Batch: D-2 Roll No.: 16010123325

Experiment No. 3

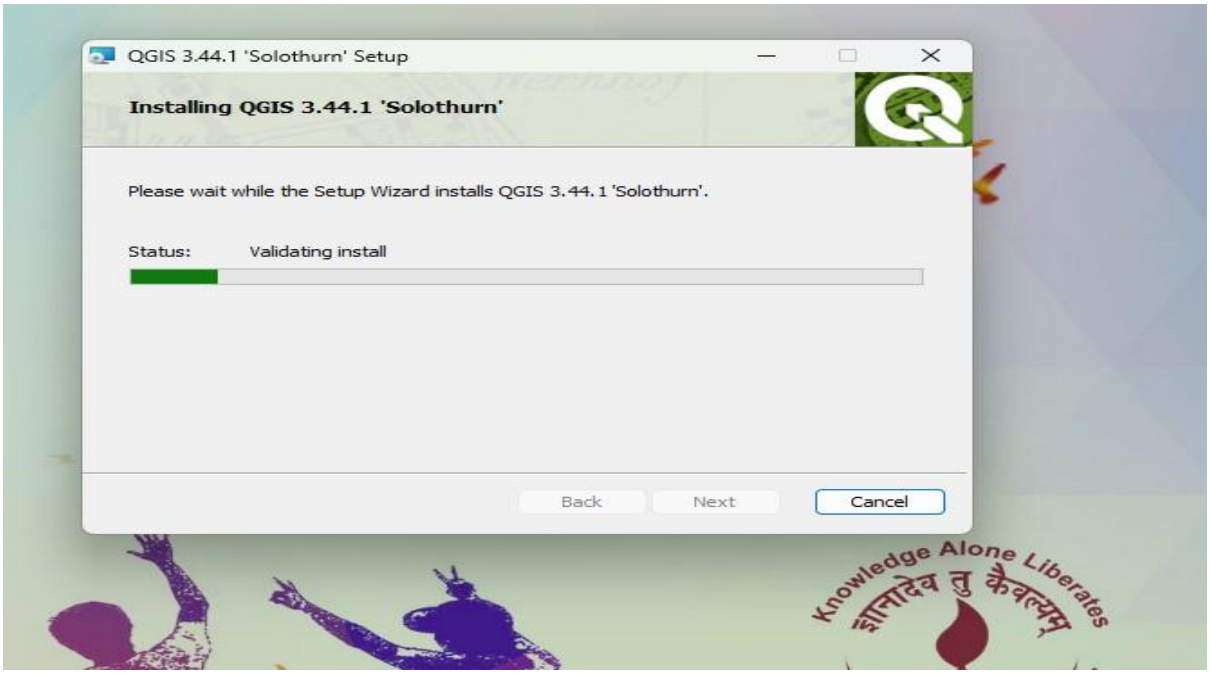
Title: Implement vector data styling and raster data styling in QGIS

Course Outcome:

CO2 Apply the data analytics in the field of geospatial system

Books/ Journals/ Websites referred:

QGIS Installation Link: https://www.qgis.org/download/ Version 3.38



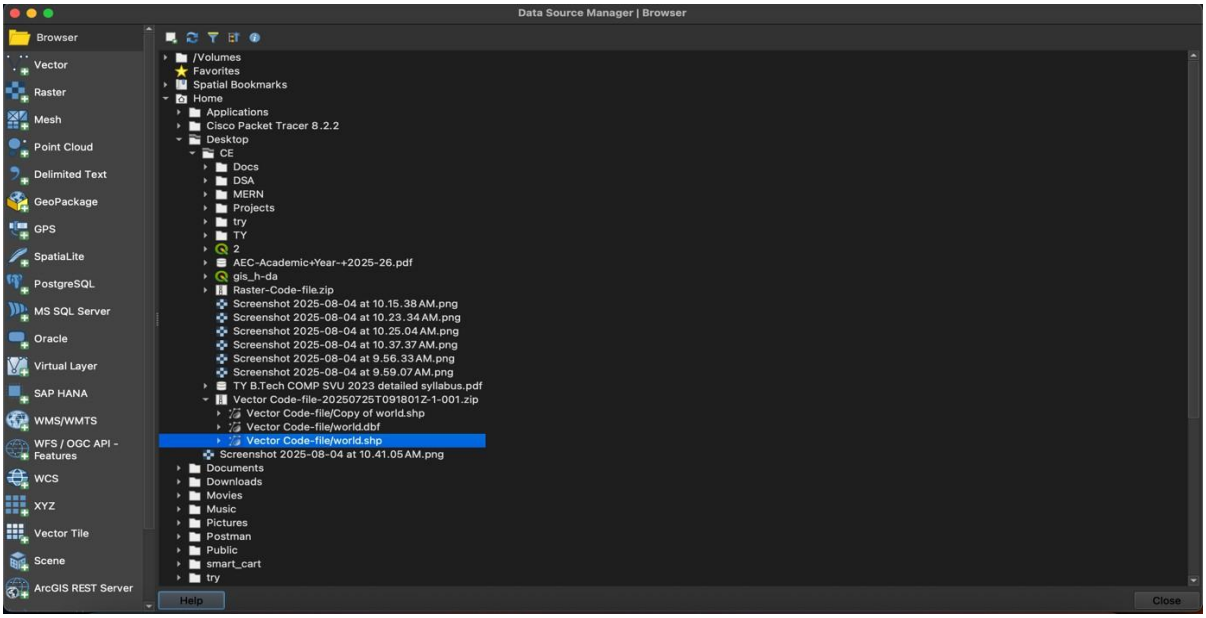
Resources used:

https://www.qgistutorials.com/en/

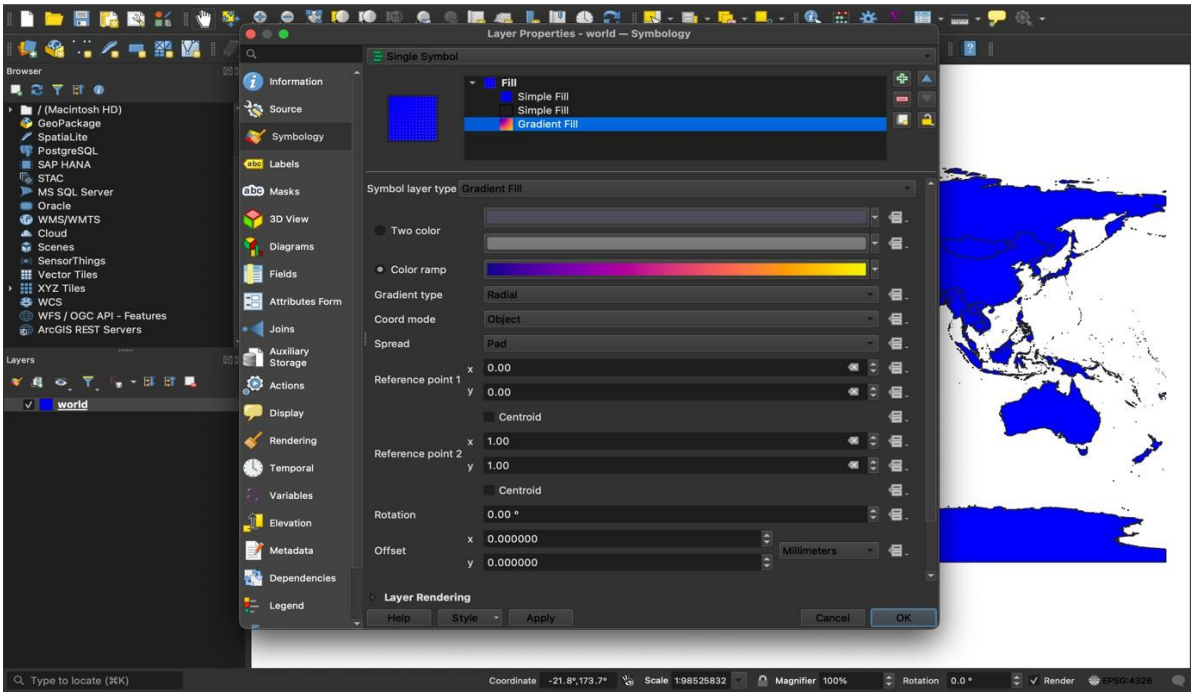
Algorithm: Vector data styling

Open QGIS and Load Vector Data:

Step 1: Start QGIS and load your vector data (e.g., shapefile, GeoJSON, etc.). Go to Layer-> Add Layer -> Add Vector Layer -> Upload the code file

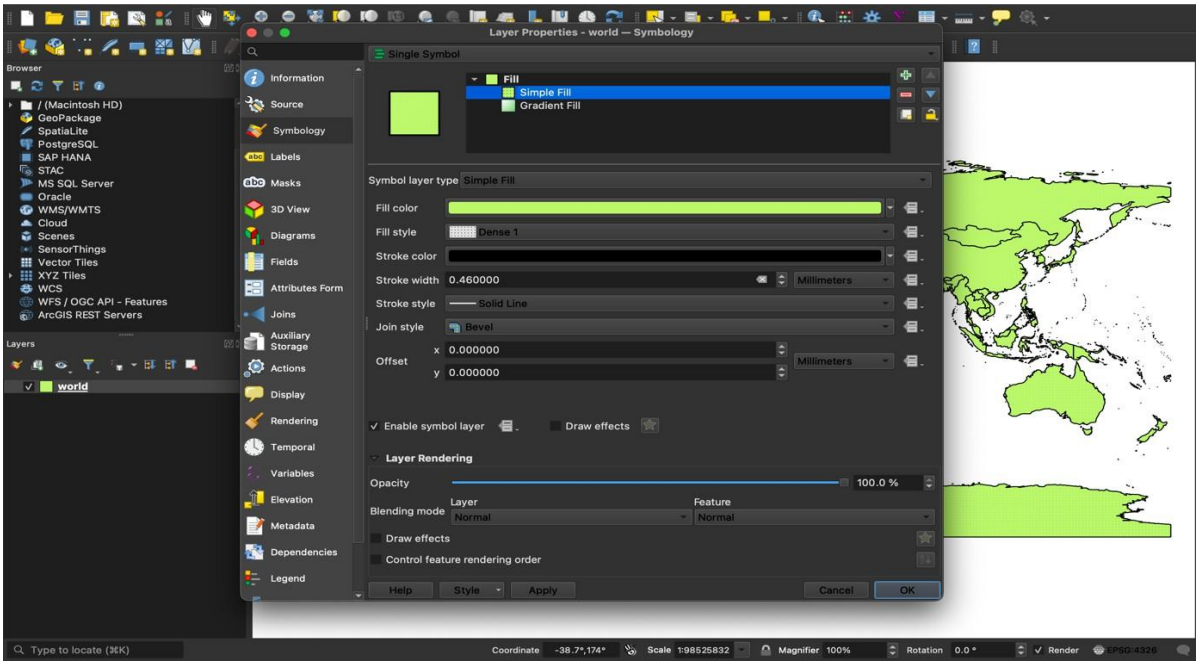


Step 2: Open the Layer Styling Panel

