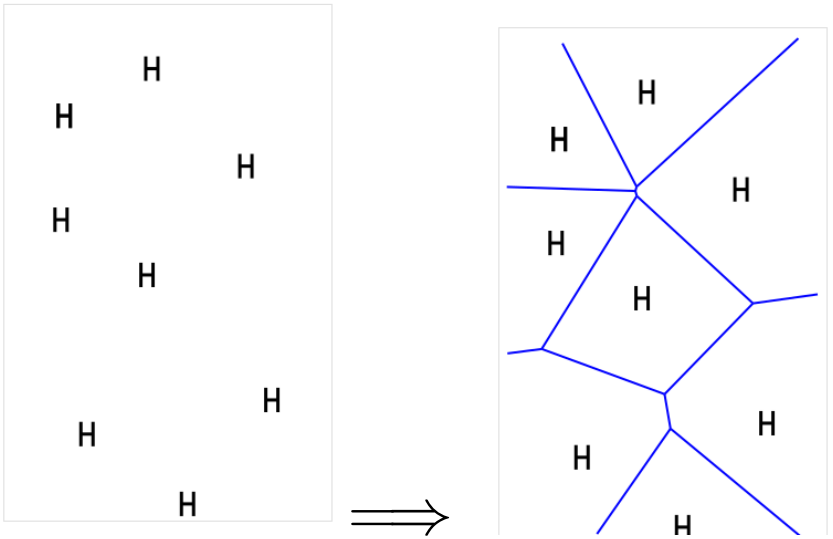
Data Visualisation
CSE613

Introduction to Voronoi Partiti

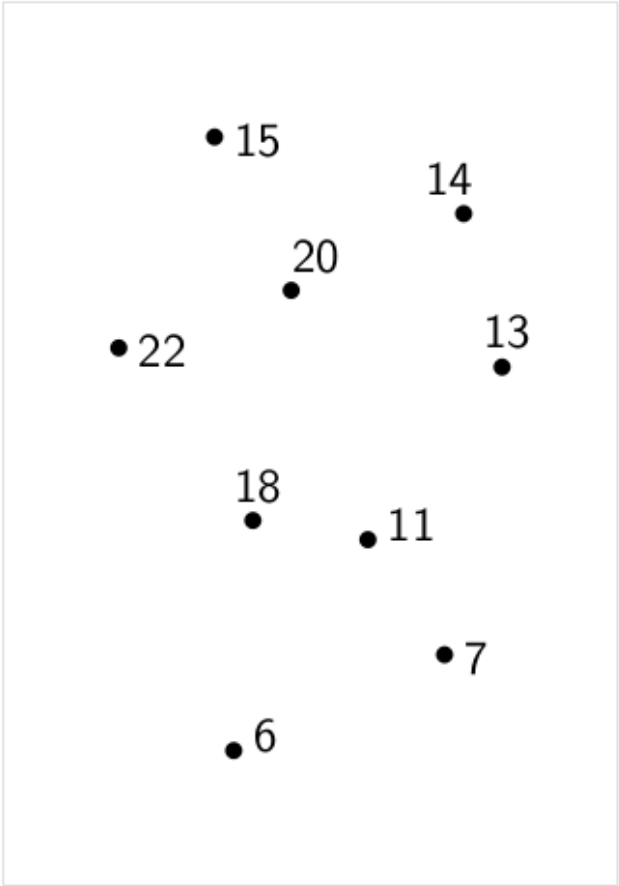
- It is an another approach to assign the available data points to clusters and partitioning the whole input space.
- Voronoi diagram: **It is induced by a set of points (called sites): Subdivision of the plane where the faces correspond to the regions where one site is closest**

Given ambulance posts in a country, in case of an emergency somewhere, where should the ambulance come from?



