

Unit 01 Space needs a scope

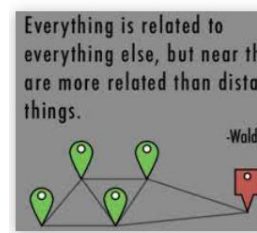
Introduction





Axiom or Thesis?

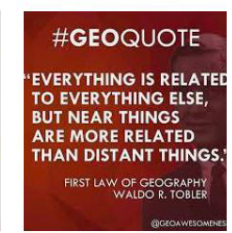
"Everything is related to everything else, but near things are more related than distant things" Waldo Tobler 1970



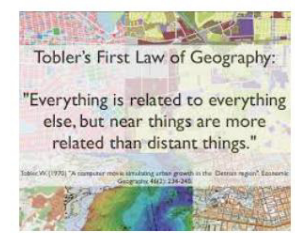
Christopher Moravec på Twitter: "W...
twitter.com



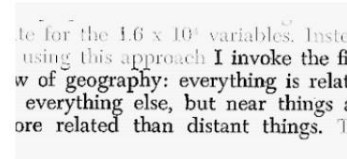
GEOG FACTS] Tobler's fir...
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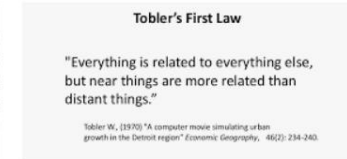
Instagram photo by Tracyel · ...
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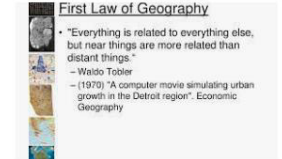
BUILD SOIL; Plant Chestnuts! on Twitte...
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the first law of geography: everything is related to...
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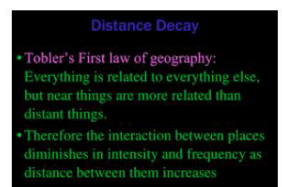
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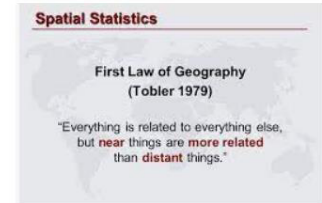
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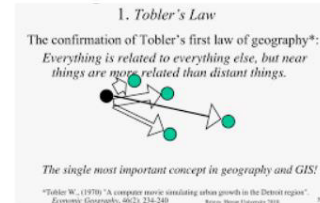
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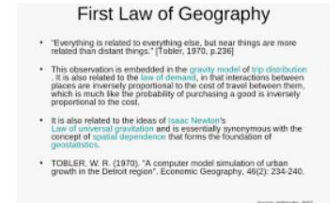
PPT - Introduction to Human Geograp...
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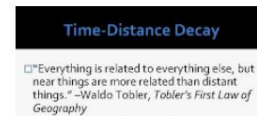
GIS and Spatial Statistics: Methods and Appl...
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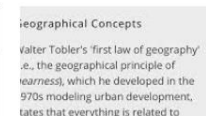
PPT - Spatial Autocorrelation: The Single Mo...
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Attractiveness & Distance - [PPT Powerpoint]
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ieographical Concepts
valter Tobler's first law of geography
e., the geographical principle of
nearness), which he developed in the
1970s modeling urban development.
tates that everything is related to



Unique features of spatial data Statistics
First Law of Geography
First law of geography [Tobler]:
- Everything is related to everything, but near
things are more related than distant things.
- People with similar backgrounds tend to live



Credits: Google search images:

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

Specific rules for specific situations

Central tasks that we will tackle in this session

- targeted and scale-dependent meanings of space (The World)
- an idea of distance and neighborhood
- an idea of influence with respect to this distance
- an idea of the digital representation of the XKCD "example map"



IF I COULD LIVE ANYWHERE, I WOULD CHOOSE THE EXAMPLE MAP FROM GEOGRAPHY BOOKS THAT EXPLAINS WHAT EVERYTHING IS CALLED.

Credits: XKCD <https://imgs.xkcd.com/comics/geography.png>

See you next time!