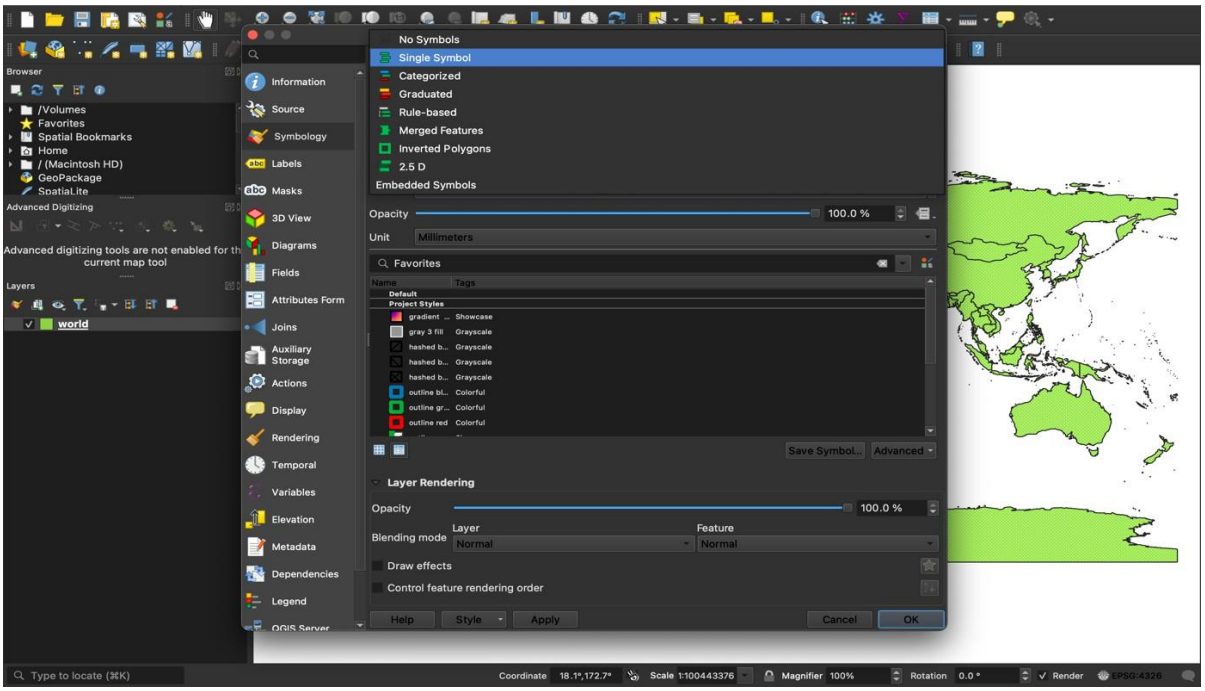


Step 3: Select your vector layer in the Layers panel.

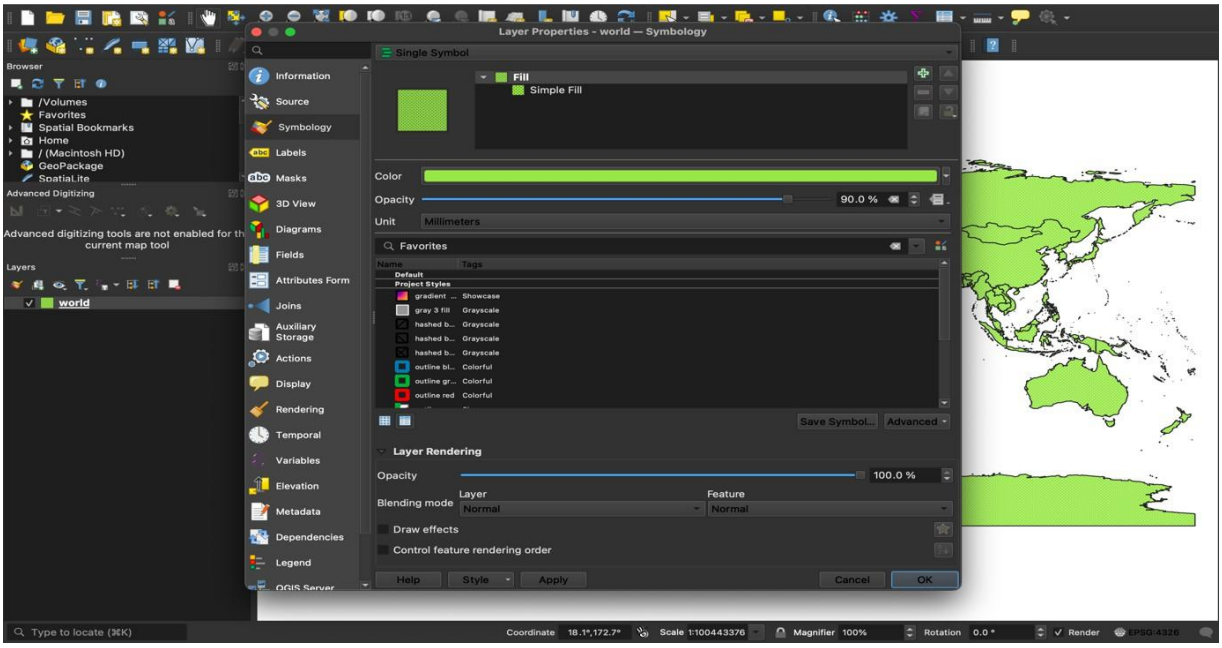
Step 4: Right-click the layer and choose "Properties" or click on the "Layer Styling" panel on the right.