Voronoi diagrams

Suppose we measured the lead concentration at a number of sample points



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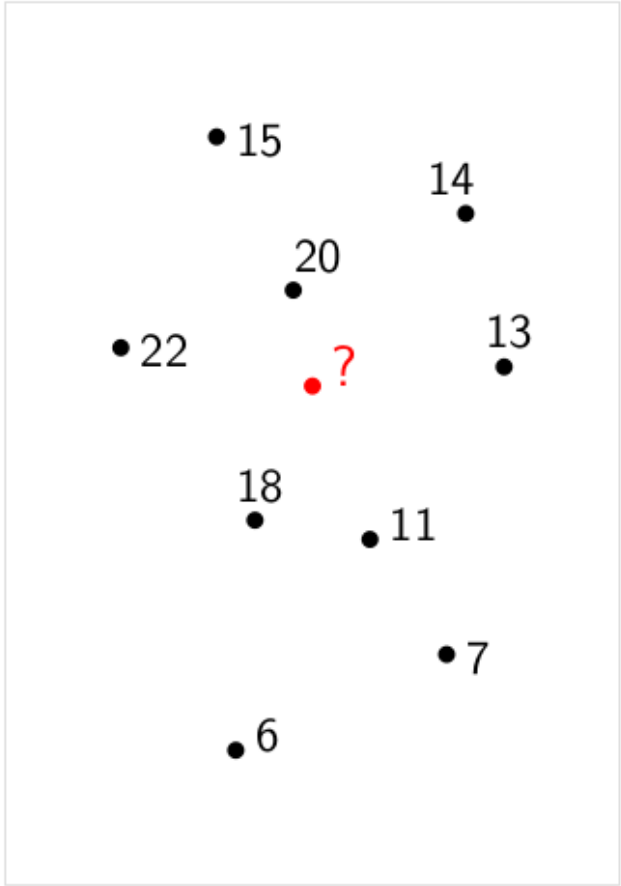

Voronoi diagrams

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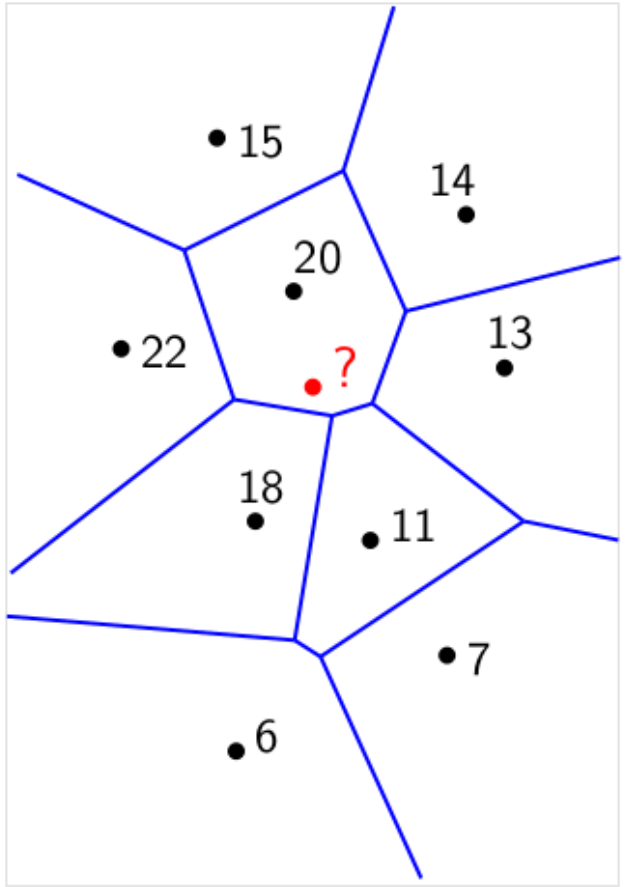

