Why Geographic Analysis

HES 505 Fall 2023: Session 2

Matt Williamson

Checking in

1. What are some advantages and disadvantages of using R for spatial analysis
2. What can I clarify about the course?
3. How do you feel about git and github classroom? How can I make that easier for you?

Today's Plan

- What can we do with geographic information?
- Conceptual challenges
- Analytical challenges
- Critiques of quantitative geography

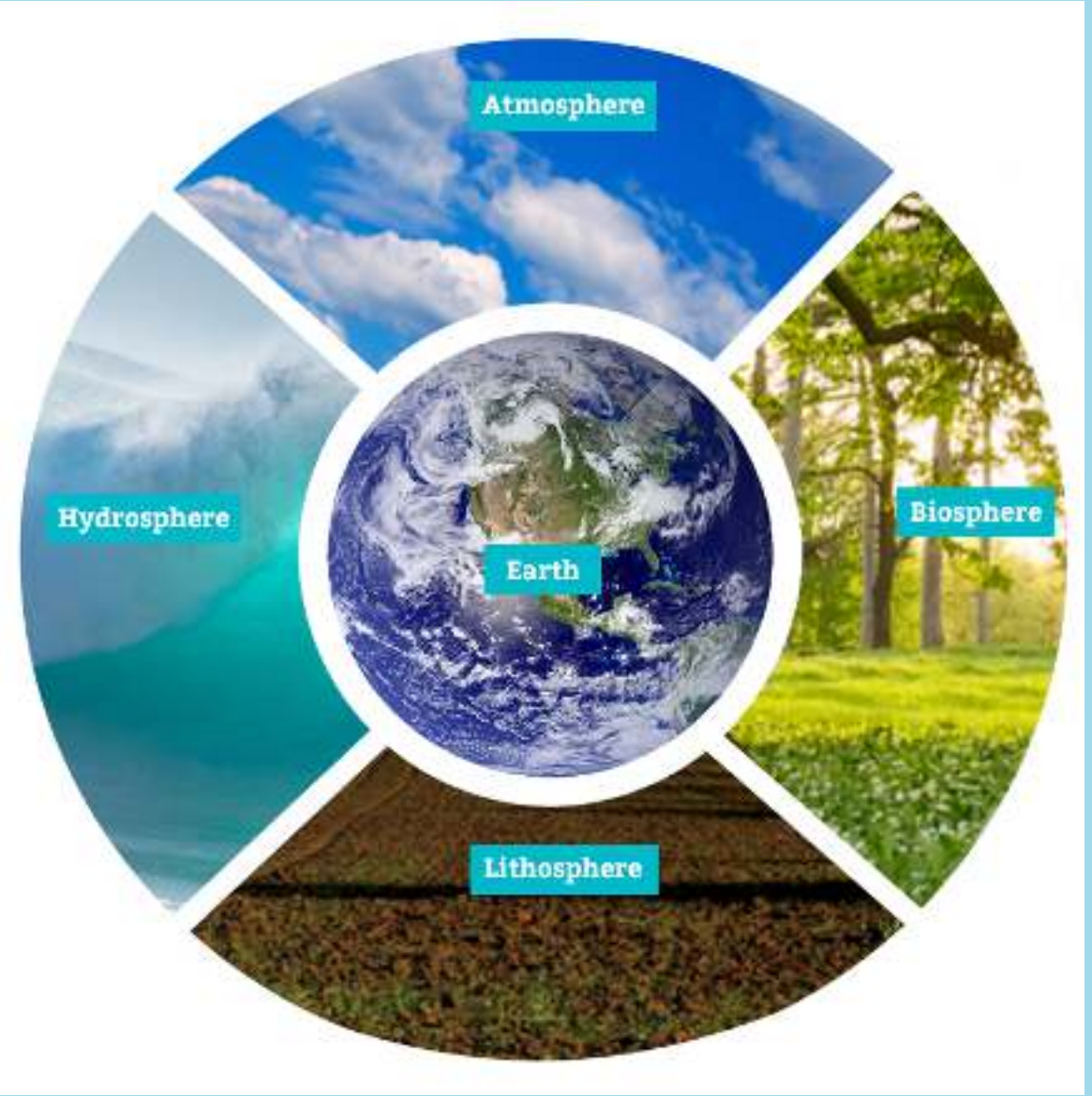

What can we do with spatial data?

What is geography

- **Geo**: land, earth, terrain
- **Graph**: writing, discourse
- Tuan: **Space** (extent) and **Place** (location)
- Analysis of the effects of extent and location on events or features

Five Themes in Geography

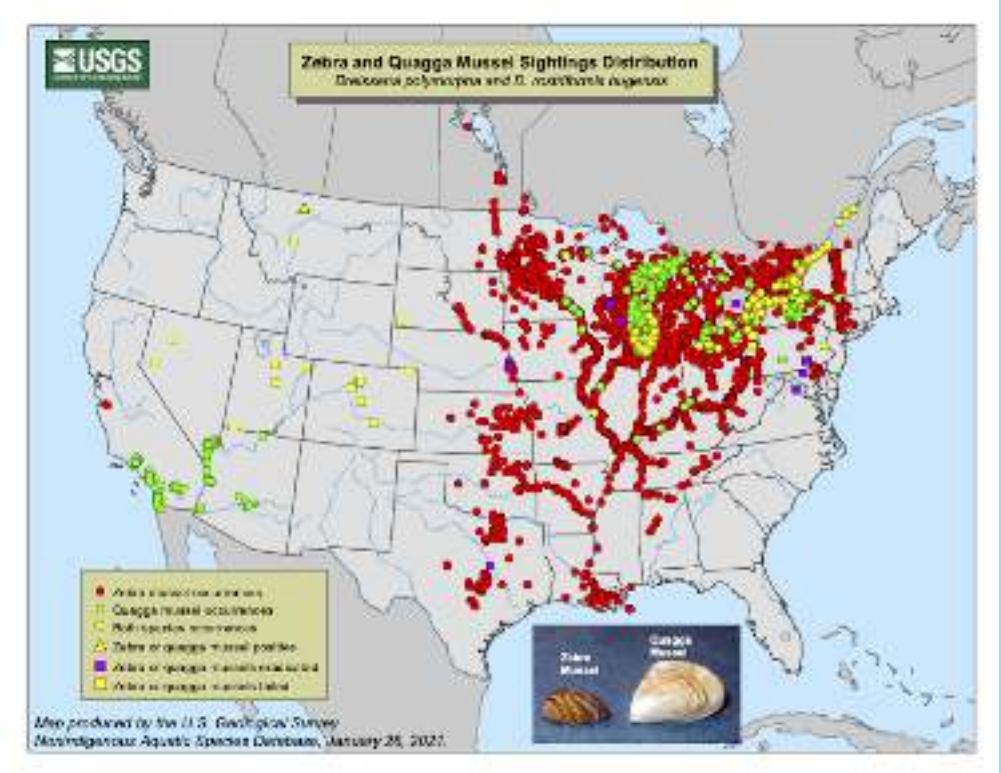
- Location
- Place
- Region
- Movement
- Human-Environment Interaction



