# Digital Scholarship Foundations: Digital Mapping

## Week 2: Working with Spatial Data

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# Today’s Objectives

- Explore how to represent your data
- Learn how to effectively structure data for visualization
- Use OpenRefine to prepare data for visualization
- Learn how to create raster data through georeferencing
- Extract vector data from georeferenced map

# Now What: Structuring our Data

Structuring: Organizing our data and gathering additional data

Why:

- Mapping platforms needs coordinates not placenames
- Make your data flexible/transferable
- Add more meaning/layers of interpretation
- Think critically about your data

Questions to ask yourself and of your data:

- What do you want your map to display?
- What columns do you need to organize and add data?
- What data will be visible to the end user?
- Is your data consistent?
- How do you make your data mappable?

# Thinking About your Spreadsheet

Non-display Data

- filenames
- coordinates
- source
- address

Often this data is meant to be read by the software/platform you are using, not your viewer/visitor.

Display Data

- title
- subject
- description
- other interpretative data

This data will help your viewer/visitor interpret what they're seeing and help further convey your argument.

# Sample spreadsheet

| church | type | nationality | address | city | latitude | longitude | source |
|---|---|---|---|---|---|---|---|
| **Sacred Heart Parish** | Catholic | Anglo | 2540 Madison Ave | Kansas City, Missouri | 39.080632 | -94.595527 | Bing Maps |
| **Church of the Assumption** | Catholic | Anglo | 204 W 8th Avenue | Topeka, Kansas | 38.4074273 | -96.1825197 | Bing Maps |
| **Our Lady of Guadalupe** | Catholic | Mexican | 210 N Branner | Topeka, Kansas | 39.0563548 | -95.6552217 | Bing Maps |
| **Mexican Mission at St. Thomas Church** | Catholic | Anglo/Mexican | 632 S Pyle | Kansas City, Kansas | 39.086914 | -94.6271638 | Bing Maps |
| **Sacred Heart Church** | Catholic | Anglo | 102 Exchange | Emporia, Kansas | 38.3990296 | -96.1750435 | Bing Maps |
| **Our Lady of Guadalupe** | Catholic | Mexican | 5023 S 24th St | Omaha, Nebraska | 41.207603 | -95.94669 | Bing Maps |
| **Our Lady of Guadalupe** | Catholic | Mexican | 1106 12th ave | Scottsbluff, Nebraska | 41.857856 | -103.6471581 | Bing Maps |
| **Mexican Baptist** | Baptist | Mexican | 1419 10th Ave | Scottsbluff, Nebraska | 41.8610337 | -103.6494167 | Bing Maps |
| **Mexican Mission House** | Catholic | Mexican | 214 E 18th St | Scottsbluff, Nebraska | 41.864054 | -103.659186 | Bing Maps |
| **Our Lady of Guadalupe** | Catholic | Mexican | 905 W 23rd Street | Kansas City, Missouri | 39.0856722 | -94.5973635 | Google Maps |
| **Our Lady of Mt. Carmel** | Catholic | Mexican | 813 st paul ave | Kansas City, Kansas | 39.0843211 | -94.6252881 | Google Maps |
| **St. Catherine of Alexandria Church** | Catholic | Mexican | 130 Pine Street | Emporia, Kansas | 38.3960861 | -96.1957963 | Bing Maps |
| **Our Lady of Covadonga** | Catholic | Anglo | 7100 Virginia Ave | St. Louis, Missouri | 38.553337 | -90.257598 | Bing Maps |
| **St. John the Divine/Mission of Our Lady of Mt. Carmel** | Catholic | Mexican | 2511 Metropolitan Ave | Kansas City, Kansas | 39.073011 | -94.658547 | Bing Maps |
| **Our Lady of Guadalupe (Basement of St. Mary's Church)** | Catholic | Mexican | 512 St. John's Avenue | Garden City, Kansas | 37.9690225 | -100.8845307 | Google Maps |
| **Mexican Mission** | Catholic | Mexican | 123 E Santa Fe Ave | Garden City, Kansas | 37.9631957 | -100.875741 | Google Maps |
| **Mexican Parish at Sacred Heart Church** | Catholic | Mexican | 1229 Crowell | Atchison, Kansas | 39.5481383 | -95.124271 | Bing Maps |
| **Iglesia Bautista** | Protestant | Mexican | 801 23rd St | Kansas City, Missouri | 39.0855082 | -94.6028343 | Google Maps |
| **Mexican Christian** | Christian | Mexican | 1204 W 23rd St | Kansas City, Missouri | 39.0860944 | -94.5985311 | Bing Maps |
| **Mexican Baptist** | Baptist | Mexican | 2128 Madison Ave | Kansas City, Missouri | 39.0866013 | -94.5949089 | Bing Maps |