Voronoi diagrams

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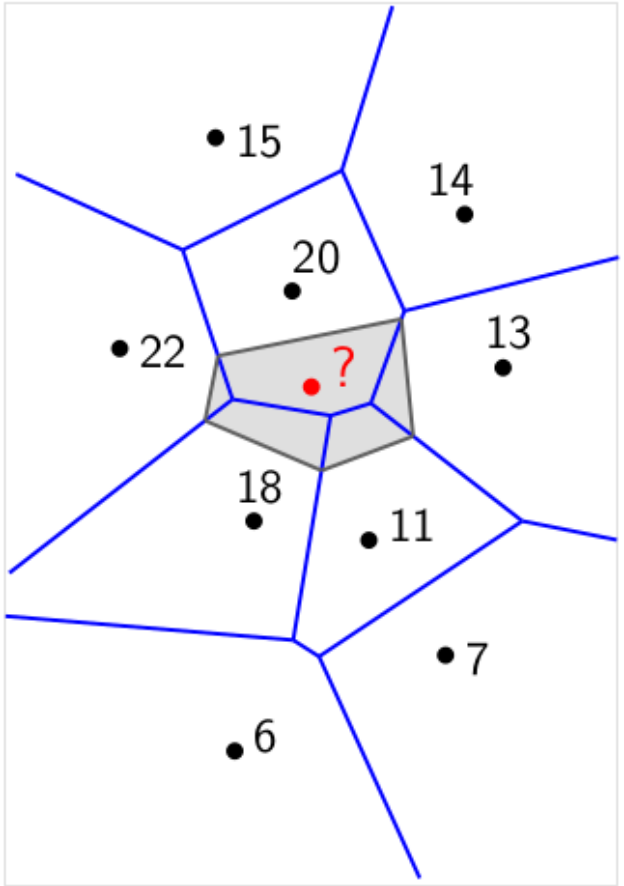

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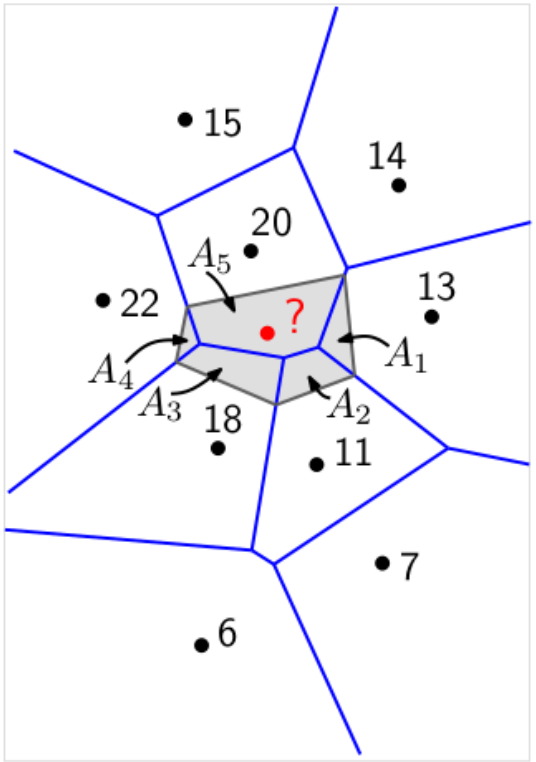

- For Visualization, 2-D slice through space.

- **Neighborhood Graphs:**
  - Algorithm developed by Leisch (2006)
  - Assumption, each centroid forms a node
  - two nodes are connected by an edge if there is atleast one data point for which those two are the closest and second-closest nodes.
  - The formula for second-closest node is $\tilde{c}(\mathbf{x}) = \arg\min_{\mathbf{c} \in C_K \setminus \{c(\mathbf{x})\}} d(x, \mathbf{c})$
  - $A_{ij} = \{\mathbf{x}_n | c(\mathbf{x}_n) = \mathbf{c}_i, \tilde{c}(\mathbf{x}_n) = \mathbf{c}_j\}$
  - $A_{i,j}$ is a set of all points where c_i is the closest centroid and c_j is the second-closest centroid.
  - The shadow value is s(x) $s(\mathbf{x}) = \frac{2d(\mathbf{x}, c(\mathbf{x}))}{d(x, c(\mathbf{x})) + d(\mathbf{x}, \tilde{c}(\mathbf{x}))}$
  - if $s_{i,j}$ ¿ 0 then at least one data point in segment i has c_j as its second-closest centroid, and segments i and j have common border.