

# Voronoi Diagrams: Applications of Lines in Sales, Territories, & Other Domains

## IMPLEMENTING BEST PRACTICES IN COURSES BELOW CALCULUS

FOUNTAIN VALLEY, CA  
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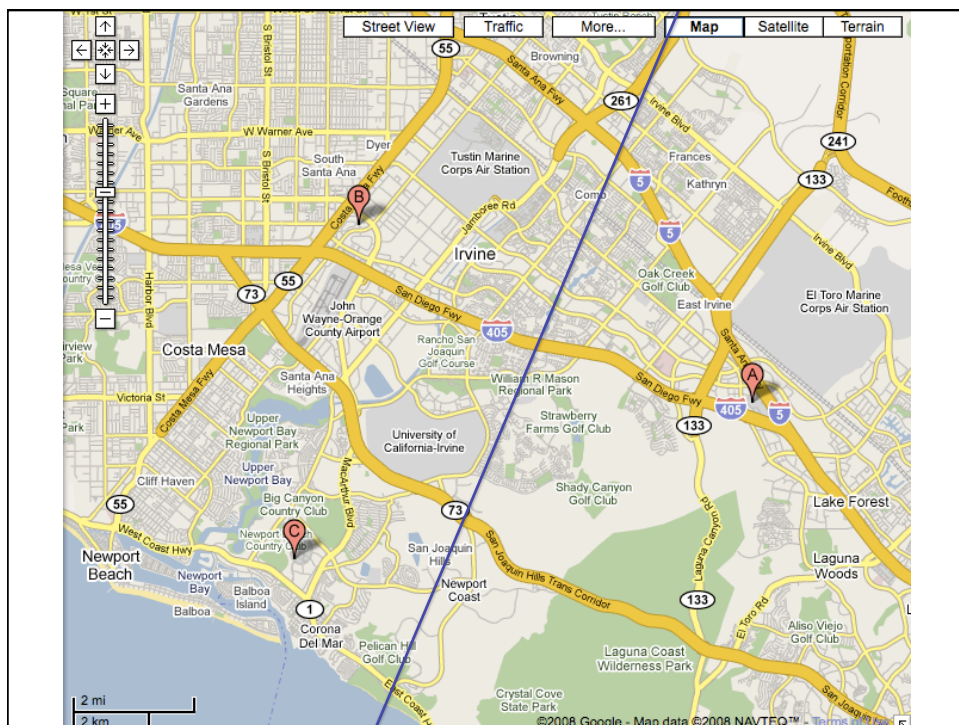
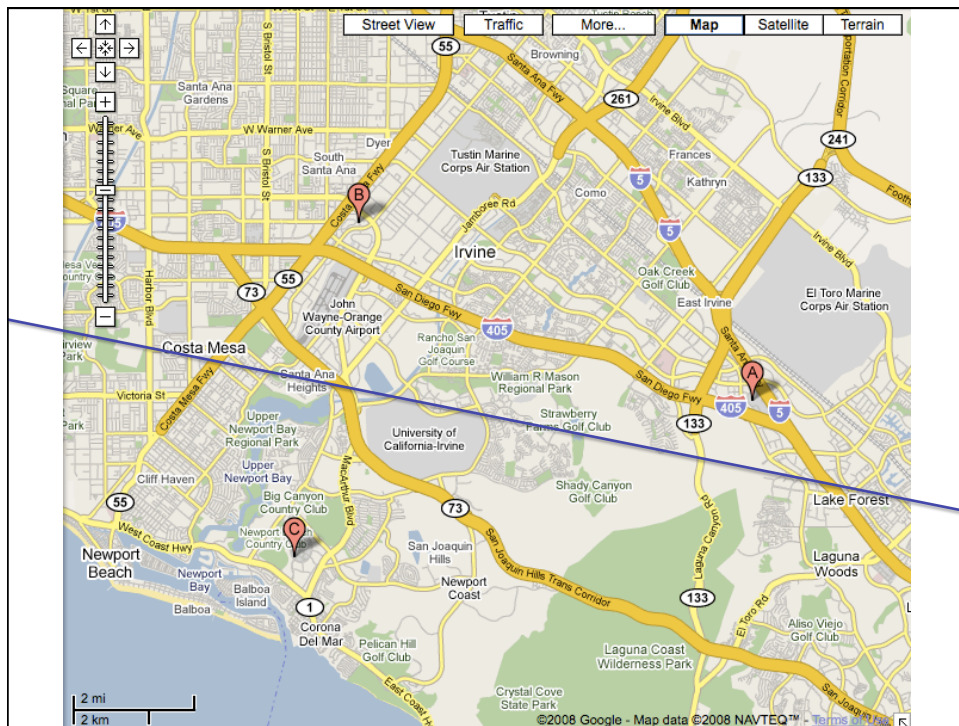