WGBH Educational Foundation

Location

The place (on Earth) of a particular geographic feature



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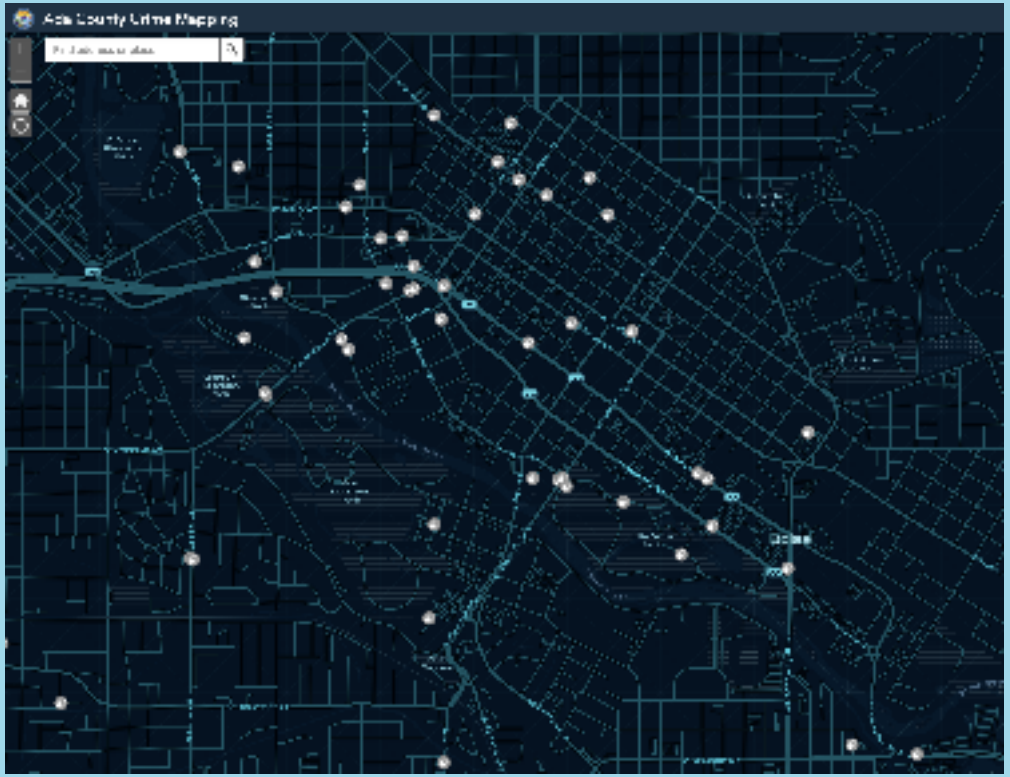
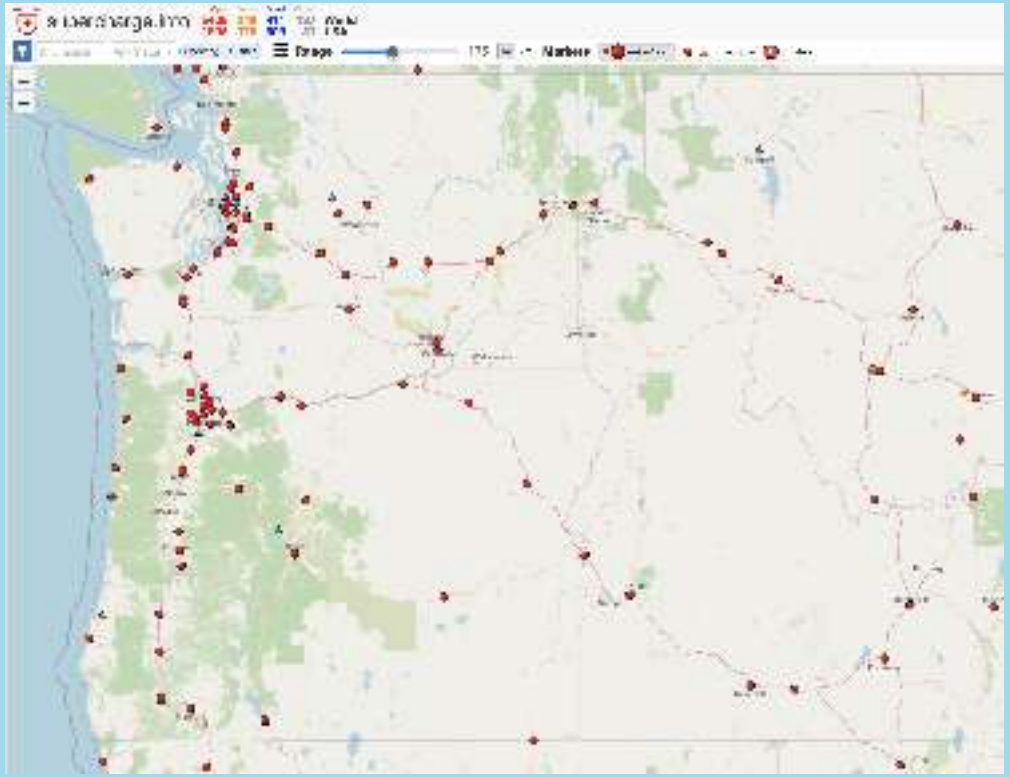
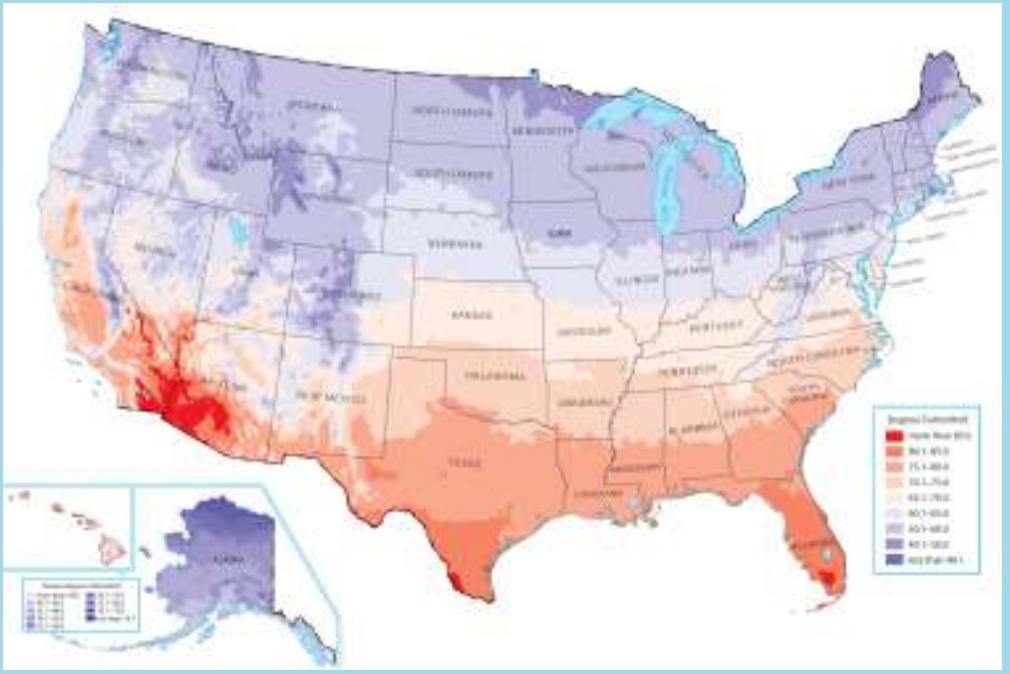




Place

What is a location *like*?



