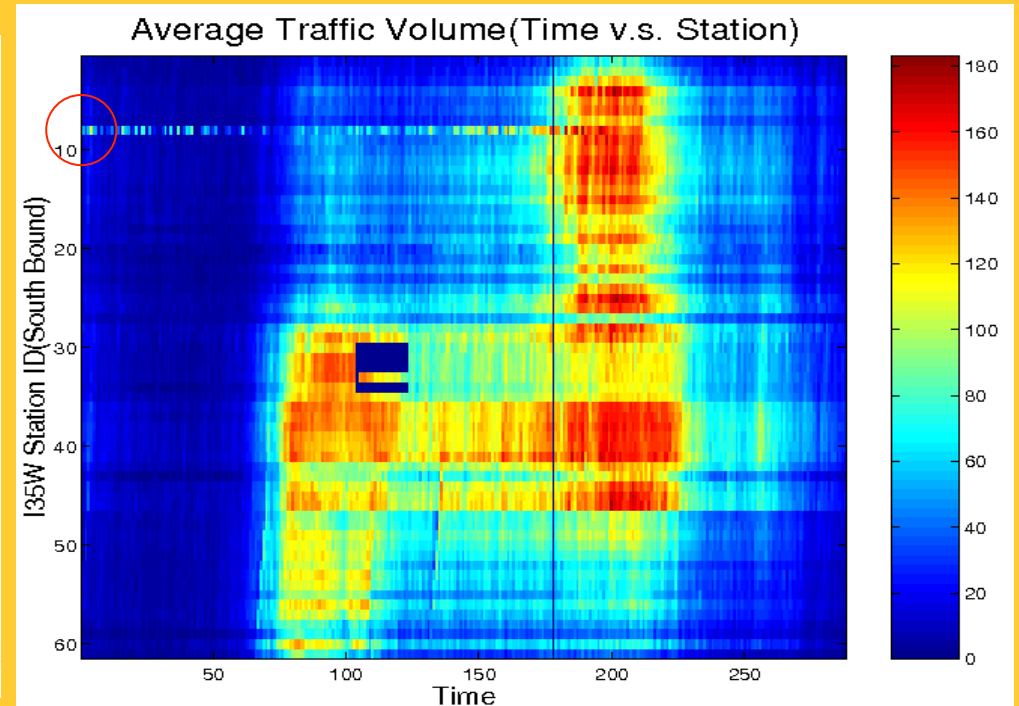
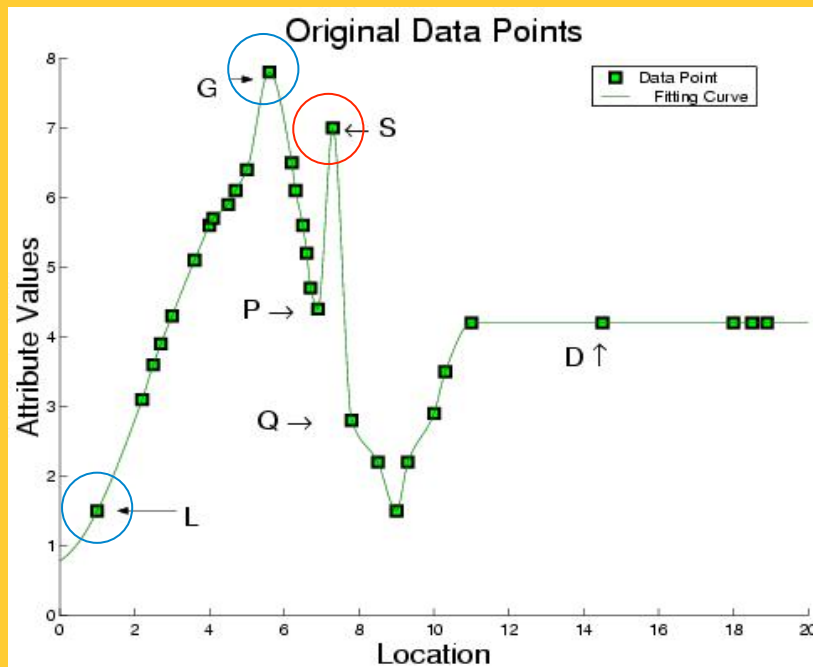