Fresh Fish Tacos Pasta

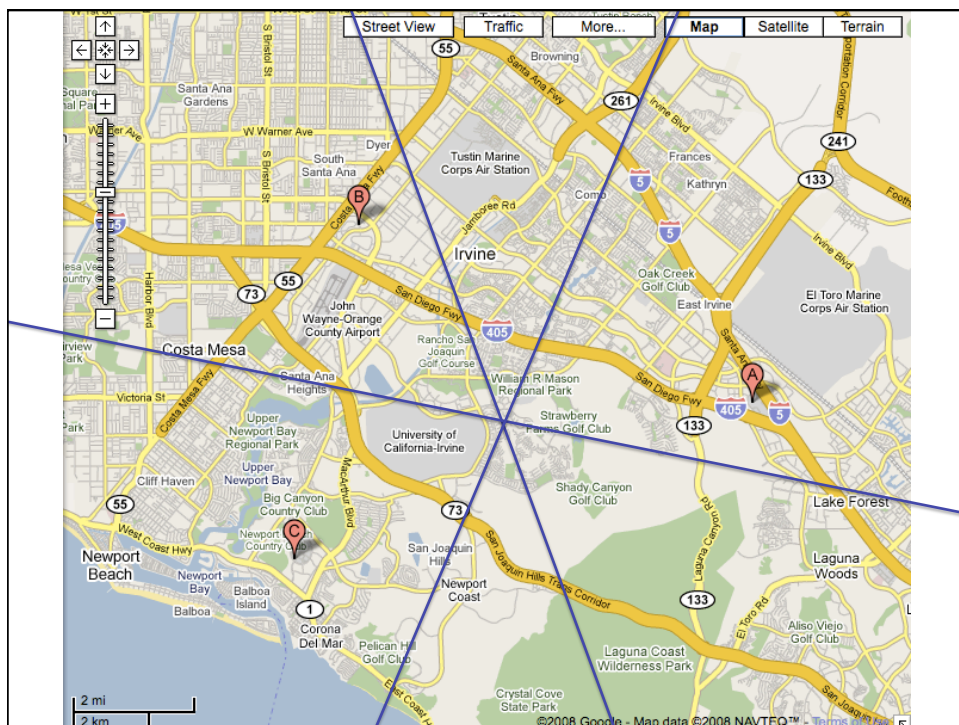
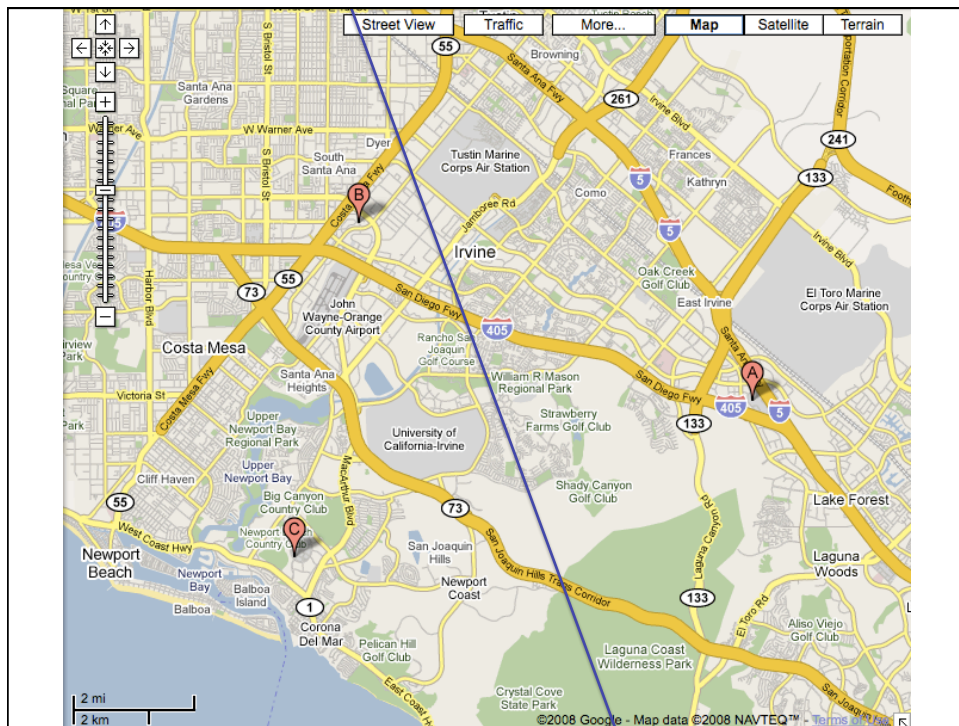