# Cleaning

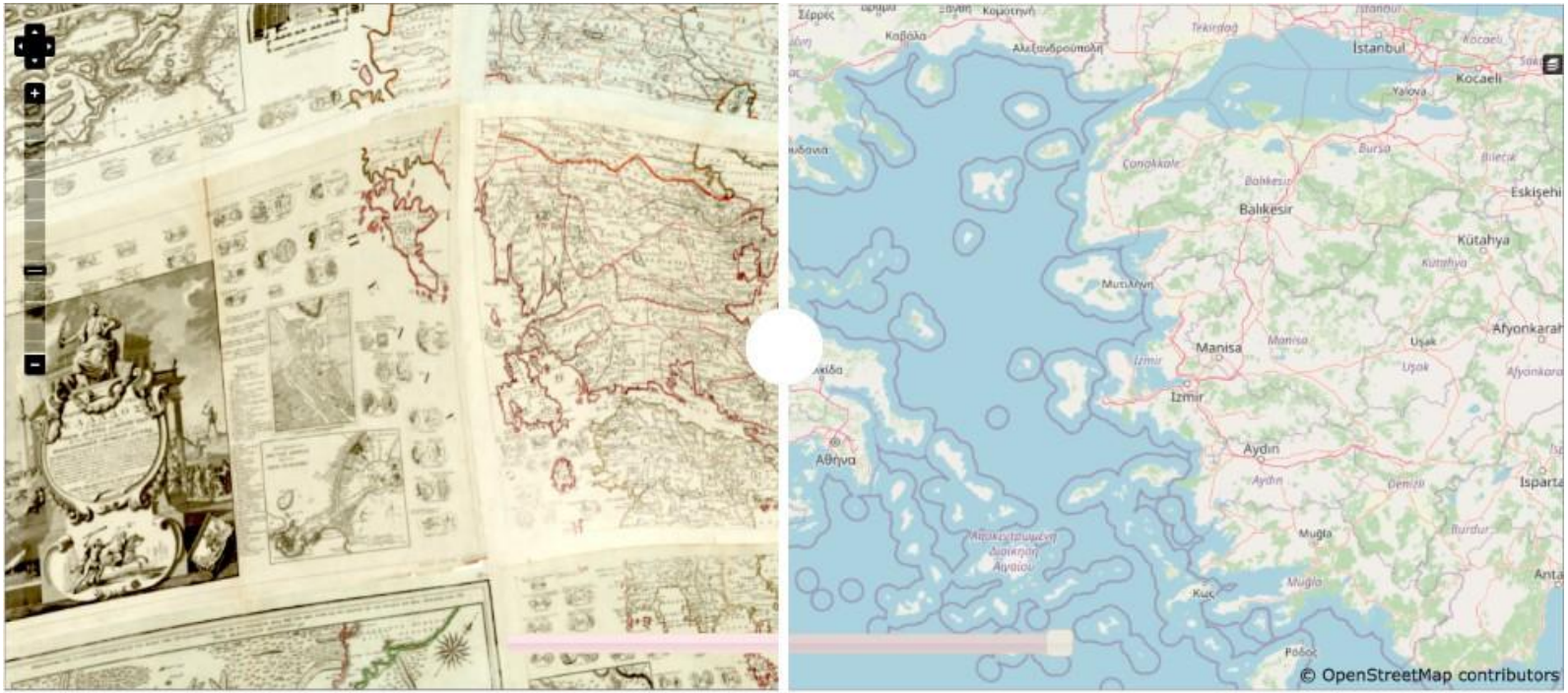
Standardizing your data is essential to proper representation, analysis, and interpretation.

