

# Geospatial Data Visualization

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<sup>1</sup>Bayes Business School

<sup>2</sup>Soundcloud

MSc in Business Analytics, 2022/23

# Outline

Geospatial  
Data  
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S. Santoni

The History of  
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Modules for  
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- 1 The History of Geospatial Data Visualization
- 2 Methodological Aspects
- 3 The Challenges of Geospatial Data Visualization
- 4 Python Modules for Geospatial Data Visualization

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# Dr Snow's Study of Cholera Spread in 19<sup>th</sup> Century London

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Go to the video: <https://www.youtube.com/watch?v=Pq32LB8j2K8>

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# What Are the Methodological Roots of Geo-Spatial Analyses?

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- Geographic Information Systems (GIS)
- Remote sensing
- Elevation data

# Python Modules for Geospatial Data Visualization

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# An Example of GIS

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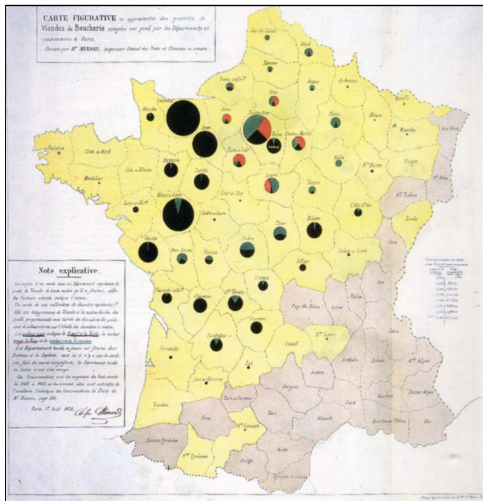
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Source: Minard (early 1900s)



# Remote Sensing

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- **Remote sensing** is the collection of information about an object without making physical contact with that object
- In the context of geospatial analysis, the object is usually the Earth
- By extracting features from images, modern remote sensing technologies have enabled GIS



# Elevation Data

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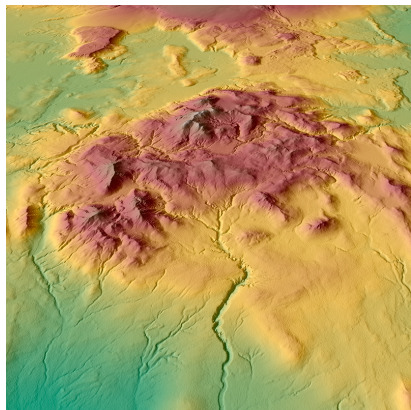
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- A Digital Elevation Model (DEM) is a three-dimensional representation of a planet's terrain (e.g., the Earth)
- Before computers, representations of elevation data were limited to topographic maps created through traditional land surveys
- Technology existed to create three-dimensional models from stereoscopic images or physical models from materials such as clay or wood



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# Geographic Vs. Screen Coordinates

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- Geographic data are stored in a coordinate system representing a grid overlaid on the Earth, which is **three-dimensional** and **round**

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- Geographic data are stored in a coordinate system representing a grid overlaid on the Earth, which is **three-dimensional** and **round**
- Screen coordinates, also known as pixel coordinates, represent a grid of pixels on a **two-dimensional** and **flat** computer screen

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- Mapping  $x$  and  $y$  world coordinates to pixel coordinates is fairly straightforward and involves a simple scaling algorithm

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- Geographic data are stored in a coordinate system representing a grid overlaid on the Earth, which is **three-dimensional** and **round**
- Screen coordinates, also known as pixel coordinates, represent a grid of pixels on a **two-dimensional** and **flat** computer screen
- Mapping  $x$  and  $y$  world coordinates to pixel coordinates is fairly straightforward and involves a simple scaling algorithm
- However, if a  $z$  coordinate exists, then a more complicated transform must be performed to map coordinates from three-dimensional space to a two-dimensional plane

# Geographic Vs. Screen Coordinates

How to build a stripped down version of a GIS

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- 1 Data model setup
- 2 Fix map size
- 3 Scaling the map
- 4 Sample GIS function
- 5 Render the map



# How to Build a Stripped Down Version of a GIS

## Step 1: data model setup

Let us set up the data for a sample USA state (Colorado) as a list with name, polygon points, and population



# How to Build a Stripped Down Version of a GIS

Steps 2 - 5

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Let us move to Python!

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# The Python Geospatial Viz Ecosystem is VERY Rich!

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Please refer to the Jupyter Notebook file  
`python_modules.ipynb`