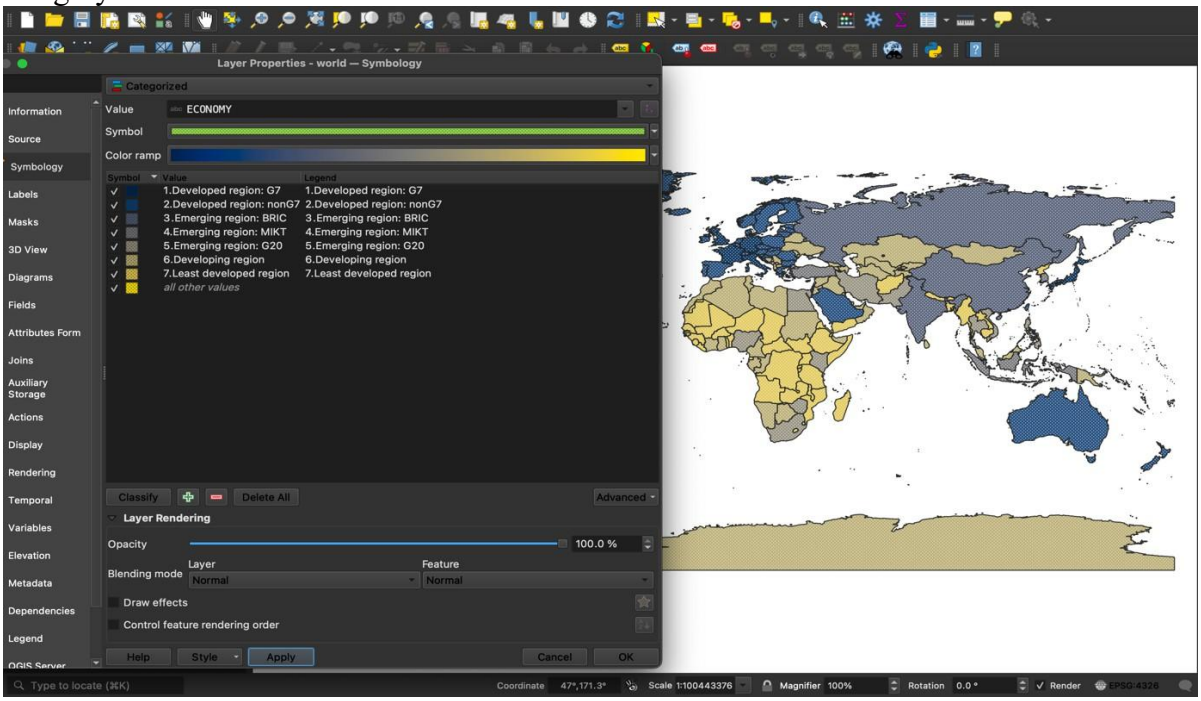
Step 5: Select a Symbology Type: In the Layer Properties window, go to the "Symbology" tab. Choose a symbology type (e.g., Single Symbol, Categorized, Graduated).