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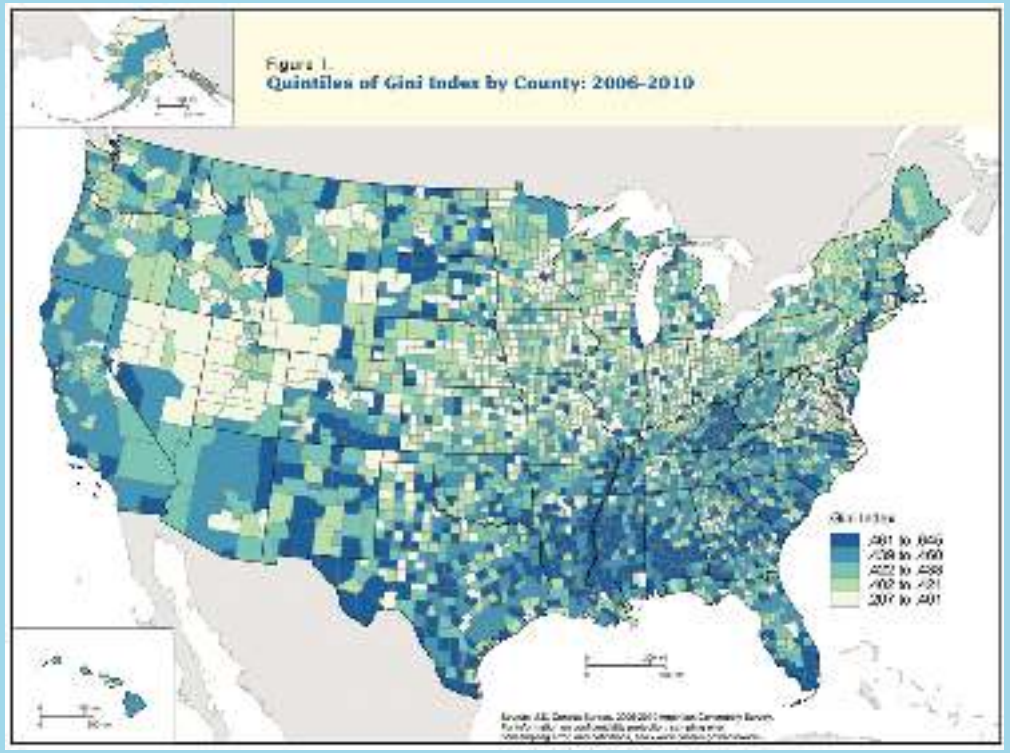
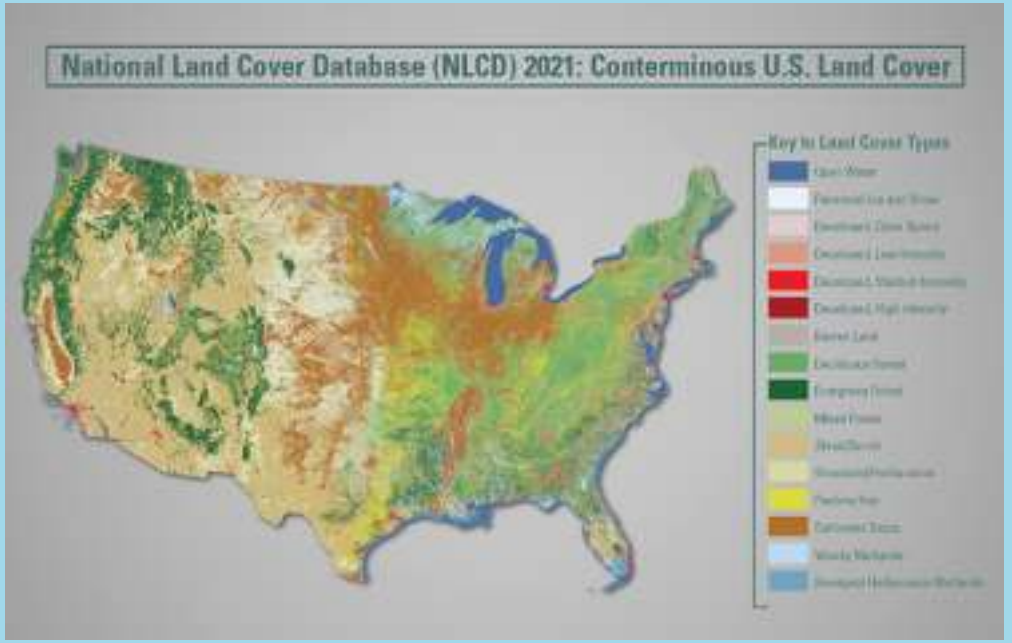


Region

How are different areas similar or different?

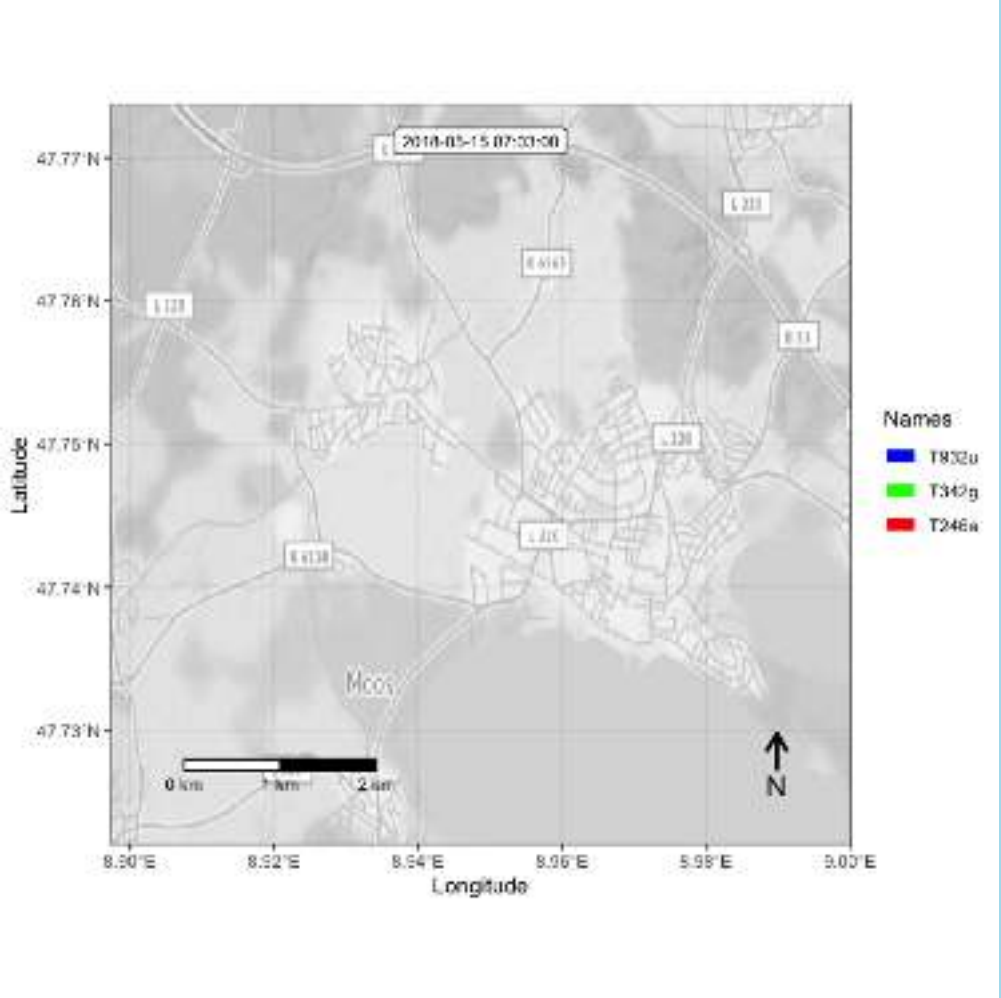


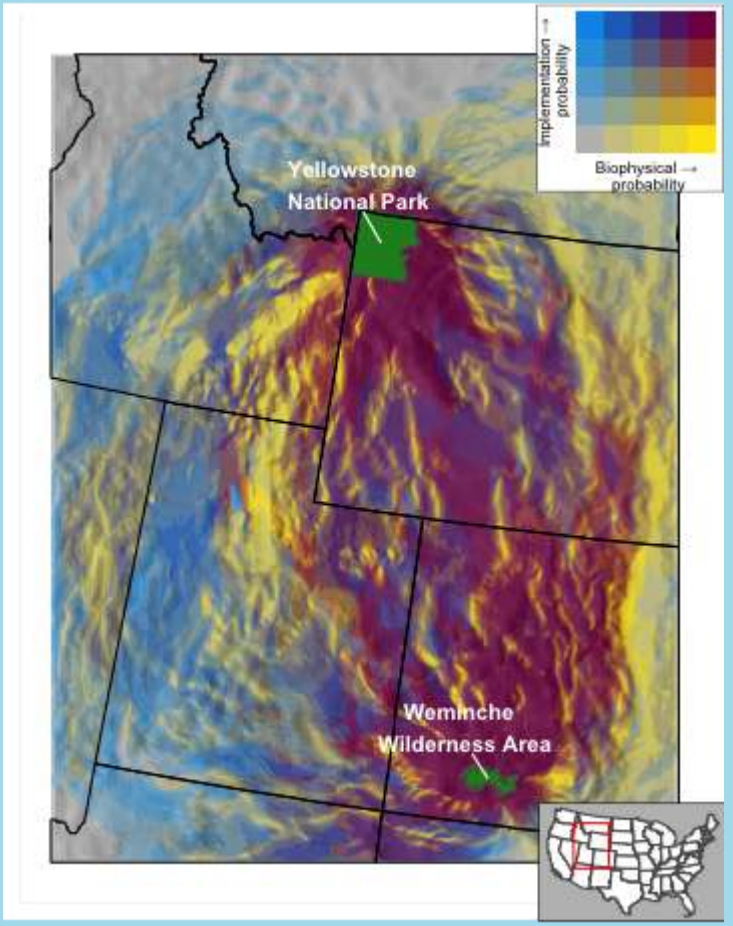
Region

How are different areas similar or different?