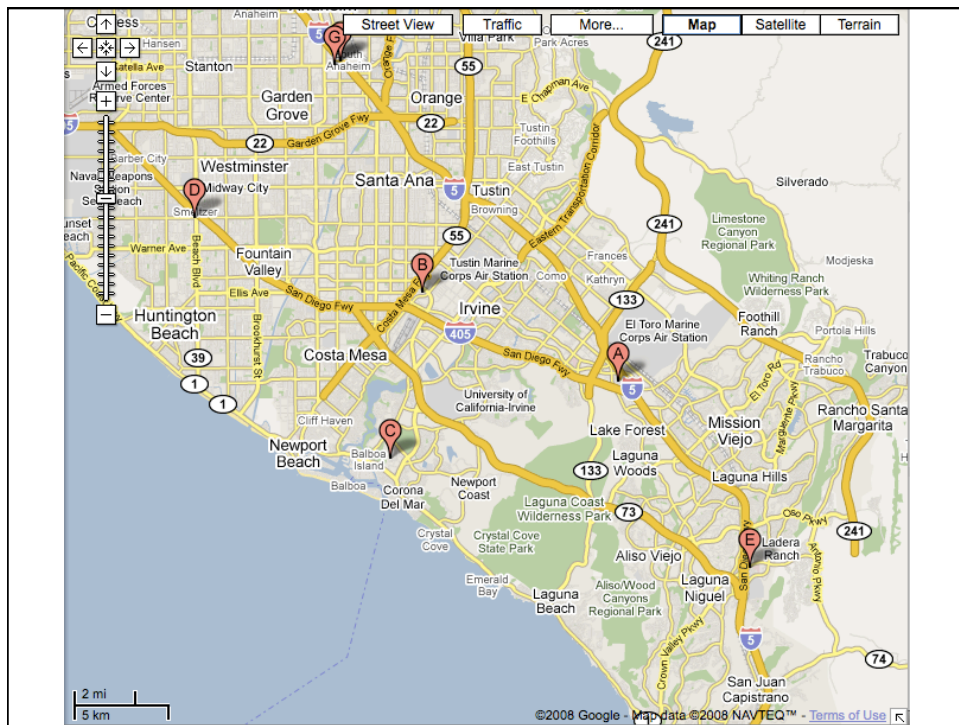
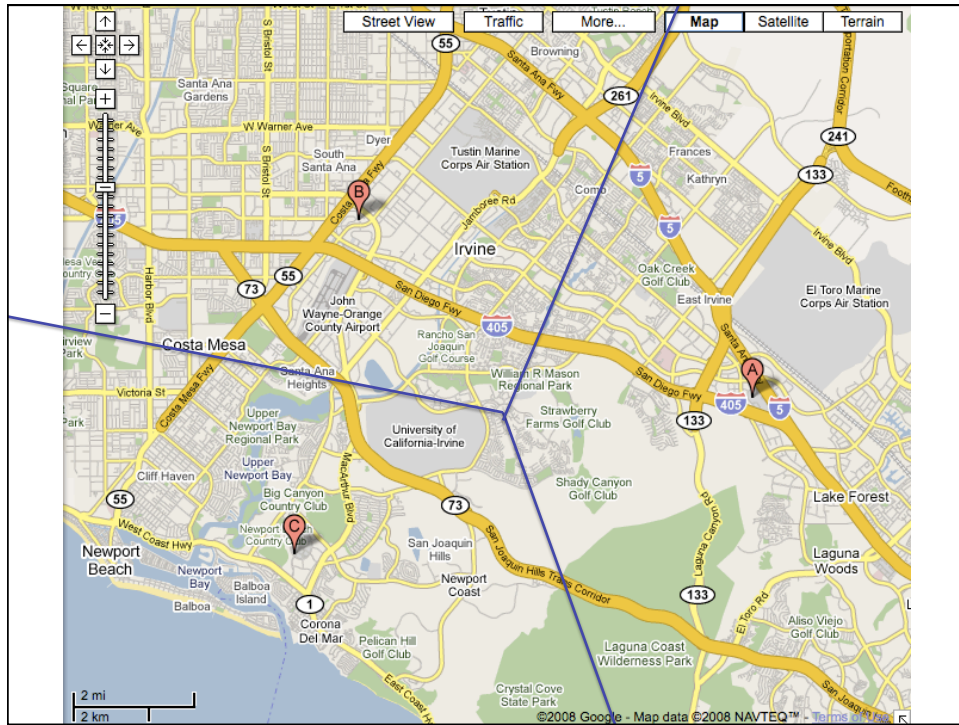