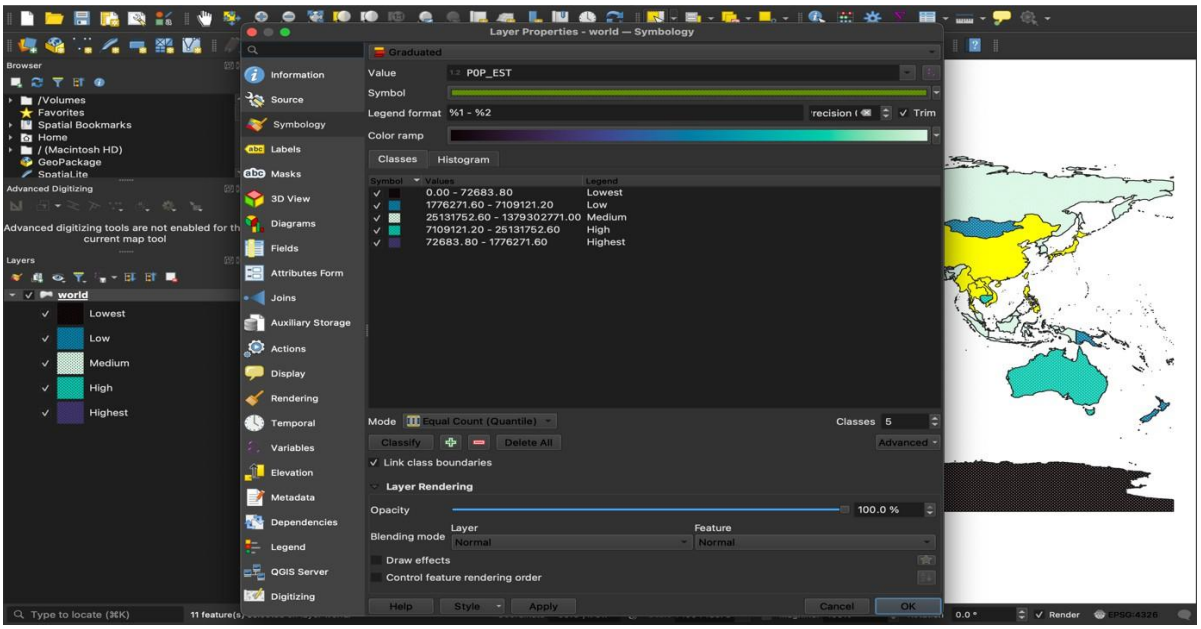
Step 6: Single Symbol Styling: For simple styling, choose "Single Symbol." Select the symbol and click on the symbol to open the Symbol Selector. Customize the symbol's color, outline, transparency, and other properties.

