## Example of a Local Application: QGIS

Summer School on Digital Humanities Course material available at https://github.com/AugustoCiuffoletti/DHSS\_2025

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#### Example of a Local Application: QGIS

The user installs a GIS application on the PC



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- In this scenario, the Web is a tool for exchanging data
  - but it is not directly involved
- Quantum GIS (QGIS) is an open-source GIS application
  - Developed and maintained by volunteers
  - First released in 2002
  - Here we use version 3.42.0 (Münster)
- Runs on Windows, Linux, and macOS

#### **QGIS** Operation

- Acquires and aggregates layers from various formats
  - Includes both local data and remote databases
- Enables creation of new layers
  - Populated with customized features
- Among final output options:
  - Produce a graphic file (JPG, PNG, etc.)
  - Save in QGIS format
  - Publish the map
- And much more...

### Step-by-Step QGIS Tutorial - Load a raster

#### Create a New Project

Open QGIS and select Project -> New

#### Add a Raster Background Layer

- Layer -> Data Source Manager -> XYZ Tiles
  - You can also use the Ctrl-L instead of using the menu
- Double-click on OpenStreetMap
- Use the control pad to zoom in on a specific region

#### Understanding the Raster Layer

- The map is now displayed as a raster layer
  - Composed of multiple tiles, similar to an image
  - Cannot be modified within QGIS
- Various providers offer raster layers
  - OpenStreetMap is a free, open-source provider
  - Anyone can propose updates

# Step-by-Step QGIS Tutorial - Add a Vector Layer

- Define a Vector Layer
  - Layer -> Create Layer -> New Shapefile Layer
    - Or use the New Shapefile icon in the toolbar (third icon in the second row)
  - Choose:
    - A filename to save the layer (e.g., Demo)
    - The feature type: Point, Multipoint, Line, Polygon
      - In this example, use Point
    - A coordinate system (EPSG:4326 WGS84)
  - Add new fields for the features in the layer
    - e.g. Last visit with type Date and click Add to Fields List
    - When finished, click Ok
  - The new layer appears in the Layers Panel
    - To view the layers panel, View -> Panels and tick Layers
  - Two layers shown, Demo and OpenStreetMap
  - We can edit the Demo vector layer

### Step-by-Step QGIS Tutorial - Refine the layer definition

#### Further Configuration of a Layer

- Double-click on the Demo layer to set its properties
  - In Symbology, choose the graphic symbol and adjust its properties
  - In Fields, update feature attributes (you may want to add a name field'
  - In Labels, select Single label and choose the field for labeling the points (e.g., select the name field)

### Step-by-Step QGIS Tutorial - Working with points

Populate a Vector Layer (with Points)

- Select the Demo layer and Layer -> Toggle editing
  - Or the pencil in the second toolbar
- Then select Edit -> Add Point feature
  - or the ctrl+, shortcut
  - The mouse pointer changes to a crosshair
- Click on the map to add a new point
  - A box appears to set feature fields
- Repeat as you like
- To move a point feature,
  - menu Edit -> Edit geometry -> Move Feature
  - right click on the point to move
  - drag to the new position
  - left click to displace the selected point
- To exit edit mode, right-click on the Demo layer and select Layer -> Toggle Editing

### Step-by-Step QGIS Tutorial - Edit fields

#### **Update Feature Attributes**

- Right-click on the Demo layer and select Open Attribute Table
  - Use the bottom-right icons to adjust the view style
- Press ctrl+E to enable table editing (or click the Pencil icon)
- Modify attribute values as needed
- Press ctrl+s to save

#### Add an Attribute ("desc") to the Features

- Right-click on the Demo layer and select Open Attribute Table
  - Enable editing
  - Press ctrl+w to add a new field (or find the "New Field" button in the toolbar)
  - Set the name and type (e.g., "desc" of type Text)
  - Click OK

### Step-by-Step QGIS Tutorial - Process fields

#### Compute Fields with Point Coordinates

- Select a layer and click the Open Attribute Table button in the toolbar
- Click ctrl+i or the abacus icon in the attribute table window
- De-select Only update 1 selected feature
- Input a name for the new field (e.g., Lat)
- Choose a type for the field (e.g., Decimal Number)
- Enter the formula y(\$geometry) in the Expression box
  - Find help in the list near the Expression box in the "Geometry" drop-down list
  - Ignore the warning about not adding the field to the provider
- Create another field for longitude (e.g., Long) using x(\$geometry)

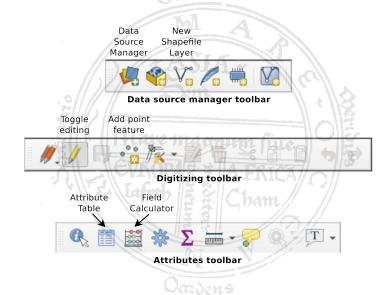


### Step-by-Step QGIS Tutorial - 7

#### Save Your Work

- Save the project in QGIS native format (Ctrl+S or Project -> Save)
- Export as an image (Project -> Import/Export -> Export Map to Image)
- Export in a portable vector format (Project -> Export DXF)

### GUI Toolbar Icons (Quick Reference)



### Lab Activity

- (Basic) North of La Spezia, there is a region called "Cinque Terre". The name comes from five fishing villages: Corniglia, Manarola, Vernazza, Monterosso, and Riomaggiore. Set a Point for each village and display a label with its name on the map.
- (Intermediate) Draw a sea route visiting all the villages, starting from Levanto (another small town to the north).
  For this create a new LineString vector, enable editing and mark waypoints with the left button. Right button to close the line.
- (Intermediate) Convert the line to a new layer of vertices using Vector -> Geometry Tools -> Extract Vertices
- (Advanced) Compute the longitude and latitude of these points, and label each one with a string "(long, lat)" using the concat function in the calculator.