

QGIS: a local application

Summer School on Digital Humanities

Web site: <https://bit.ly/dt4h-gis>

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QGIS: a local application

- 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 3.34 (Prizren)
- 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** on the *QGIS Cloud* (plugin needed)

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

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 new *last visit* field
 - for this enable editing with the pencil and add (or delete) a 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

For each point compute a new field with distance from Rome in degrees

- 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
- Input a name for the new field (e.g., *Lat*)
- Choose a type for the field (e.g., *Decimal Number*)
- Enter the following formula in the *Expression* box

```
distance(@geometry, make_point(12.5, 41.9))
```

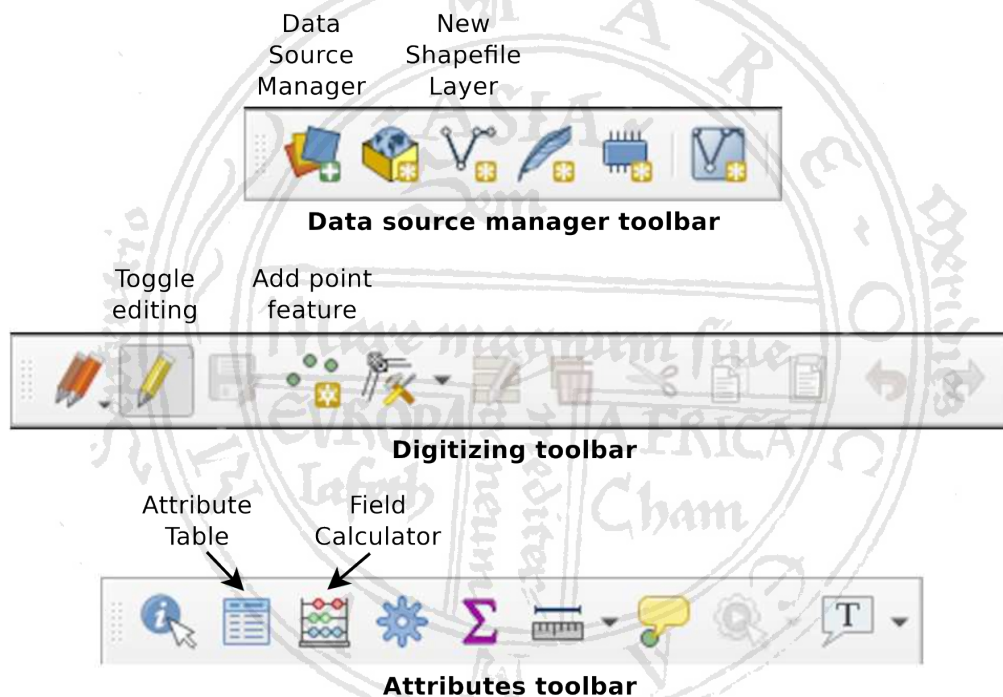
- The `distance` function takes two points
 - `@geometry` is the one corresponding to the row in the table
 - `make_point(12.5, 41.9)` corresponds to Rome (long,lat)
- Note: to see meters conversion is needed, from EPSG:4326 to EPSG:3857, using the `transform` function

Step-by-Step QGIS Tutorial - Save or export

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, select Add Linear Element and mark waypoints with the left button. Right button to close the LineString.
- (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.