

# Example of a Local Application: QGIS

Summer School on Digital Humanities

Course material available at

[https://github.com/AugustoCiuffoletti/DHSS\\_2025](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



User

- 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  $x(\$geometry)$

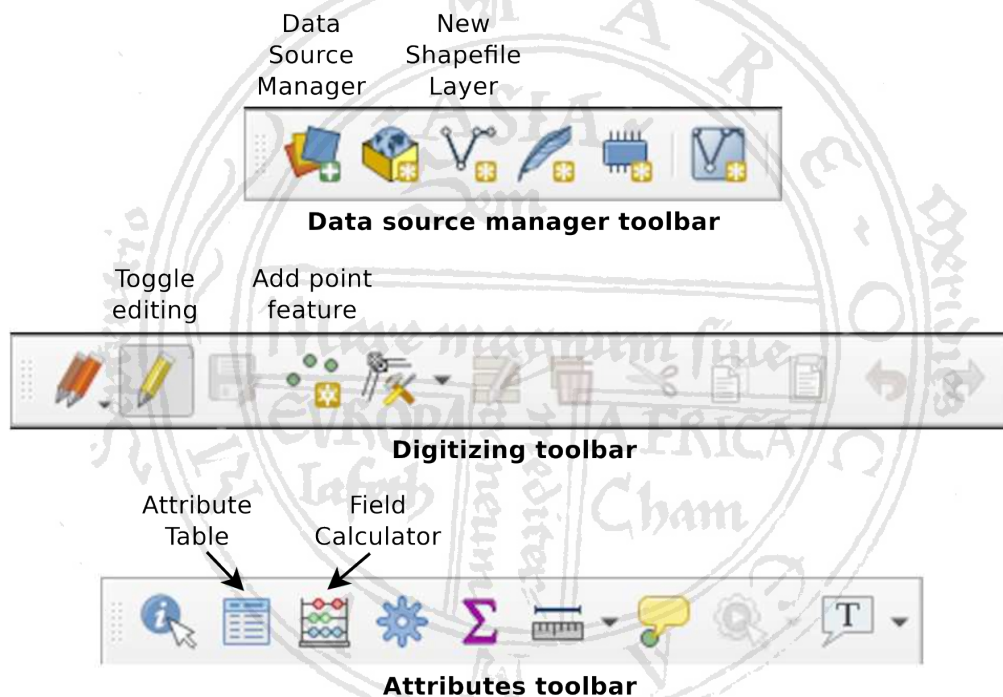
## Step-by-Step QGIS Tutorial - 7

### 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.