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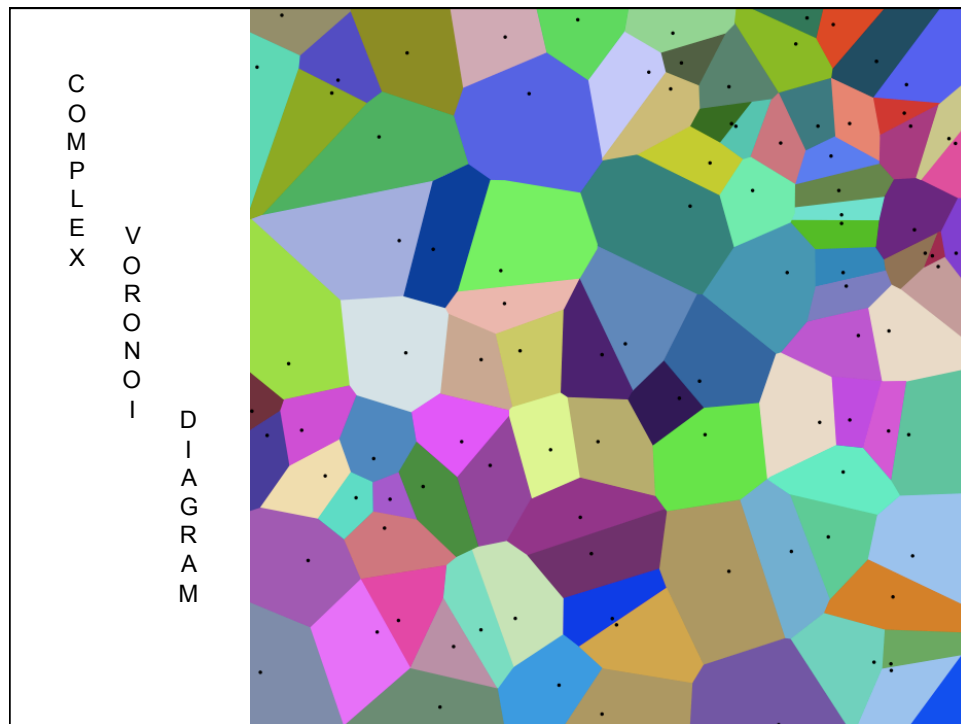