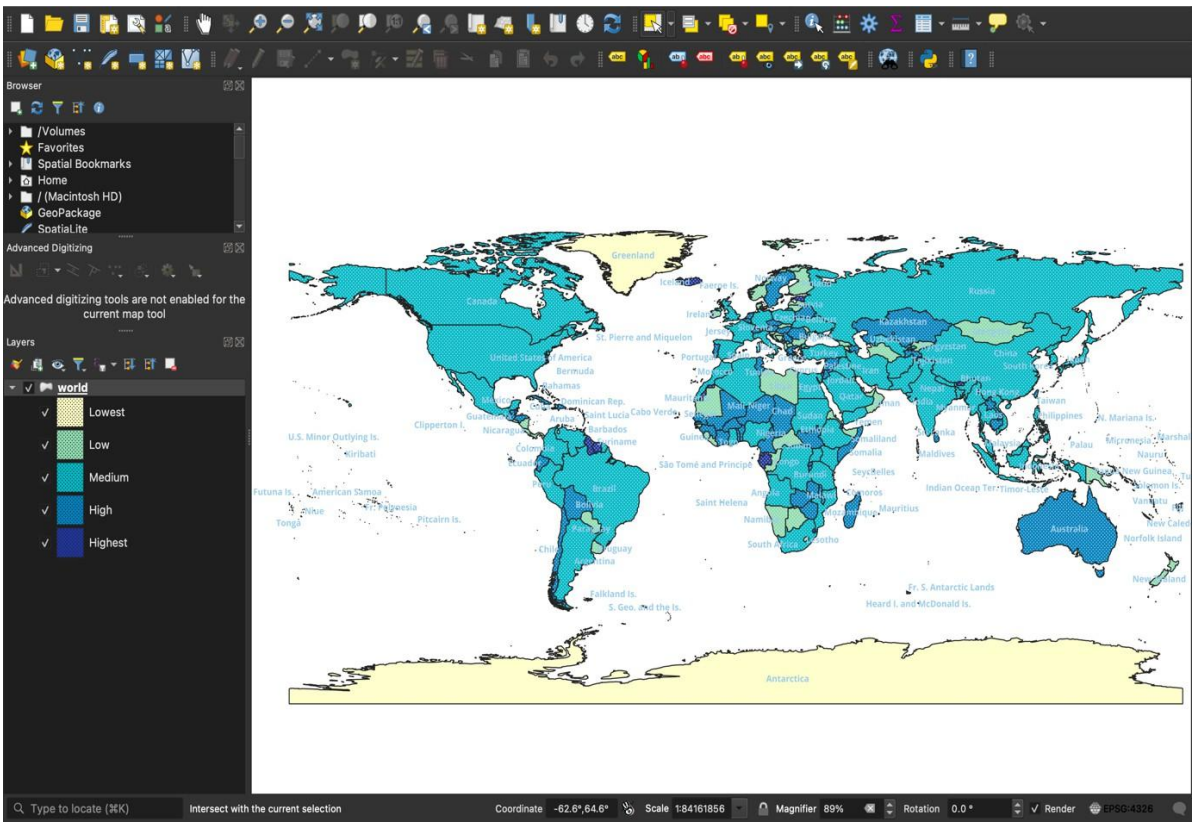


Step 6: Categorized Styling: Choose "Categorized" to style the layer based on a categorical attribute. Select the attribute column and click "Classify" to generate unique symbols for eachcategory. Customize each category's symbol by clicking on the symbol next to each category.



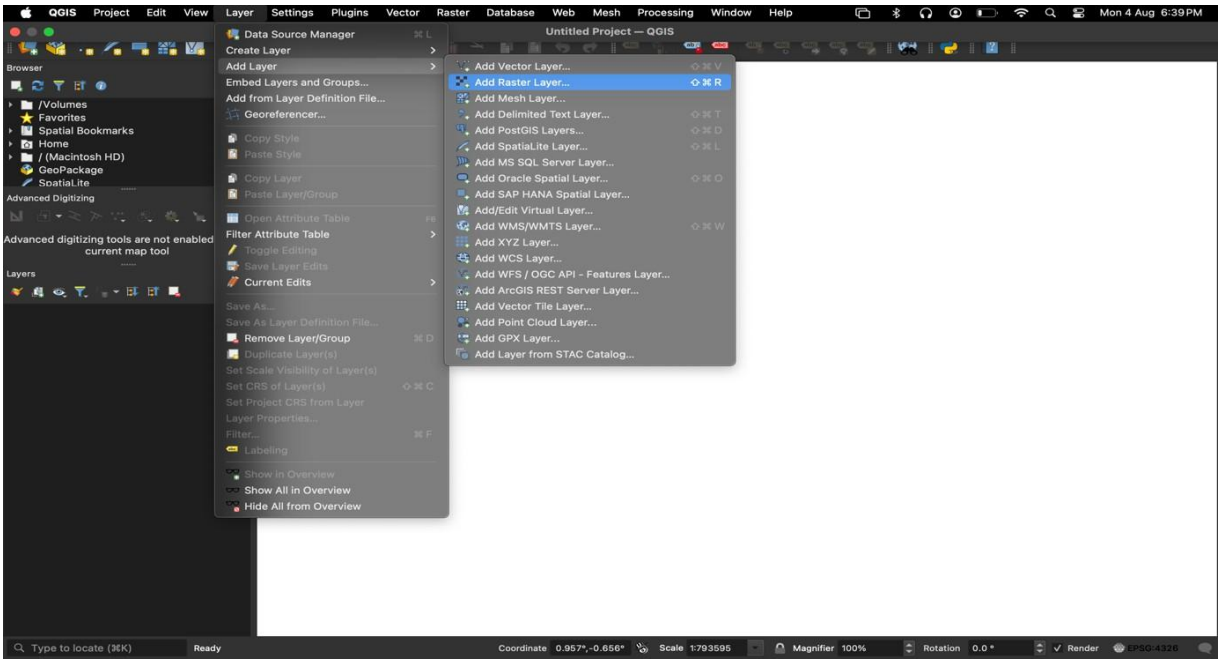
Step 7: Graduated Styling: Choose "Graduated" to style the layer based on a numeric attribute. Select the attribute column and the classification mode (e.g., Equal Interval, Quantile). Click "Classify" to generate ranges and corresponding symbols. Customize each range's symbol by clicking on the symbol next to each range.



