Understanding the Basics: Introduction to the Language of Spatial Analysis

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• What is the “Language of Spatial Analysis” and why is it important?

• Categories of spatial analysis
  - Understanding where
  - Measuring size, shape and distribution
  - Determining how places are related
  - Finding the best locations and paths
  - Detecting and quantifying patterns
  - Making predictions
Language of Spatial Analysis

• **Language:**
  
  - The *method of human communication*, either spoken or written, consisting of the use of words in a structured and conventional way.
Language of Spatial Analysis

• Language:
  The *method of human communication*, either spoken or written, consisting of the use of words in a structured and conventional way.

• Spatial analysis:
  • Pose questions and derive results using of analytical tools
  • Pulling out information from data, turning data into information
  • Unlock the data’s full potential
The Science of Where

• Illuminate the truth answer fundamental questions of where
  - Where is it
  - How do I get there?
  - Where am I?
  - Where is it changing?
  - Where is it suitable?
The Science of Where

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- Get away from using single geoprocessing tools – Think workflows!
THE LANGUAGE OF SPATIAL ANALYTICS

Using The Science of Where to understand our world—mapping where things are, how they relate, what it all means, and what actions to take.

Understanding where
1. Understanding where things are (location maps).
2. Understanding where the variations and patterns in values are (comparative maps).
3. Understanding where and when locations and values change.

Measuring size, shape, and distribution
4. Calculating individual feature geometries.
5. Calculating geometries and distributions of feature collections.

Determining how places are related
6. Determining what is nearby or coincident.
7. Determining and summarizing what is within an area(s).
8. Determining what is closest.
9. Determining what is visible from a given location(s).
10. Determining overlapping relationships in space and time.

Finding the best locations and paths
11. Finding the best locations that satisfy a set of criteria.
12. Finding the best allocation of resources to geographic areas.
13. Finding the best route, path, or flow along a network.
14. Finding the best route, path, or corridor across open terrain.
15. Finding the best supply locations given known demand and a travel network.

Detecting and quantifying patterns
16. Where are the significant hot spots, anomalies, and outliers?
17. What are the local, regional, and global spatial trends?
18. Which features/pixels are similar, and how can they be clustered, classified, and identified.
19. Are spatial patterns changing over time?

Making predictions
20. Given a success case, identifying, ranking, and predicting similar locations.
21. Finding the factors that explain observed spatial patterns and making predictions.
22. Interpolating a continuous surface and trends from discrete sample observations.
23. Predicting how and where objects spatially interact (attraction and decay).
24. Predicting how and where objects affect wave propagation.
25. Predicting where phenomena will move, flow, or spread.
26. Predicting what if.
Understanding where

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25 Predicting where phenomena will move, flow, or spread.
26 Predicting what-if.
Examples: Understanding where
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Examples: Understanding where

- Location
- Change over Time
- Comparative
Examples: Calculating size, shape and distribution

| Individual geometries | Feature Collections |
Examples: Calculating size, shape and distribution

Individual geometries

Feature Collections
Examples: Calculating size, shape and distribution
Examples: Calculating size, shape and distribution

- Individual geometries
- Feature Collections
Examples: Calculating size, shape and distribution

Individual geometries

Feature Collections
Demo: Understanding where

Measuring size, shape, and distribution
Determining how places are related - Distance
Determining how places are related - Distance

What's nearby?

Hotel

.5 miles
Determining how places are related - Distance

What's within a drive/walk time?
Determining how places are related - Distance

What’s the distance?
Determining how places are related - Distance

What’s the service area?
Determining how places are related - Distance
Determining how places are related – Coincidence and Containment
Determining how places are related – Coincidence and Containment

What’s within?
Determining how places are related – Coincidence and Containment

How much is within?
Determining how places are related – Coincidence and Containment

How much is within?

What’s the visible area?
Determining how places are related – Coincidence and Containment

How much is within?

What’s changing?
Determining how places are related – Coincidence and Containment

How much is within?

When and where?
Demo: Determining how places are related
Finding the best locations and paths
11. Finding the best locations that satisfy a set of criteria
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Weighted Overlay
Finding the best locations and paths

11. Finding the best locations that satisfy a set of criteria
12. Allocating resources to geographic areas
Finding the best locations and paths

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13. Finding the best route, path, or flow along a network

14. Finding the best route, path, or corridor over a terrain

Routing

3D Routing
Finding the best locations and paths

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15. Finding the best supply locations given demand and travel network
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Multivariate Clustering (Spatially Constrained)
Detecting and quantifying patterns

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Demo: Detecting and quantifying patterns
Making predictions
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20. Identifying or ranking similar locations?
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Making predictions

21. What explains or predicts patterns?
Making predictions

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GWR: % Blue Collar Workers (+)

GWR: % College Degrees (-)
Making predictions
Making predictions

23. Interpolating a continuous surface from discrete sample locations
Making predictions

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Point Data - Temperature
Making predictions

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Making predictions

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Point Data - Temperature

Prediction Map

Standard Error Map
Making predictions

23. Interpolating a continuous surface from discrete sample locations

Point Data - Temperature

Prediction Map

Standard Error Map

Semivariogram

Model: 0*Nugget + 0.715*K-Bessel(303700,455550,88.1,0.11971)
Making predictions
Making predictions

24. Predicting how and where objects affect wave propagation
Making predictions

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Sun Shadow Volume - Building Scenario #1
Making predictions

24. Predicting how and where objects affect wave propagation

Sun Shadow Volume - Building Scenario #1
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Sun Shadow Volume - Building Scenario #1

Sun Shadow Volume - Building Scenario #2
Making predictions

24. Predicting how and where objects affect wave propagation

Sun Shadow Volume - Building Scenario #1

Sun Shadow Volume - Building Scenario #2
Demo: Finding similar locations
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Select the Feedback tab.

Complete answers and select “Submit”.

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Houston, TX

Esri User Conference
July 9-12, 2018
San Diego, CA

Esri Water Conference
January 29-February 1, 2018
San Diego, CA

ArcGIS Earth: Introduction and Deployment
SDCC - Room 66-D

ArcGIS Maps for Microsoft Office: An Introduction
SDCC - Room 66-E

The title and description were consistent with the content.

The content of the workshop was relevant to my work.

The workshop provided information or techniques I can apply to my work.

Well organized/clear presentation.

Public speaking skills.

Click the Feedback tab to complete your answers and submit.

Select the session you attended.

Select the Feedback tab.

Complete answers and select “Submit”.