Movement

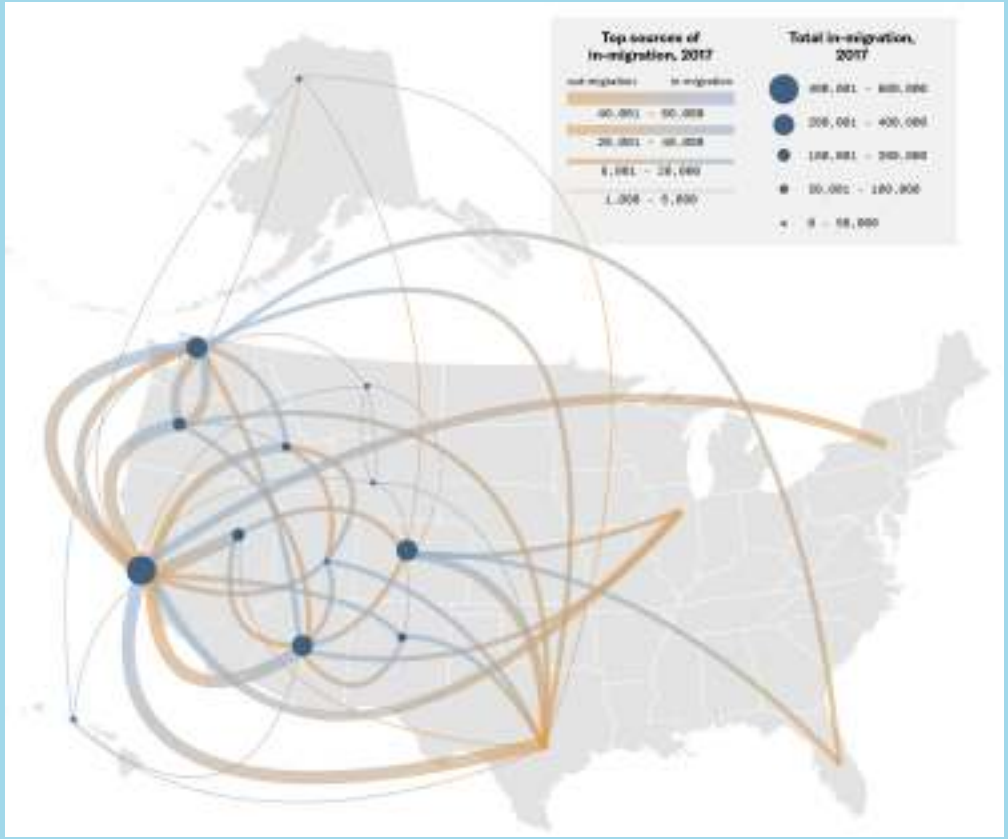
How do genes, individuals, populations, ideas, goods, etc traverse the landscape.


47.77°N
47.76°N
47.75°N
47.74°N
47.73°N
Latitude
8.90°E
8.92°E
8.94°E
8.96°E
8.98°E
9.00°E
Longitude
0 km
1 km
2 km
N
Names
T832u
T342g
T246a


Implementation → probability
Biophysical → probability
Yellowstone National Park
Wemmche Wilderness Area

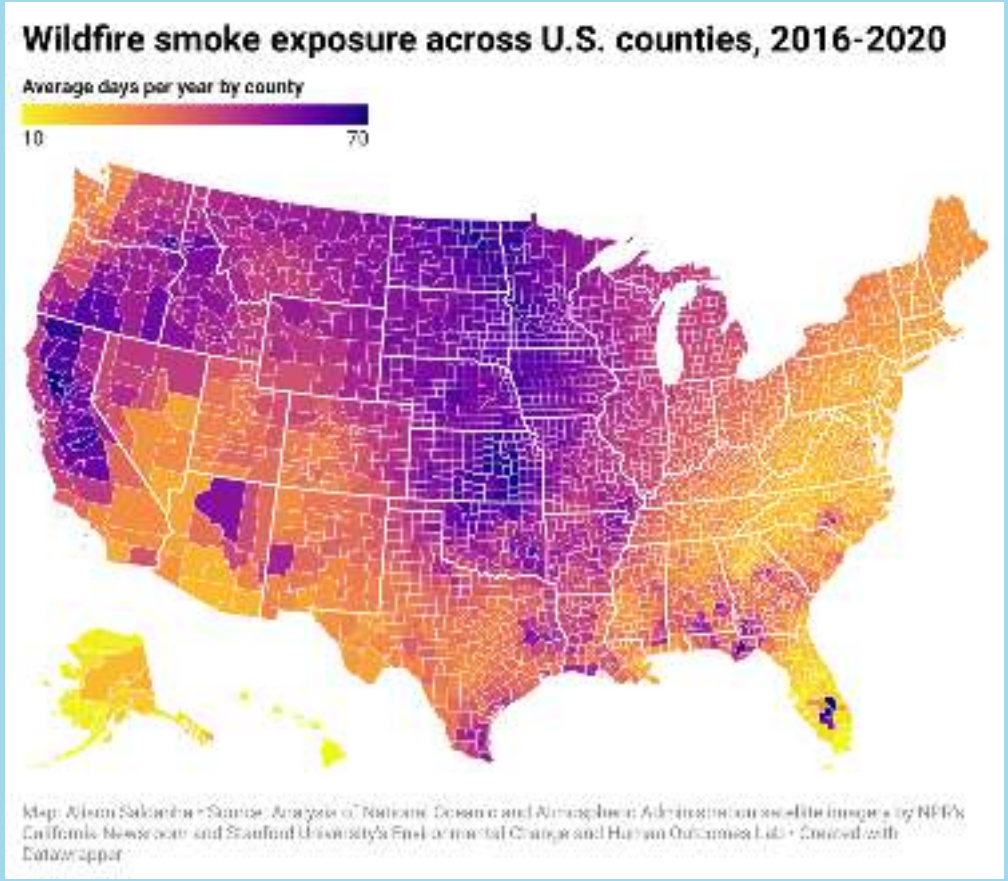
Movement

How do genes, individuals, populations, ideas, goods, etc traverse the landscape.