Unit 01 Space needs a scope

Distance, neighborhood and spatial interactions



Dr. Snow and the spatial influence

- Mapping of cases
- Mapping of pumps

Intuitively, he concluded that:

The closer a house was located to the water pump on Broad Street, **the more** cholera deaths occurred there



Credits: Snow's cholera map (https://de.wikipedia.org/wiki/John_Snow)

Modern Geoanalysis and Dr. Snow

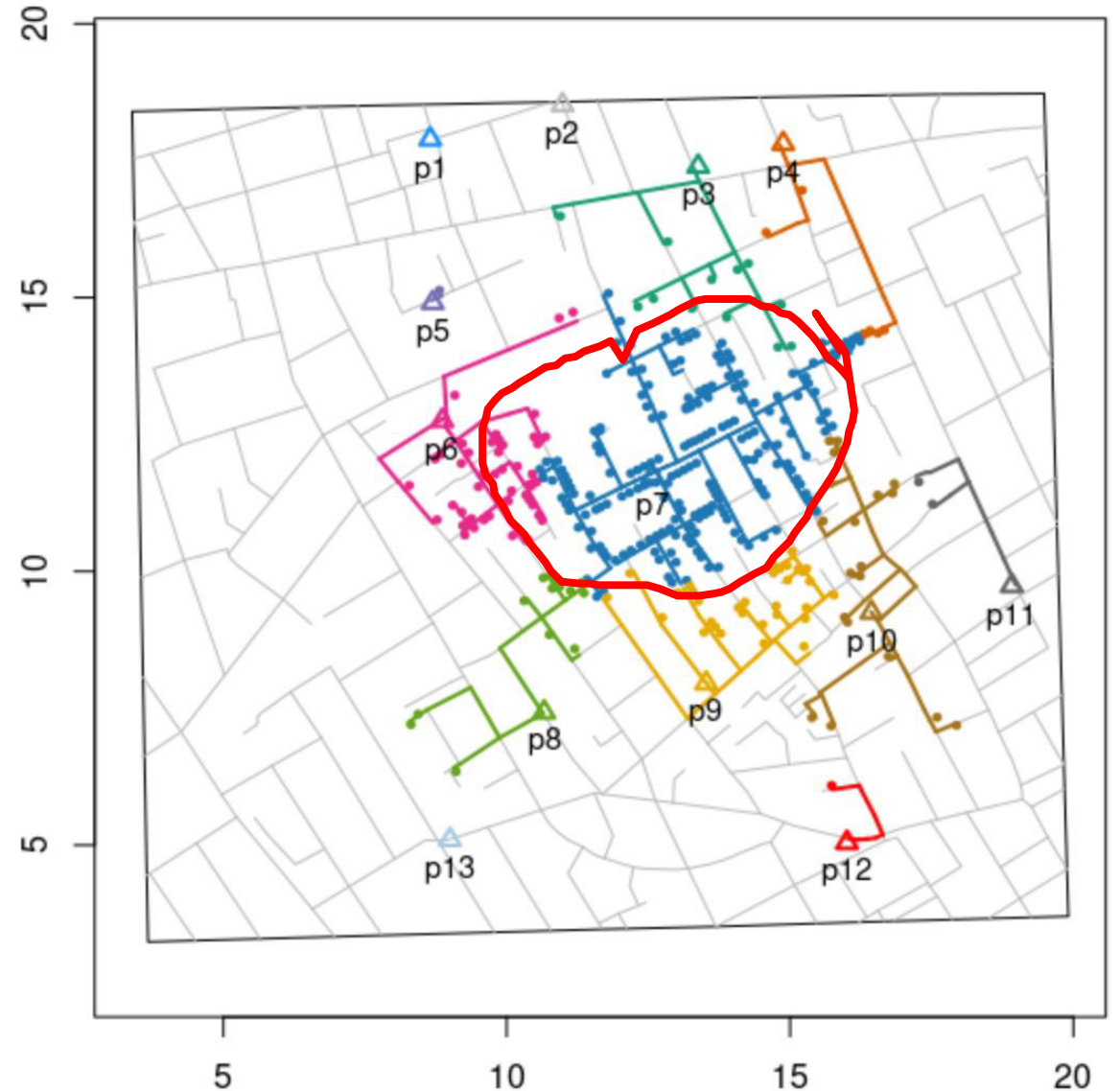
Again:

- Mapping of cases
- Mapping of pumps

Quantitatively analyzing that:

The time and walking distance (you carry a bucket of water) is strongly related to the water pump on Broad Street (p7).