Common inconsistencies:

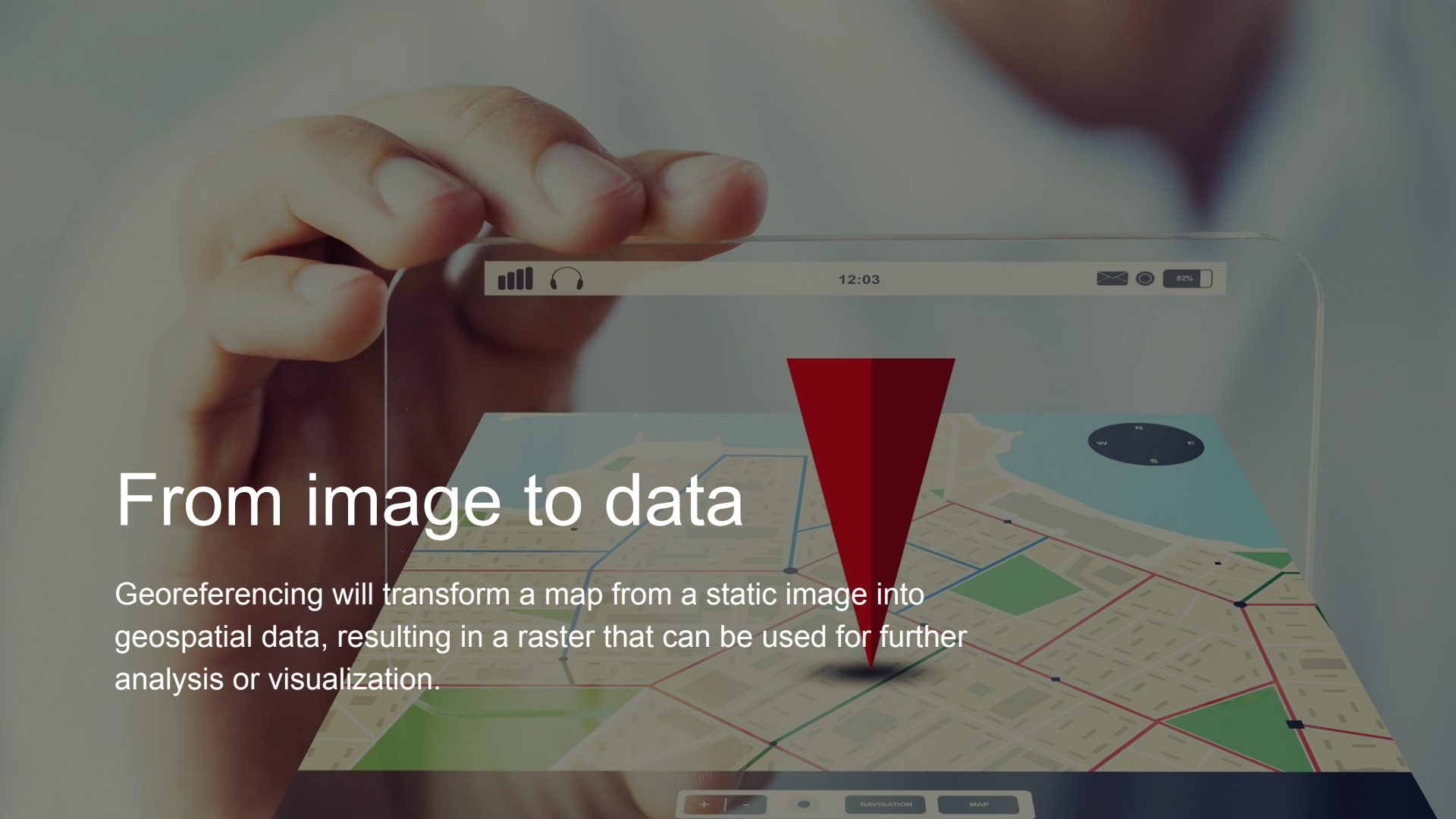
- Misspelling
- White space
- Multiple spellings
- Capitalization
- Blank cells
- Formatting

# Let’s explore with OpenRefine!

# Georeferencing




Source: MapWarper




# From image to data

Georeferencing will transform a map from a static image into geospatial data, resulting in a raster that can be used for further analysis or visualization.

# Why georeference historical maps?

## Create basemaps

Georeferencing allows the creation of basemaps—background map layers over which other thematic layers of data can be overlaid. This enables us to visualize how an area looked in the past or compare changes over time.

## Extract historical vector data

Once a map is georeferenced, it can serve as a source for digitizing historical features into vector formats, enabling further spatial analysis and interpretation.

# Historical maps

Why are they challenging?