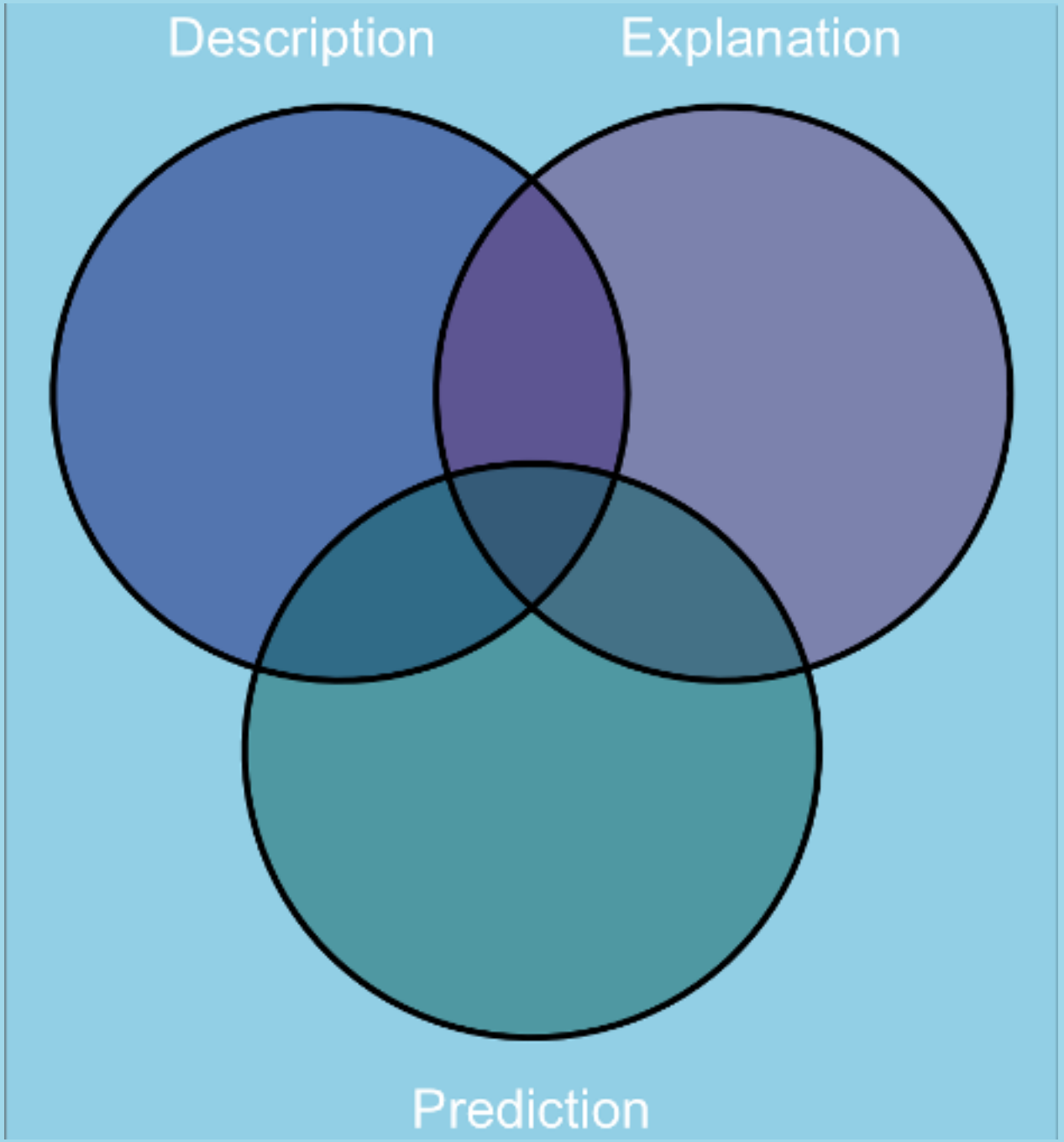


Human-Environment Interactions

How do people relate to and change the physical world to meet their needs?



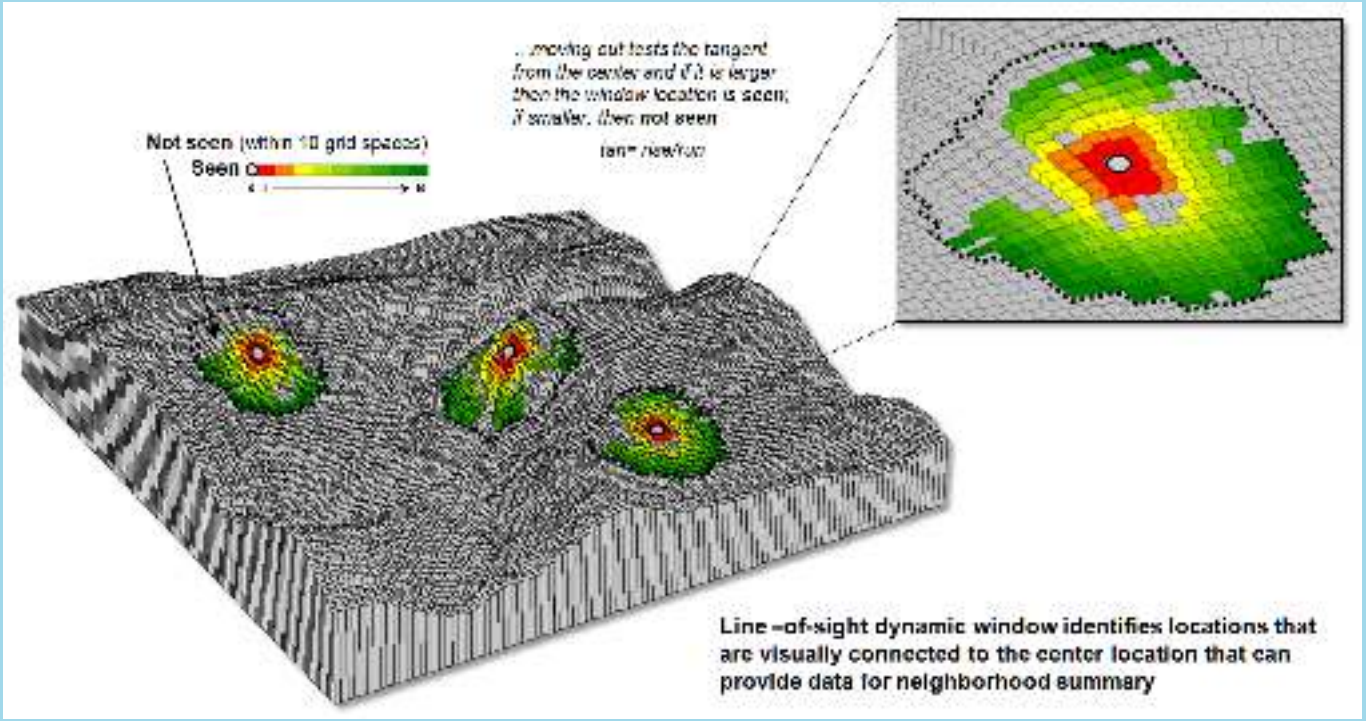
Towards *quantitative* spatial analysis


Description
Explanation
Prediction

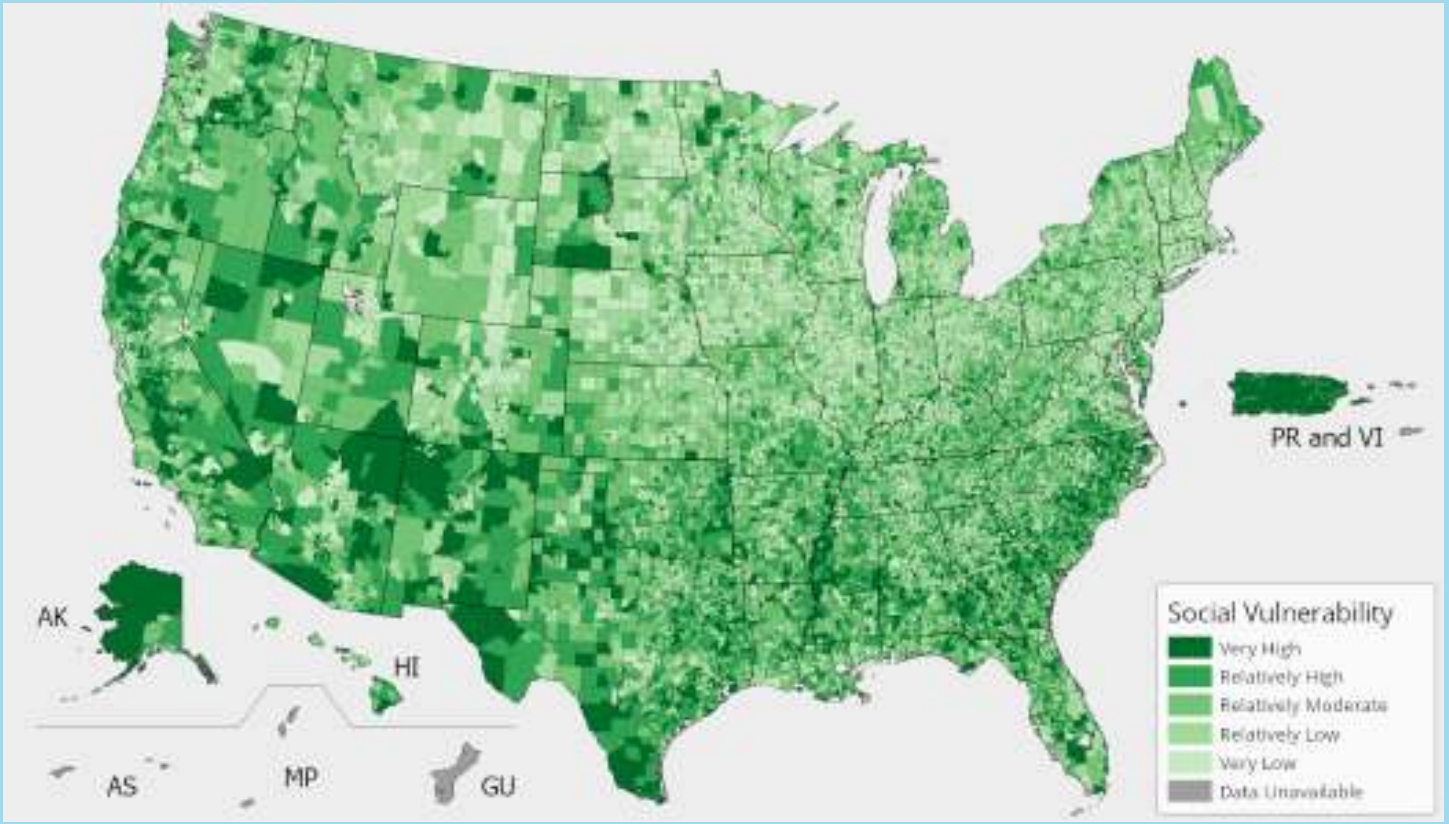
> ‘everything is usually related to all else but those which are near to each other are more related when compared to those that are further away’.
> Waldo Tobler