# How To

Google:

NetLogo & Voronoi

<http://ccl.northwestern.edu/netlogo/models/Voronoi>

## NetLogo

- [Home Page](#)
- [Download](#)
- [Models](#)
- [Community Models](#)
- [Extensions](#)
- User Manual:
  - [Web version](#)
  - [Printable version](#)
- [FAQ](#)
- [Resources](#)
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### NetLogo Models Library: Sample Models/Mathematics

[\(back to the library\)](#)

#### Voronoi

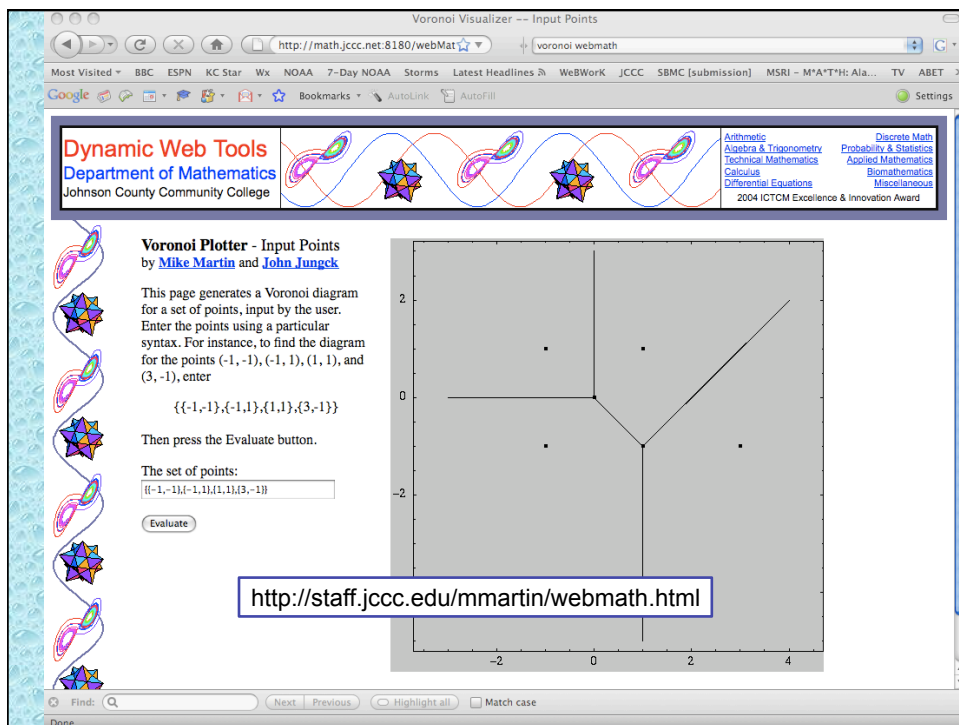
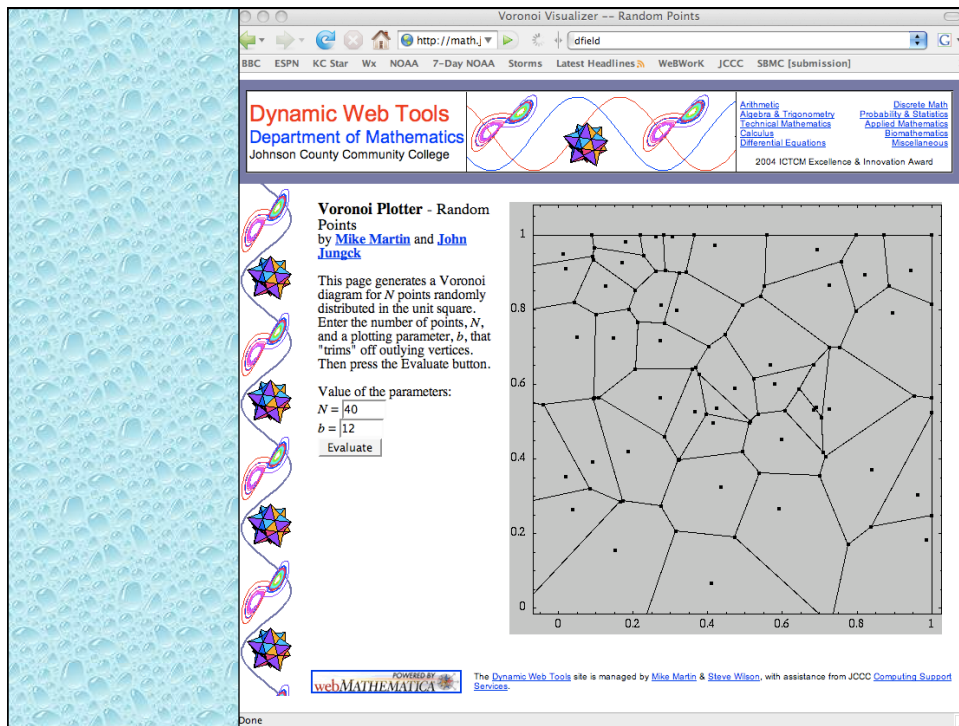
[Run Voronoi in your browser](#)  
uses NetLogo 4.0.3  
requires Java 1.4.1+  
([system requirements](#))