Pump Neighborhoods: Walking



Credits: Peter Lindbrook <https://github.com/lindbrook/cholera>

We need knowledge about space and its effect

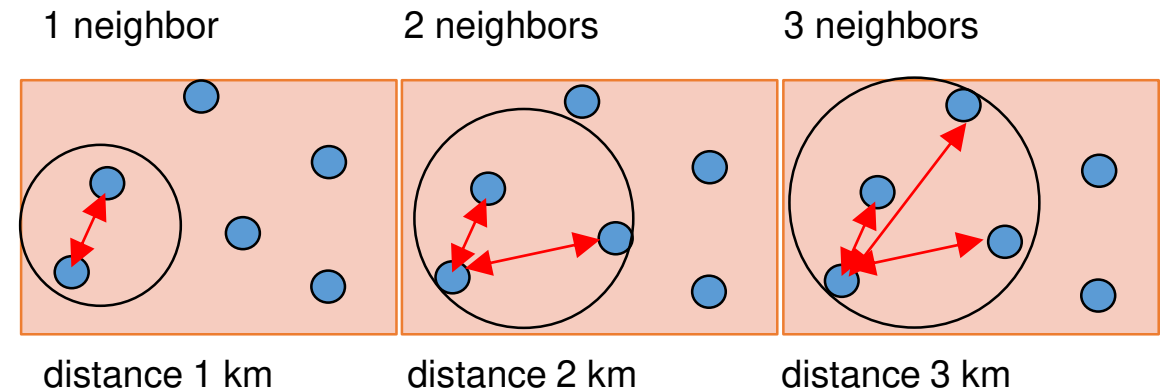
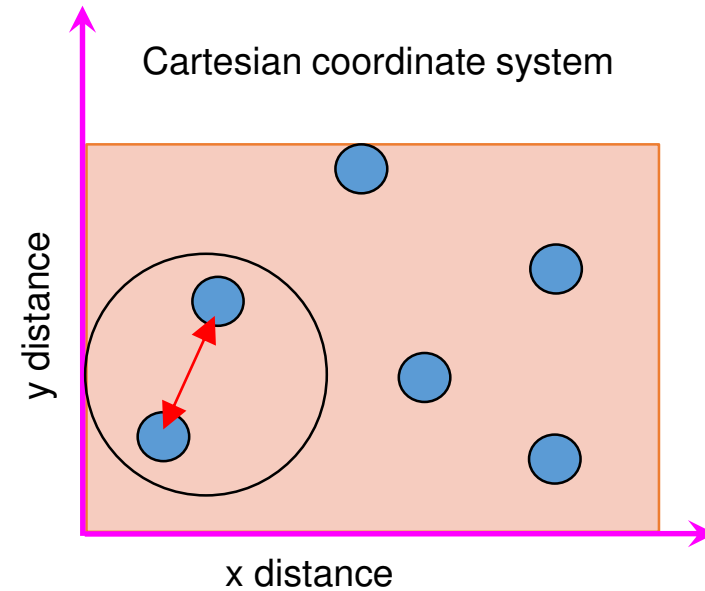
- Two points that are close together are not necessarily similar in (every) way
- Actors influence, judge and use static aspects of space differently
- Parametric models are being supplemented by self-learning methods of data analysis