# Learning Objectives

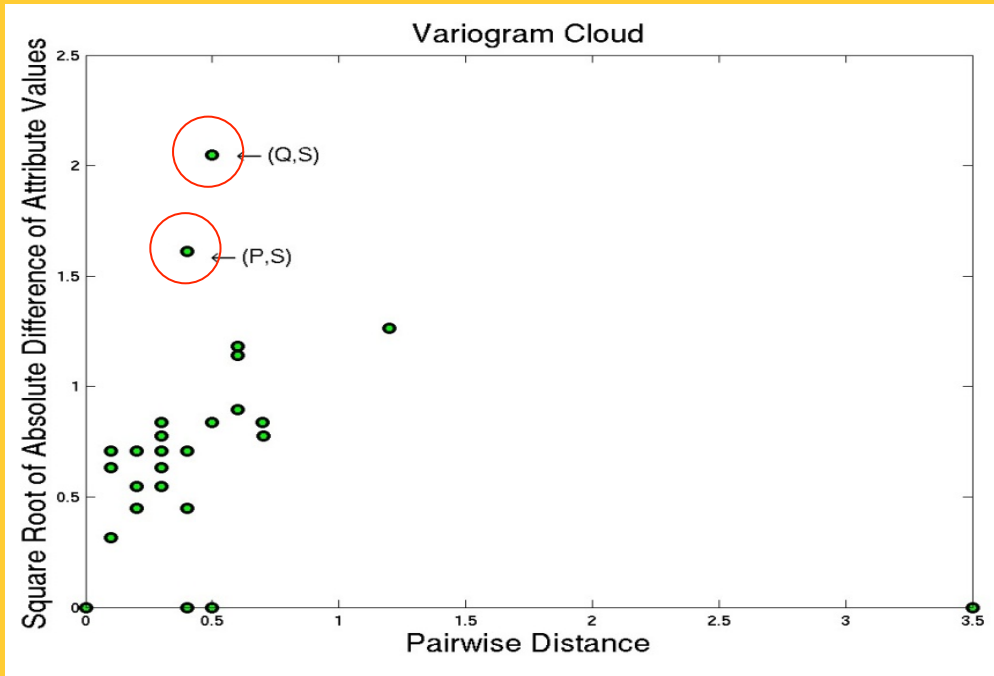
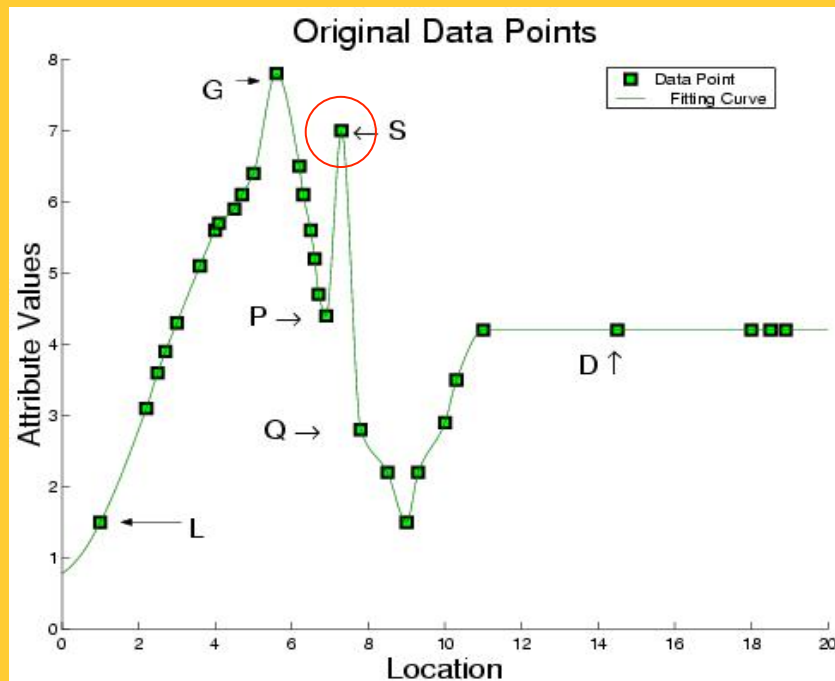
- After this segment, students will be able to
  - Contrast global & spatial outliers
  - List spatial outlier detection tests