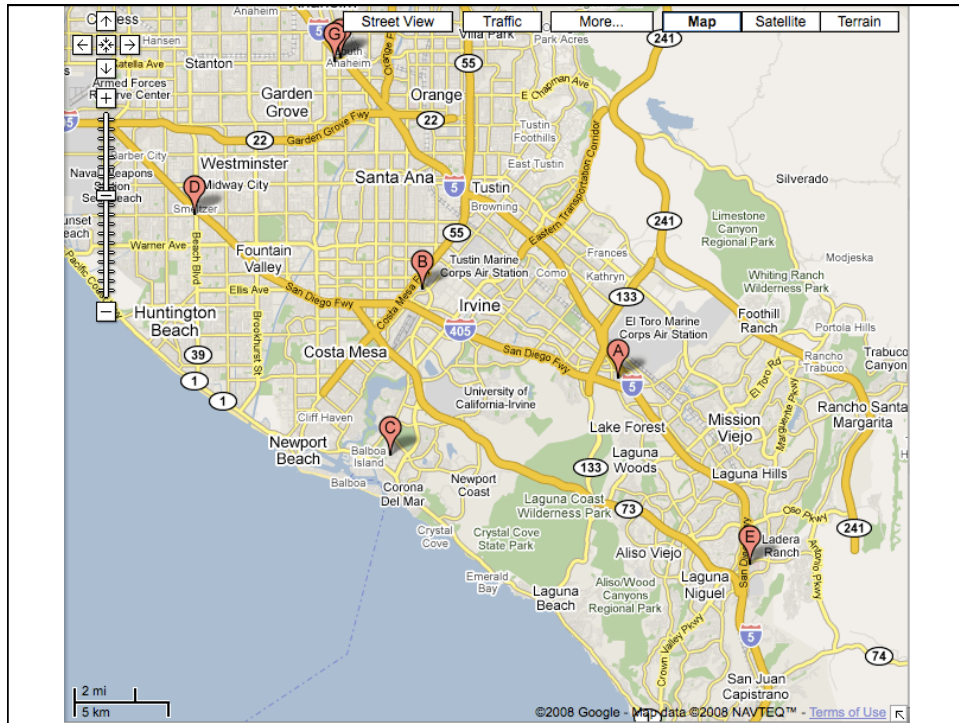
Note: If you download the NetLogo application, every model in the Models Library (besides the Community Models) is included. If you have trouble running this model in your browser, you may wish to [download](#) the application instead.

This model draws a Voronoi diagram of polygons around a set of points. These diagrams resemble many phenomena in the world including cells, forest canopies, territories of animals, fur and shell patterns, crystal growth and grain growth, cracks in dried mud and other geological phenomena, road networks, and so on. Voronoi diagrams are useful in computer graphics, vision and path planning for robots, marketing, and other applications.