- **Textual** and **visual** elements
- Spatial and cultural representations
- Narratives of **power**, **identity** and **change**
- **Artifacts** with complex biographies of use and reuse
- Diverse in **form**, level of **detail** and **content**
- Full of **interpretative challenges**

*Hereford Mappa Mundi, Wikimedia commons*

# Core concepts

**Georeferencing**

Assign real-world coordinates to a scanned map or raster image.

**Georectification**

Geometrically adjust to correct distortions and align with a spatial reference system.

**Ground Control Points**

Identifiable locations used to align the source image with real-world geographic coordinates. They are used as “anchor” points.

**Transformations**

Transformation algorithms mathematically adjust the image (by shifting, scaling, rotating, and warping it) so that its GCPs match their corresponding points on a modern map.

# Is your map geo-referenceable?

### Check if already done

Determine if the map is already georeferenced or georectified (e.g., in Allmaps Explore, MapWarper, OldMapsOnline) and whether it can be exported in the desired format.

### Review metadata

Assess whether the map's creation date, creator, or stated purpose points to geographic precision.

### Assess image quality

Check for damage that could obstruct analysis. Verify scale, resolution and legibility for Ground Control Point placement.

### Assess map type

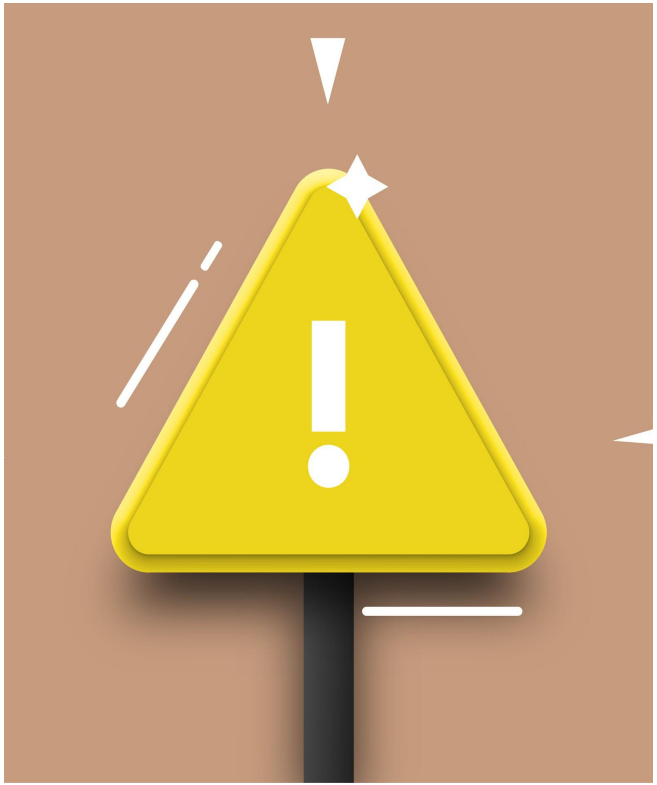
Determine whether the map is schematic (e.g., symbolic) vs. cartographically precise. Look for distortions caused by historical projection methods or artistic license.

### Check for Ground Control Points

Identify recognizable landmarks (e.g., coastlines, rivers, towns) that match modern or historical basemaps.

# Will it be perfect?

As historical maps are probably not based on the projection systems used in modern cartography, the process of georeferencing and georectifying them is unlikely to produce a perfectly smooth or seamless result.



# Web georeferencing workflow

# Geocoding

# Getting Coordinates

Latitude and longitude are important additions to your metadata.

**Geocoding**: a computational process of transforming a description of a location, such as an address or place name, into geographic coordinates

**Coordinate format**: You will want your coordinates in decimals rather than degrees. Below are examples for Firestone Library:

Decimals: 40.34972638362372, -74.6574238318438

Degrees: 40° 20' 59.013", -74° 39' 26.7264"

# Preparing Descriptive Location Information

Are you mapping a city? A state? A building? A river? A park? A historic neighborhood?

Add columns to your spreadsheet that may help with efficient coordinate extraction.

Include state and country if possible.

Be consistent.

# Geocoding Tools

Where do you find coordinates?

How can you do it efficiently?

Google Maps

Wikidata

GPS Visualizer

Geocodio

APIs

# Geocoding Tools: Challenges

Geocoding tools often require addresses.

Some tools are limited by country.

Historical data often lacks addresses or does not conform to current street organization.