# Outliers: Global (G) vs. Spatial (S)



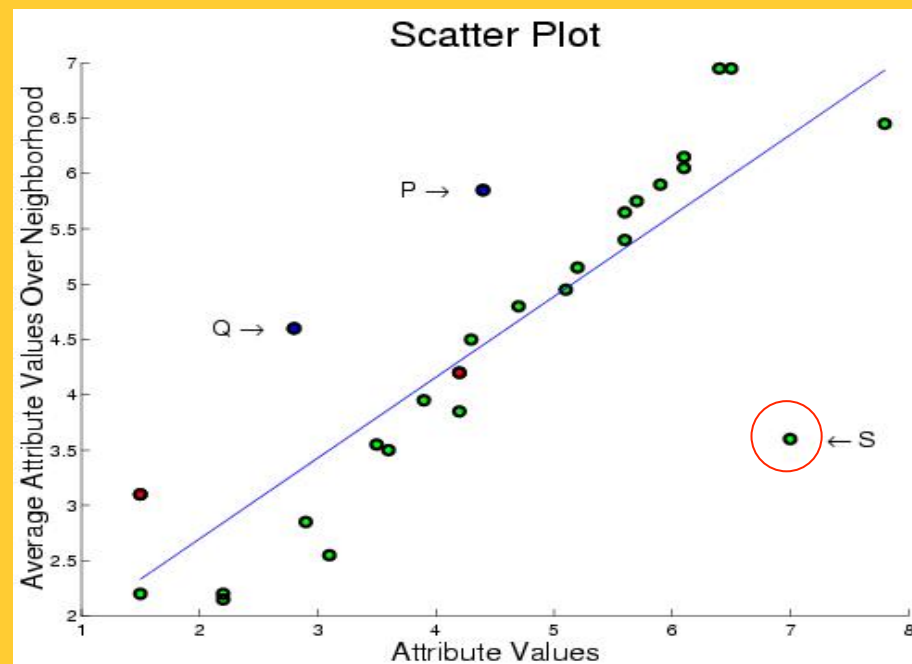
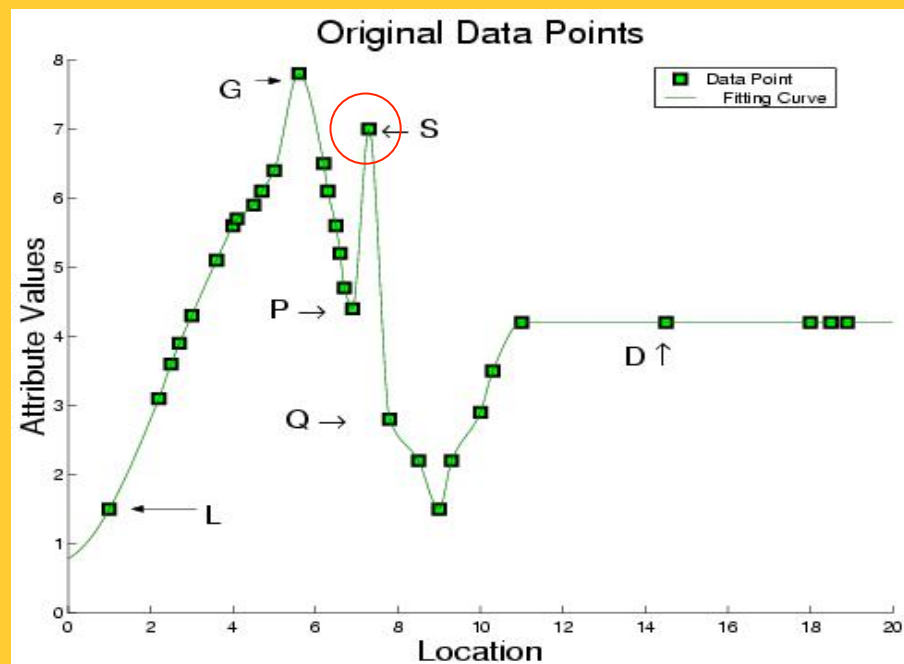
# Outlier Detection Tests: Variogram Cloud