Description

- Coordinates
- Distances
- Neighbors
- Summary statistics



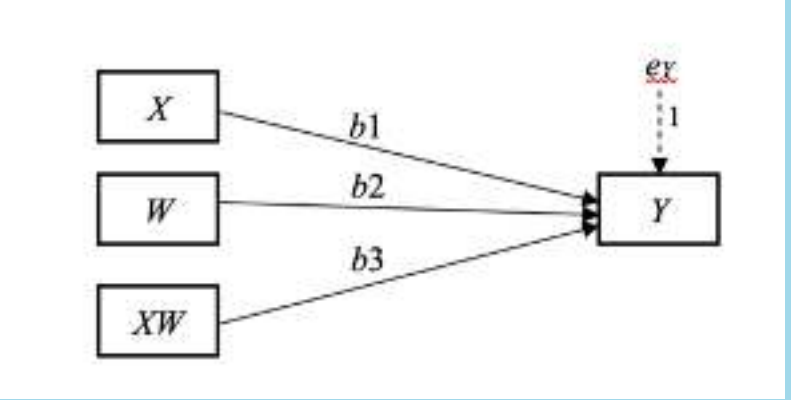
Description



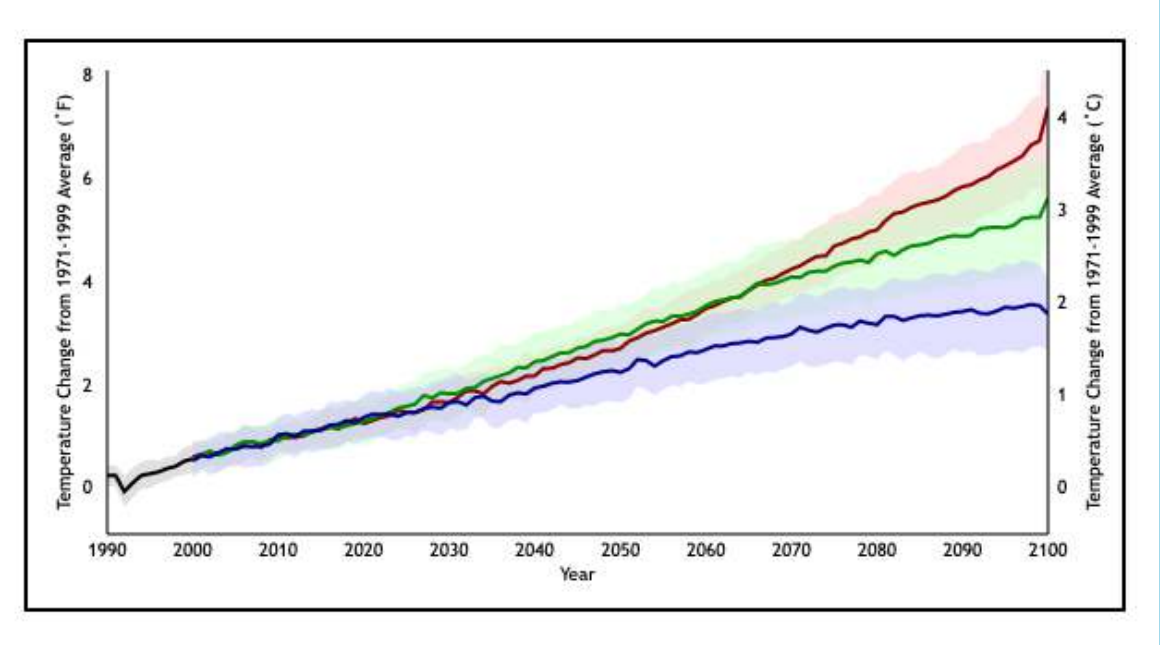
- Range Maps
- Hotspots
- Indices

Explanation and Inference

- **Cognitive Description**: collection ordering and classification of data
- **Cause and Effect**: design-based or model-based testing of the factors that give rise to geographic distributions
- **Systems Analysis**: describes the entire complex set of interactions that structure an activity



Prediction

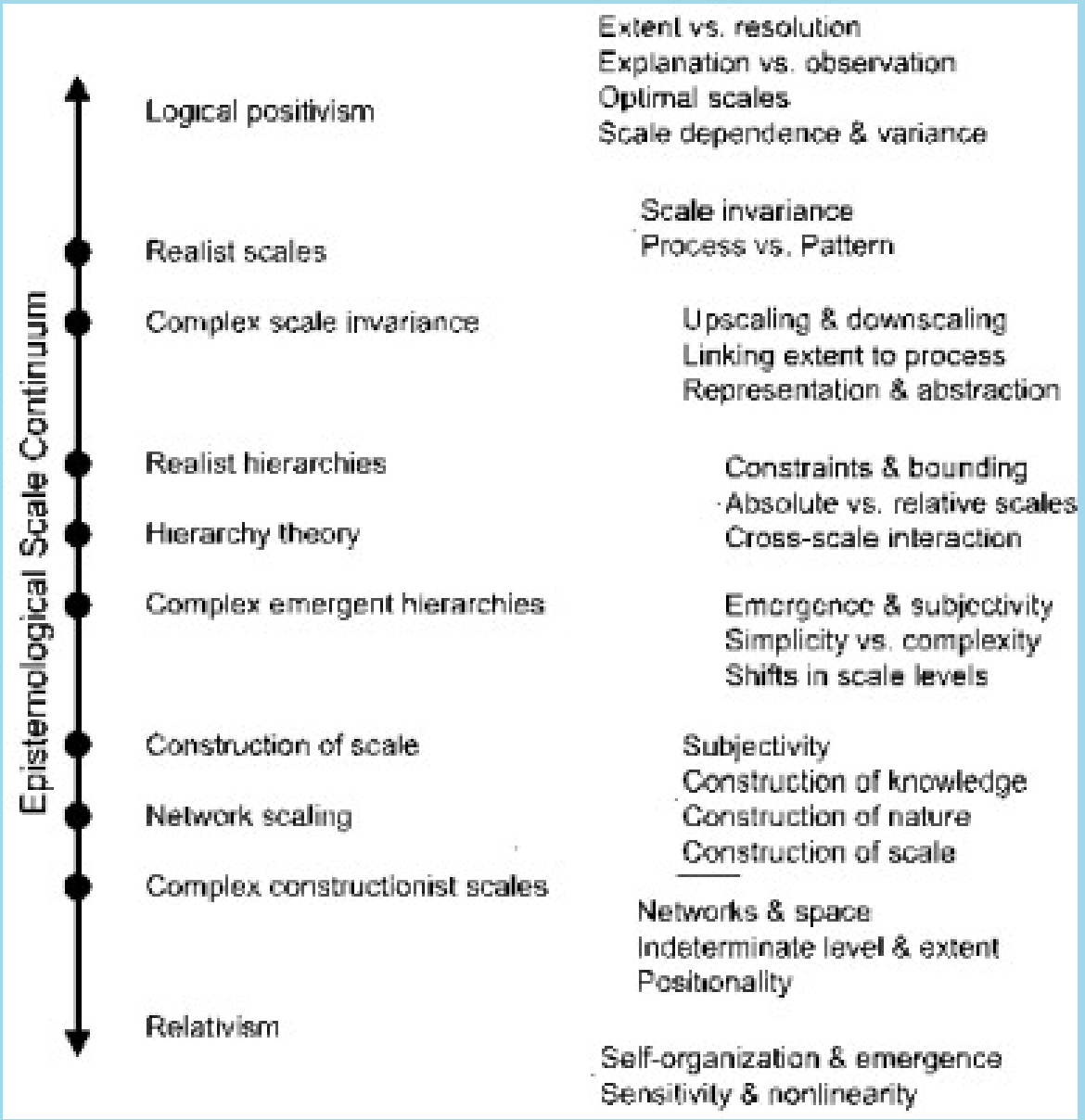


- Extend description or explanation into unmeasured space
- Stationarity: the rules governing a process do not *drift* over space-time

Conceptual challenges

Scale

What do we even mean?

