

# OPTIMIZATION

GIS Analysis | Winter 2016

# 1<sup>st</sup> Law of Geography

## **Waldo Tober's 1<sup>st</sup> Law of Geography**

*"Everything is related to everything else, but near things are more related than distant things."*

## **Spatial Autocorrelation**

A measure of the degree to which a set of spatial features and their associated data values tend to be clustered together in space (positive spatial correlation) or dispersed (negative spatial autocorrelation)



# Optimization

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Analytical techniques used to determine the best (optimal) path, location, or other geographic parameter based on a set of criteria

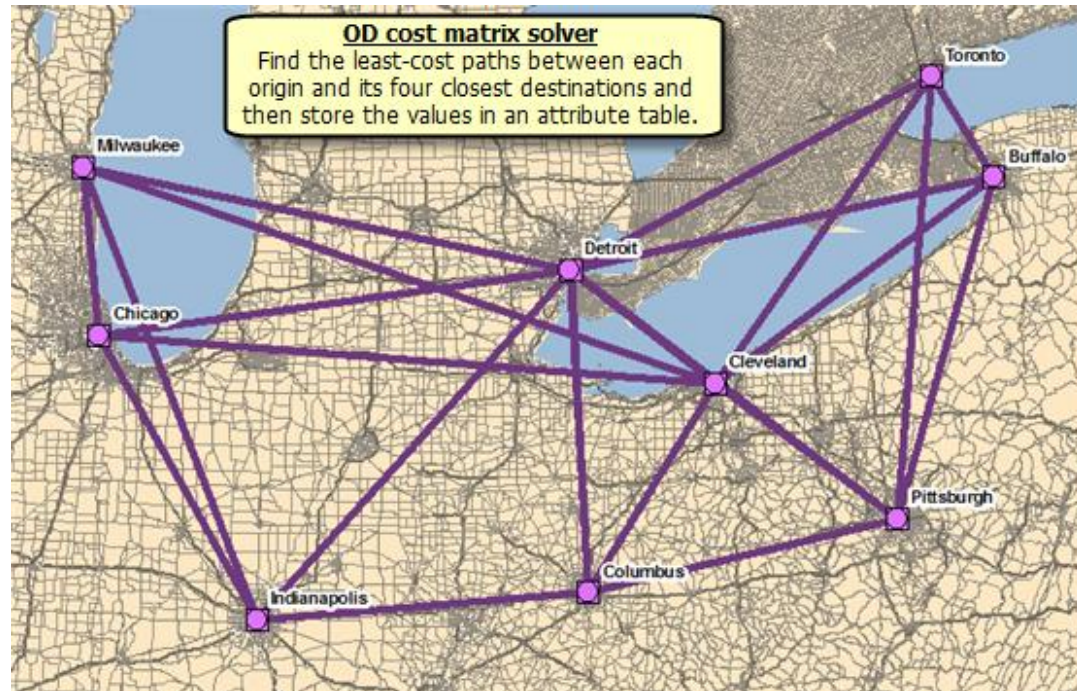
# Common Optimization Analyses

- Route (“Least Cost Path”)
- Origin-Destination (OD) Cost Matrix
- Service Areas
- Location-Allocation
- Site Suitability



# Origin-Destination (OD) Cost Matrix Analysis

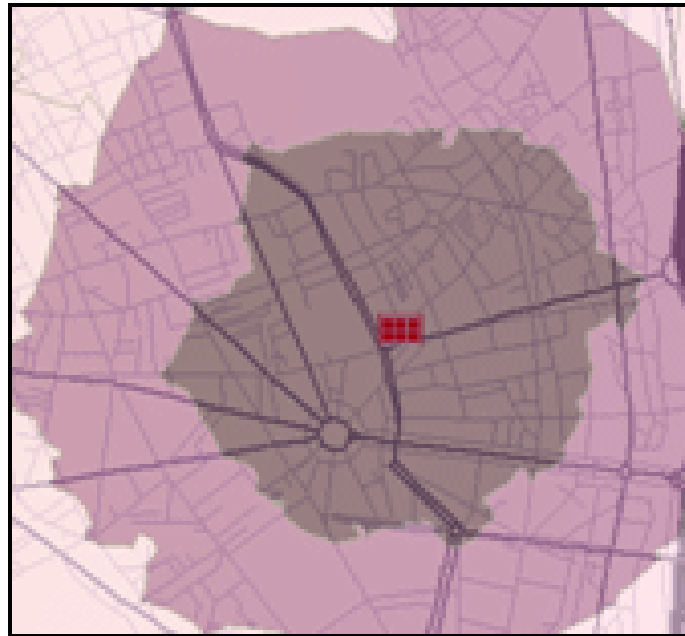
- Finds and measures distances along network **least-cost paths**, from **multiple origins** to **multiple destinations**



Network Analyst toolbar > New OD (Origin-Destination) Cost Matrix (layer)

# Service Areas Analysis

- Identifies **areas along all paths** in a network that are **within an impedance value** (e.g. 5 minutes) from a starting location.



Network Analyst toolbar > New Service Area (layer)



# Location-Allocation Analysis

- Locates facilities in such a way that demand for services is allocated to each facility efficiently.



*Network Analyst toolbar > New Location-Allocation (layer)*

# Location-Allocation Analysis

- Locating an Emergency Response Center.

*“Where should three ERC facilities be placed so that the greatest number of people in the community can be reached within 4 minutes?”*

- Locating a manufacturing plant.

*“Where should the manufacturing plant be located to minimize overall transportation costs?”*