- Graphical Test: Variogram Cloud



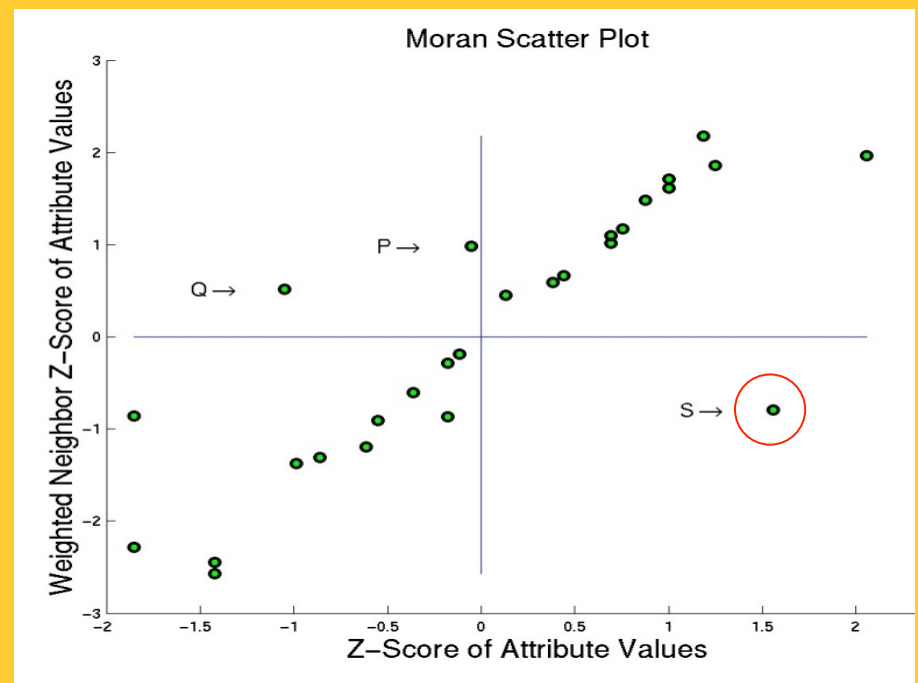
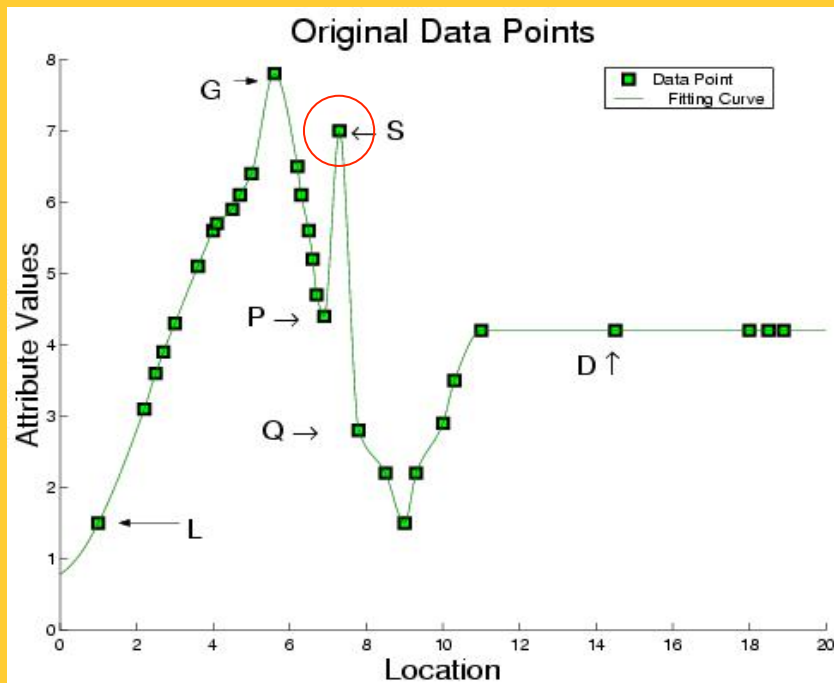
# Outlier Detection - Scatterplot