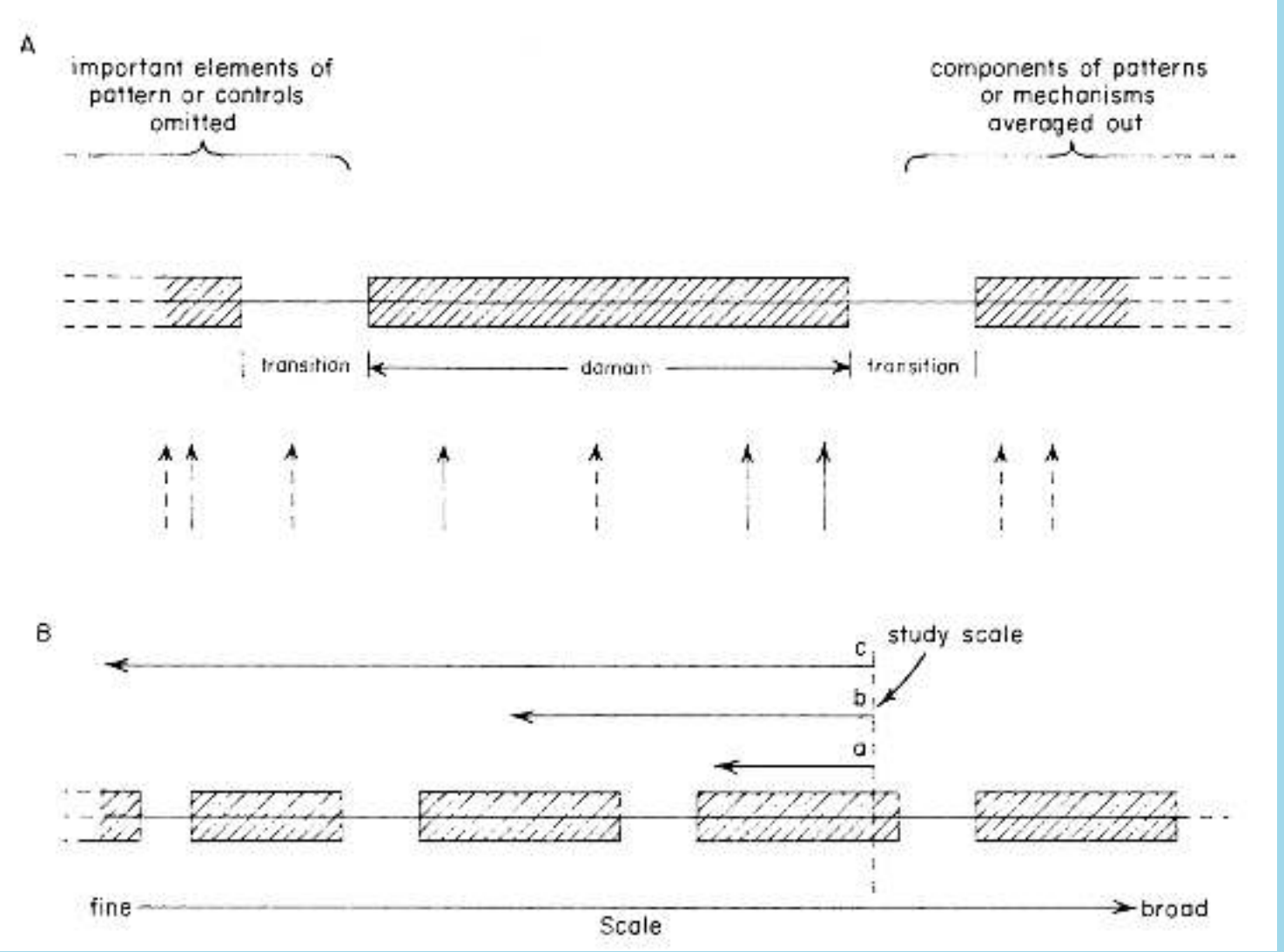


- **Grain**: the smallest unit of measurement
- **Extent**: the areal coverage of the measurement

From Manson 2008

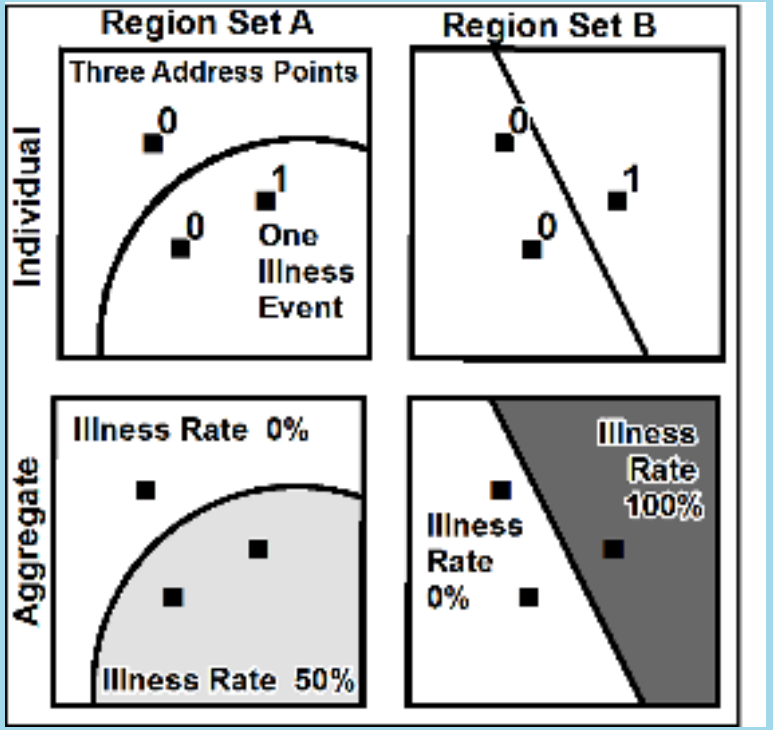
Scale

Even if it exists, how do we know we are measuring at the *right* scale?