Credits: <https://pixabay.com/photos/cliff-sheer-person-suicide-1031187/>

Distance and topology

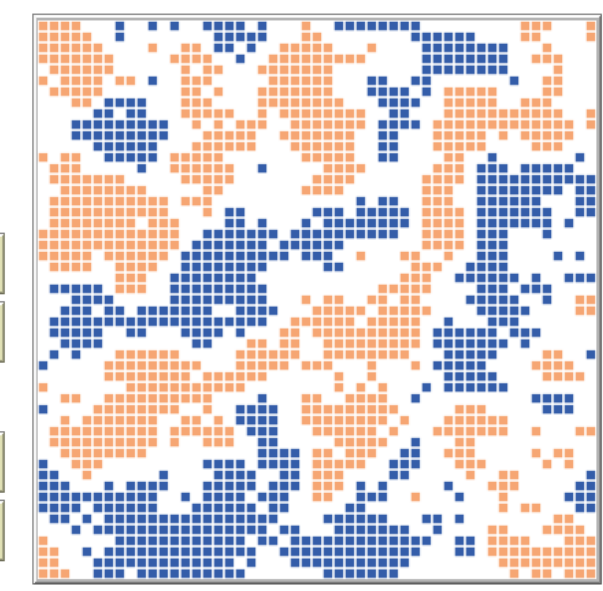
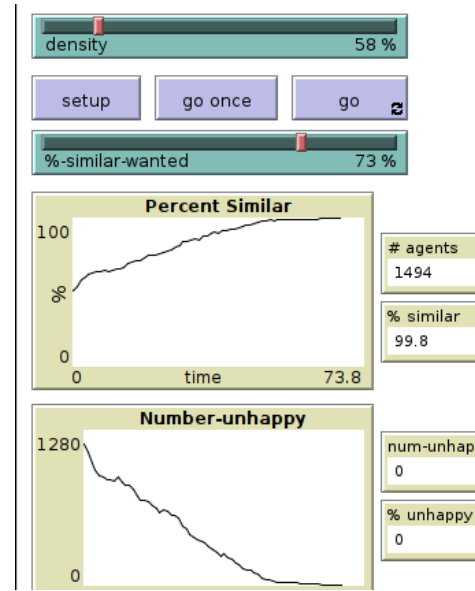
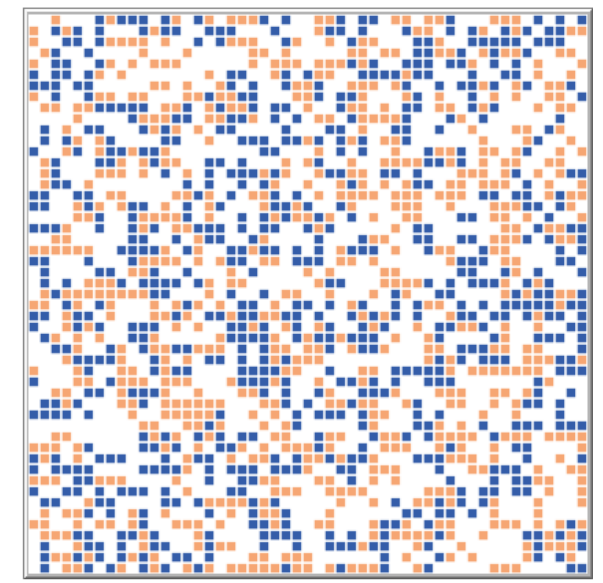
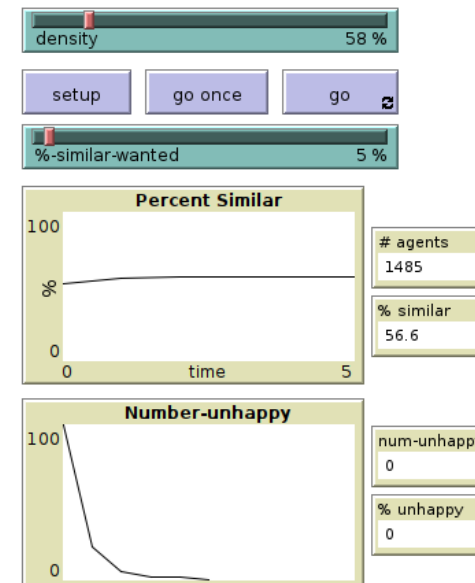
- Distances are calculated using simple Euclidean geometry
- Topology (= neighborhood) indicates the relative position of objects to each other.
- Objects have a distance to each other and a positional relationship with each other.