- Quantitative Tests: Scatter Plot



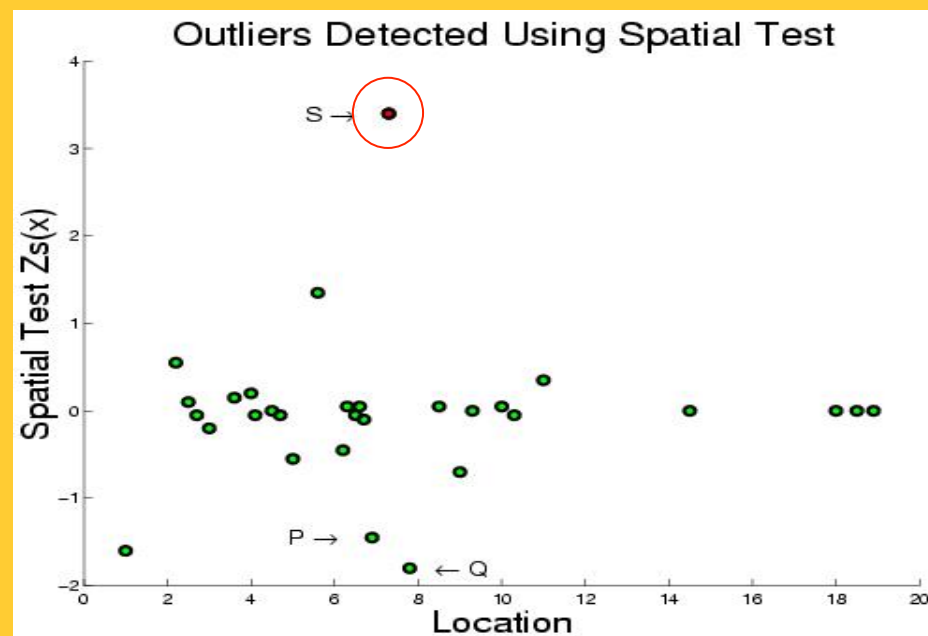
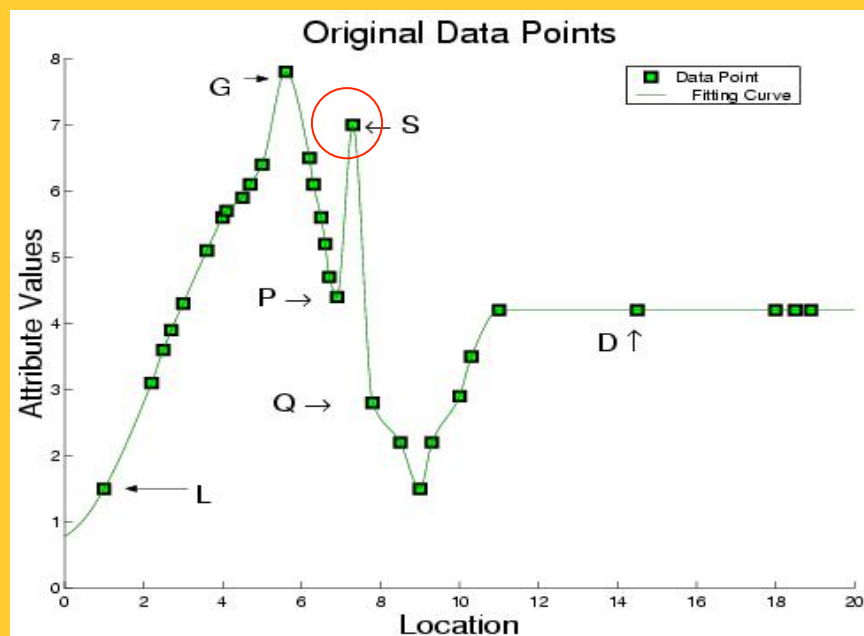
# Outlier Detection Test: Moran Scatterplot

- Graphical Test: Moran Scatter Plot



# Outlier Detection Tests: Spatial Z-test

- Quantitative Tests: Spatial Z-test
  - Algorithmic Structure: Spatial Join on neighbor relation



# Spatial Outlier Detection: Computation

- Separate two phases
  - Model Building
  - Testing: test a node (or a set of nodes)
- Computation Structure of Model Building
  - Key insights:
    - Spatial self join using  $N(x)$  relationship
    - Algebraic aggregate function computed in one scan of spatial join



# Trends in Spatial Outlier Detection

- Multiple spatial outlier detection
  - Eliminating the influence of neighboring outliers
- Multi-attribute spatial outlier detection
  - Use multiple attributes as features
- Scale up for large data