#### HOW IT WORKS



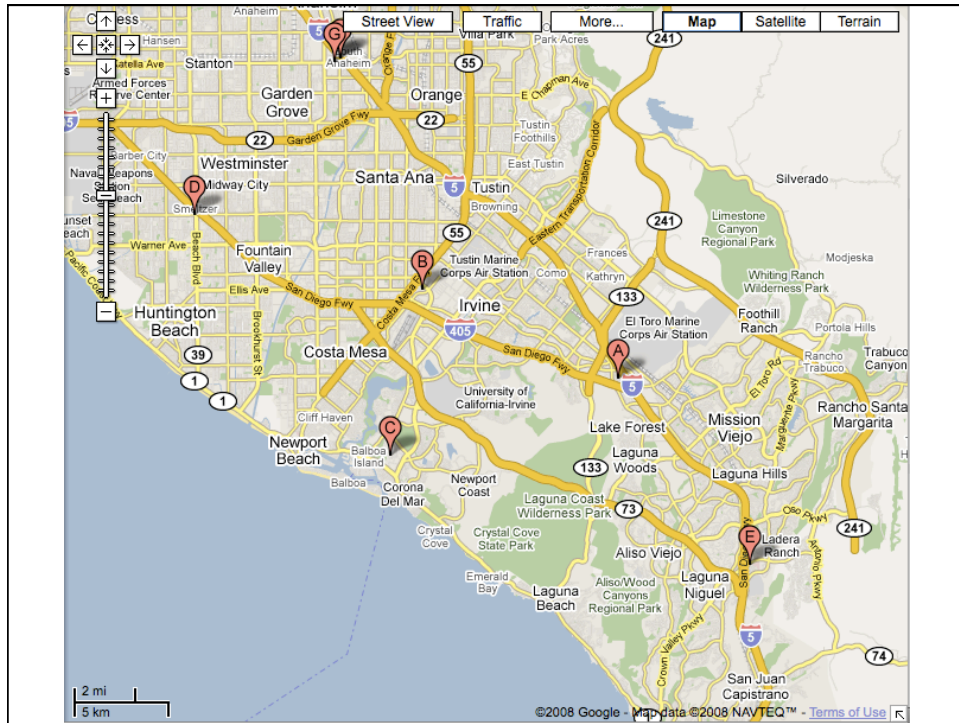




## Mini-Project

- You are charged with opening a new Cheesecake Factory in and around the Irvine area (constrained by the attached map).
- Where should you locate it and why?
- What are the mathematical considerations?
- What other considerations are there?





## Geometry in Action: Voronoi Diagrams

- Cell Membranes
- Forest Canopies
- Wireless Networks
- Marketing
- Animal Territories
- Morphogenesis
- Road Networks
- Polymer Physics
- Anthropology
- Crystal & Grain Growth
- Cracking Patterns in Dried Mud
- Computer Graphics
- Geophysics
- Epidemiology
- Meteorology
- Plant Competition

## Cholera Outbreak in 1854

from AMS article

In John Snow's analysis of the London cholera outbreak of 1854. The following map, included in Snow's Report on the Cholera Outbreak in the Parish of St. James, Westminster, during the Autumn of 1854, shows the distribution of deaths due to cholera. Each bar represents a death at that address.

Snow then considered the sources of drinking water, pumps distributed throughout the city, and drew a line labeled "Boundary of equal distance between Broad Street Pump and other Pumps," which essentially indicated the Broad Street Pump's Voronoi cell.

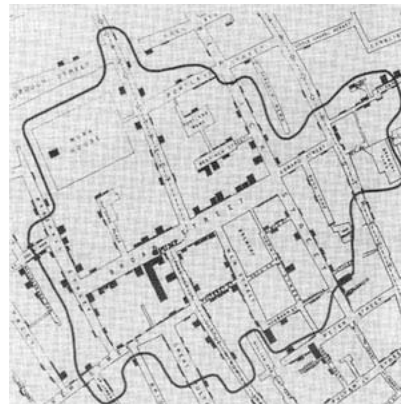


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This map supported Snow's hypothesis that the cholera deaths were associated with contaminated water, in this case, from the Broad Street Pump. Snow recommended to the authorities that the pump handle be removed, after which action the cholera outbreak quickly ended. As Snow's work helped develop the modern field of epidemiology, this map has been called "the most famous 19th century disease map."





Thank You

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