Credits: <https://geomoeer.github.io/geoAI>

Distance and scale effect

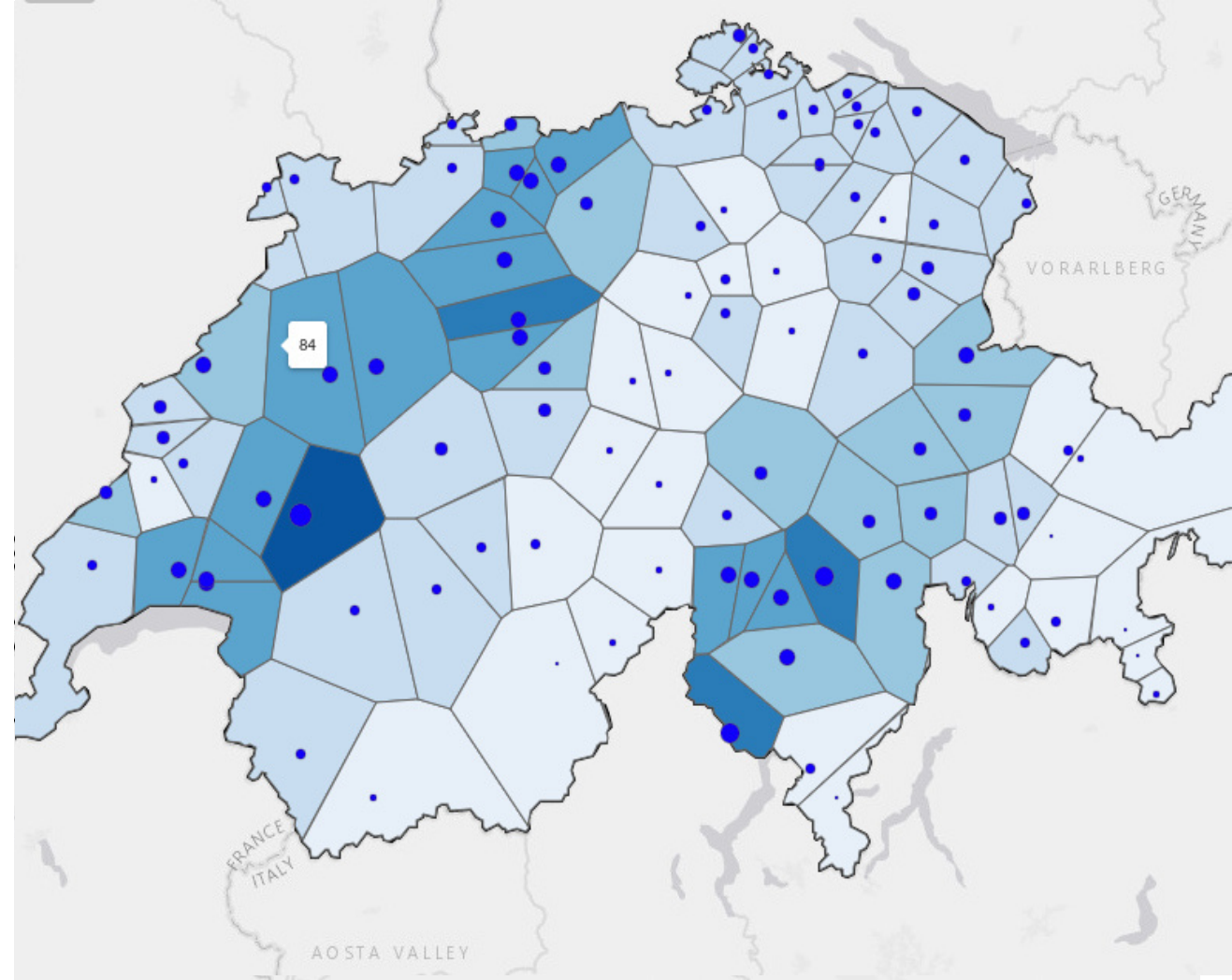
- Distance on two different scales. The local environment of each actor either causes it to remain in space or to migrate. This depends on the preference to have "same-colored" actors in the vicinity.
- Above, the preference is low and hardly any segregation takes place. Below, the preference is high and spatial patterns emerge
- But what does proximity mean?



