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)

Hands-on QGIS - 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

Hands-on QGIS - 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*, *LineString*, *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

Hands-on QGIS - 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)

Hands-on QGIS - 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
  - left click to pick the point you want to move
  - another left click to release it on 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

Hands-on QGIS - 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

Hands-on QGIS - 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))
```

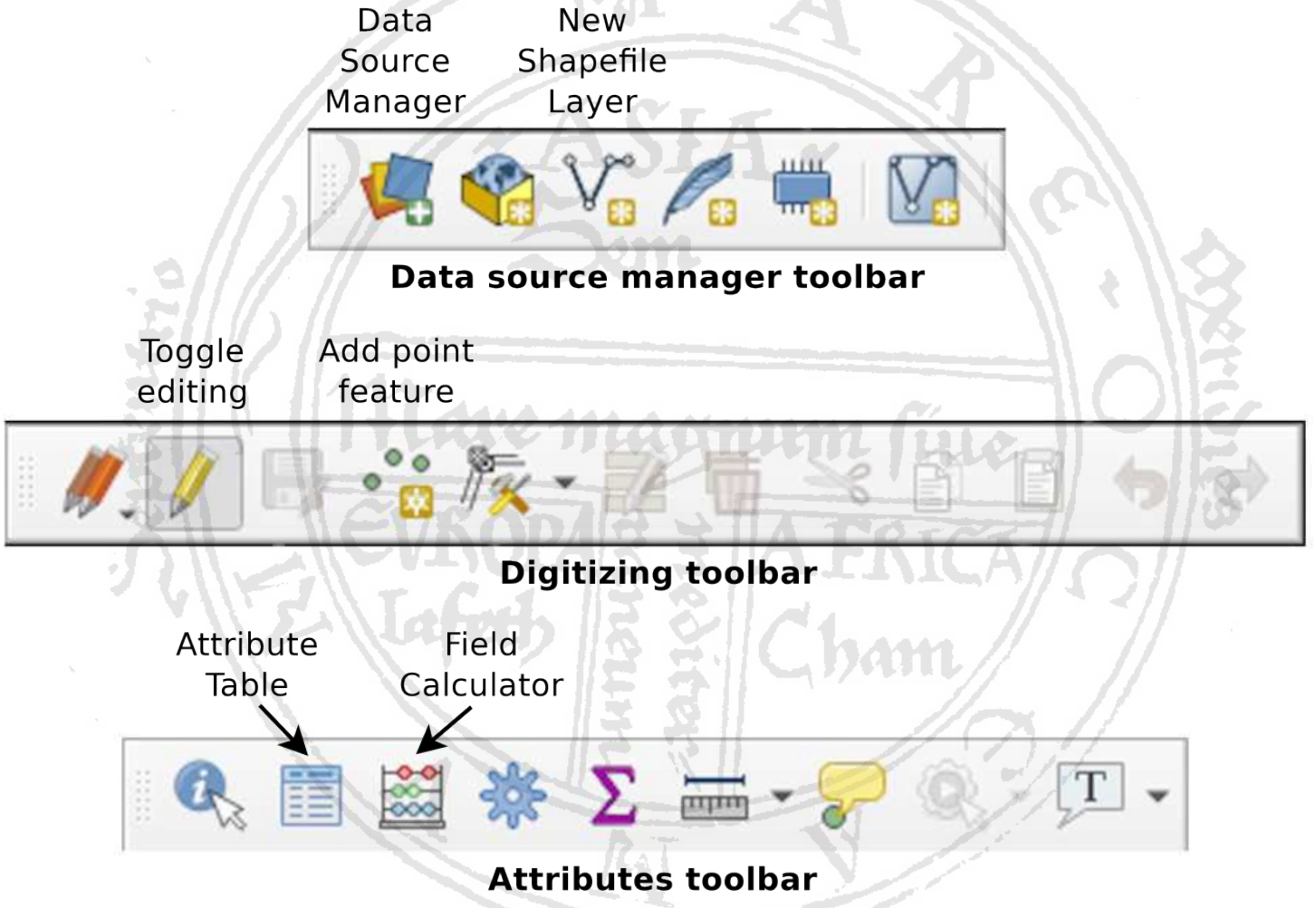
- The `distance` function takes two points
  - `@geometry` is the one corresponding to the row in the table
  - `make_point(12.5, 41.9)` corresponds to Rome (long,lat)
- Note: to see meters conversion is needed, from `EPSG:4326` to `EPSG:3857`, using the `transform` function

Hands-on QGIS - 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.