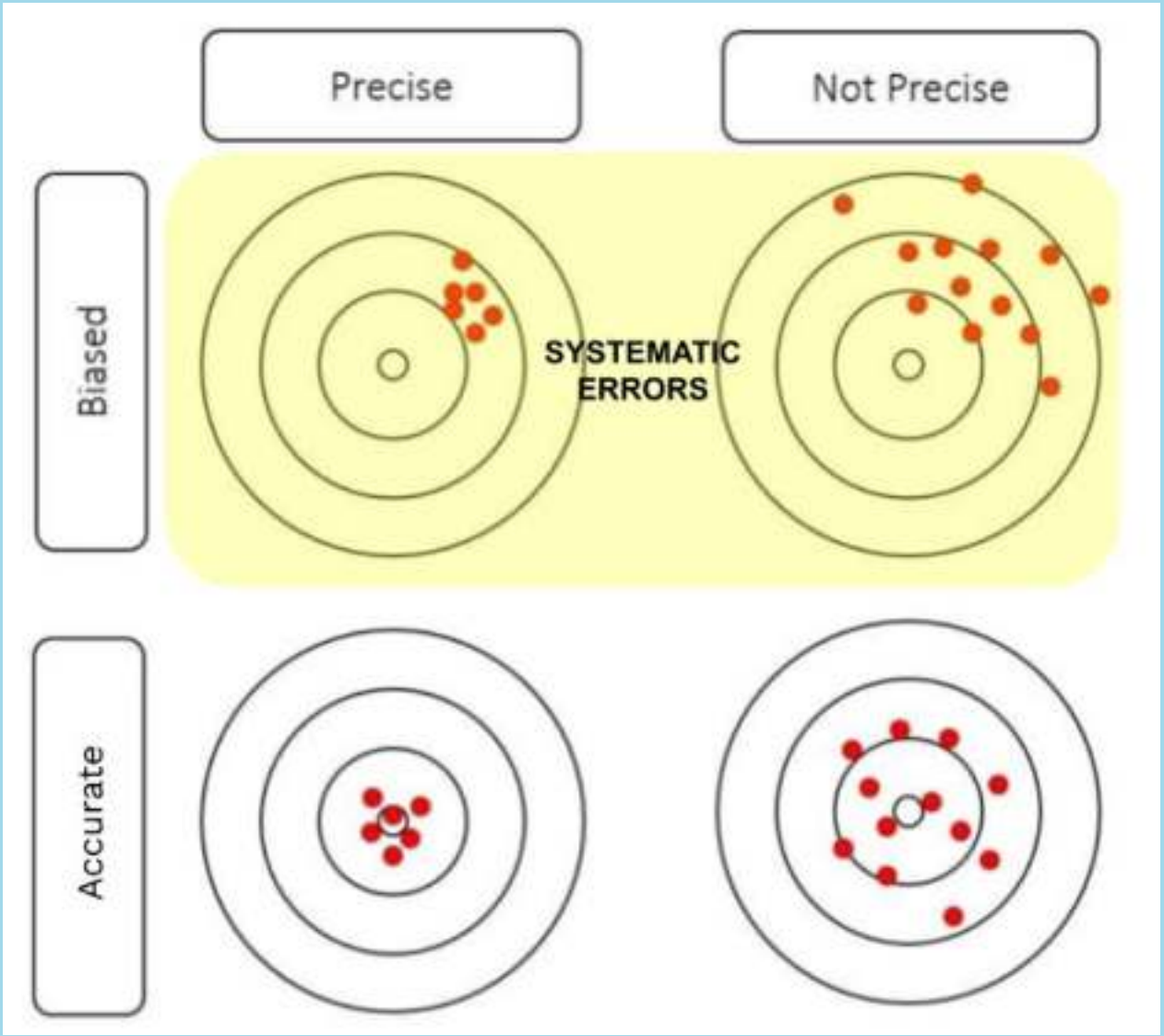


Fallacies

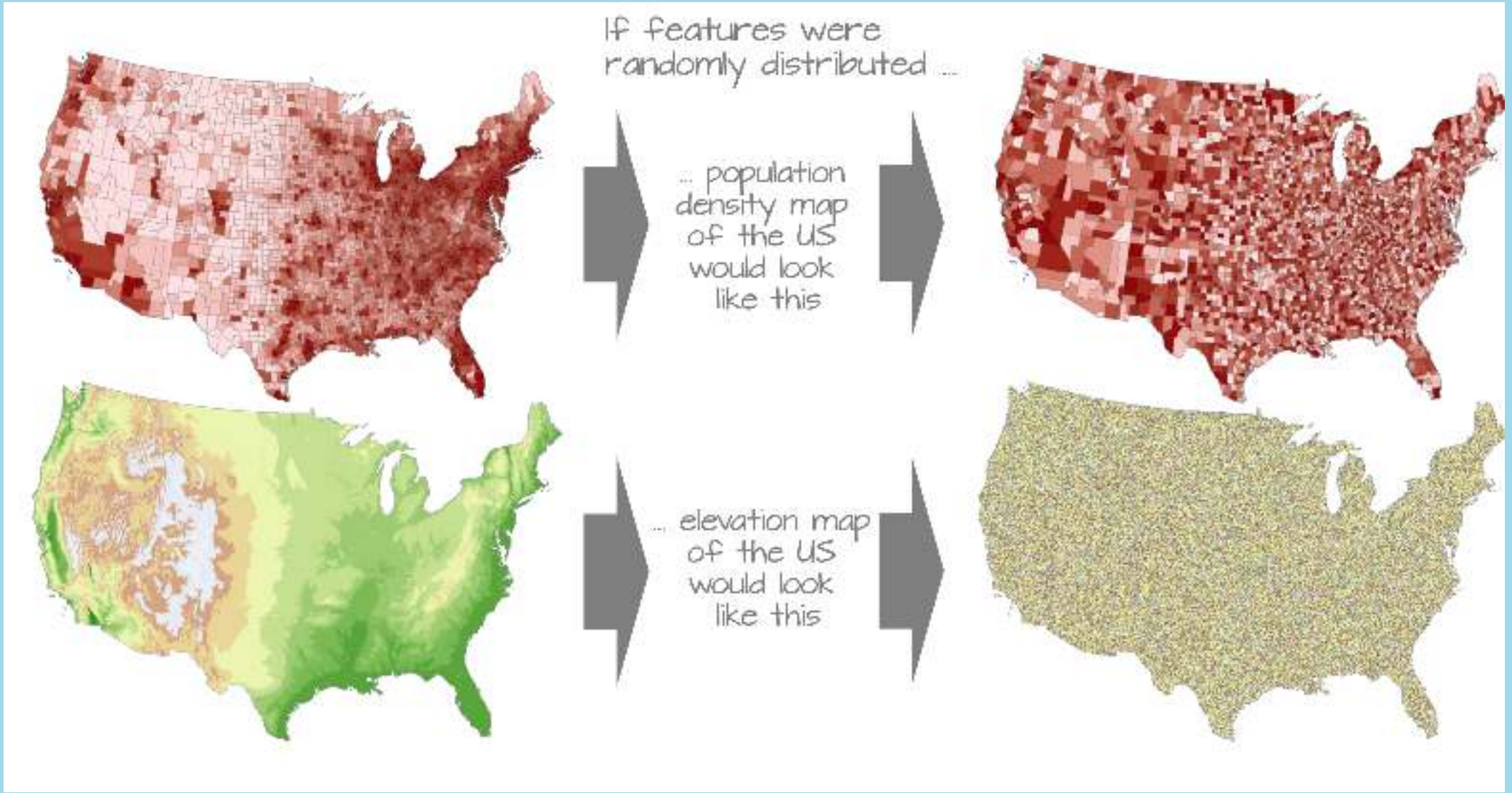
- **Locational Fallacy:** Error due to the spatial characterization chosen for elements of study
- **Atomic Fallacy:** Applying conclusions from individuals to entire spatial units
- **Ecological Fallacy:** Applying conclusions from aggregated information to individuals



Measurement Error and Mismatch



Spatial Autocorrelation

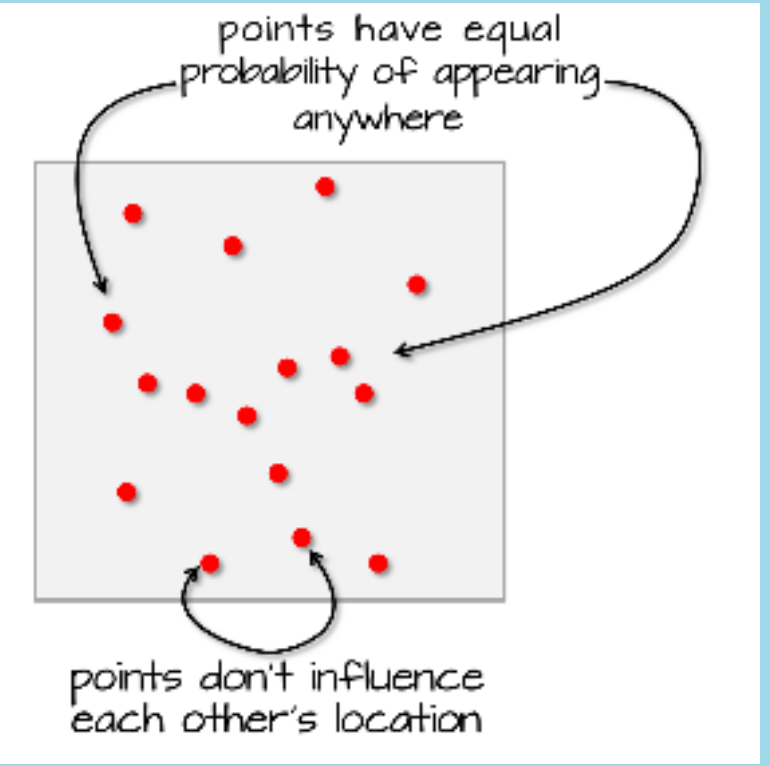


From Manuel Gimond

Stationarity

The rules governing a process do not *drift* over space-time

- **First Order** effects: any event has an equal probability of occurring in a location
- **Second Order** effects: the location of one event is independent of the other events



From Manuel Gimond

Key Critiques

Not all geography needs to be quantitative

1. Abstraction removes the interesting part
2. What “is” may require assumptions we don’t want to accept
3. Wholly dependent on the military-industrial complex

Wrapping Up

1. Themes in geography
2. Description, explanation, prediction
3. Key challenges and critiques