Credits: <https://ccl.northwestern.edu/netlogo/>

Filling the Gaps - Voronoi

- Data is often irregular and patchy
- Filling the gaps means assuming that each measurement point is significant for the area that is closest to it.
- The concept is called Voronoi tessellation and is based exclusively on Euclidean equidistance.

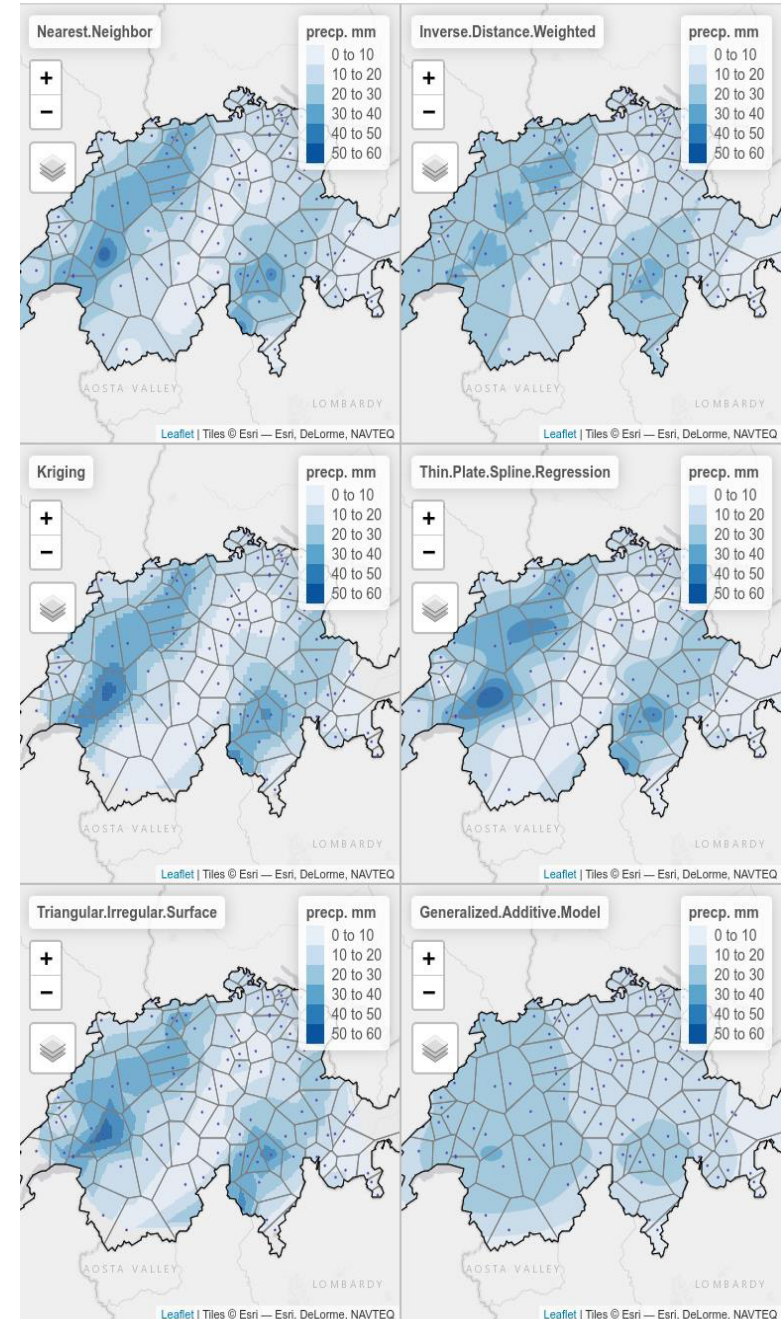


Credits: <https://geomoe.github.io/geoAI>

Filling the Gaps

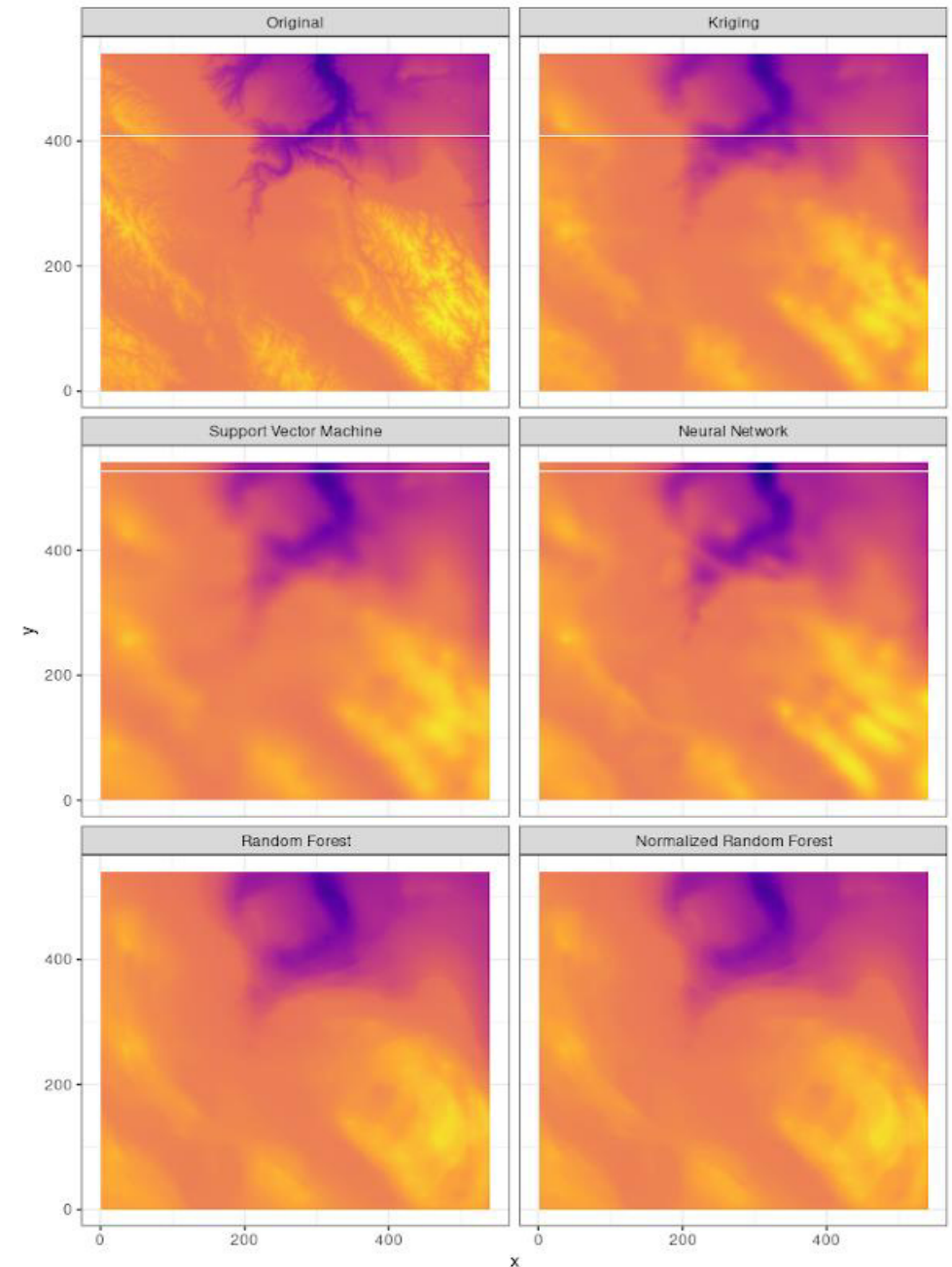
There are much more complex methods like:

- nearest neighbor, inverse distance, kriging and spline TIN and GAM models
- Methods that use spatial autocorrelation and covariate information, i.e. sophisticated regression statistics
- These methods are far more efficient and differentiated



What about Machine Learning?

- ML can also produce spatial and temporal predictions
- Spatial autocorrelation, adding geographic distances and predictors can map much more complex relationships and dependencies.
- Fewer assumptions means that we are **learning from the data**



Credits: <https://geomoeer.github.io/geoAI>

See you next time!