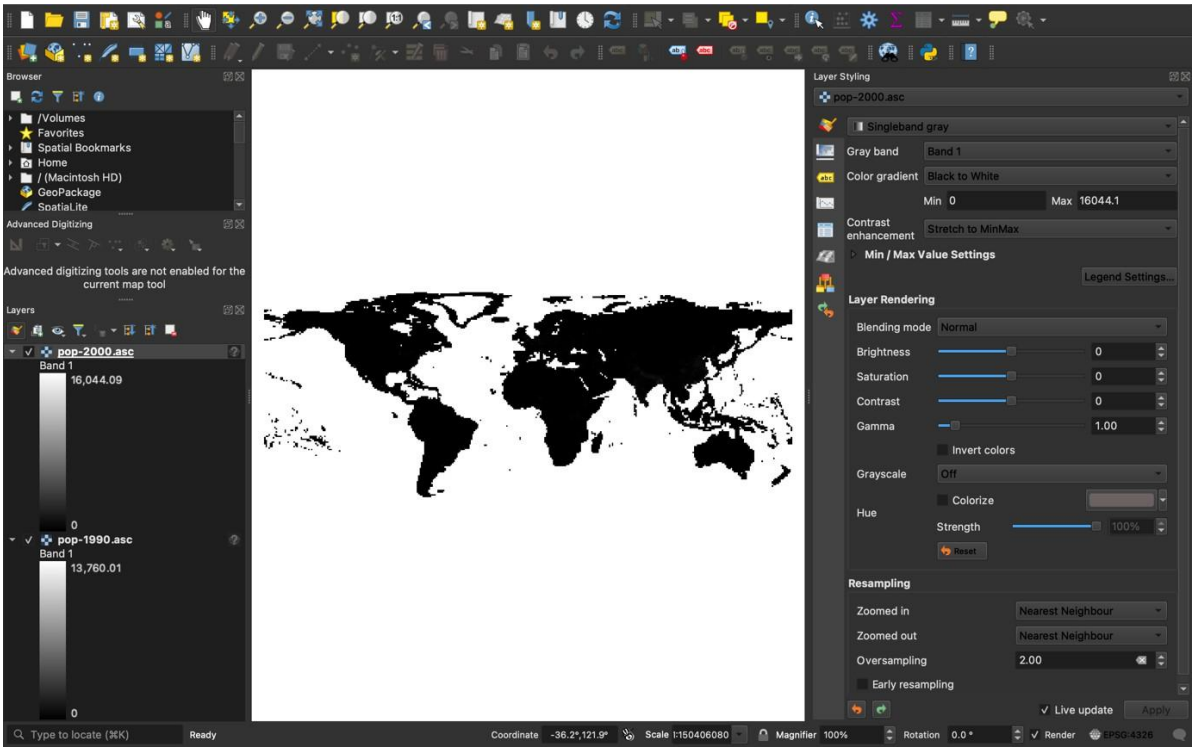


Algorithm: Raster data styling

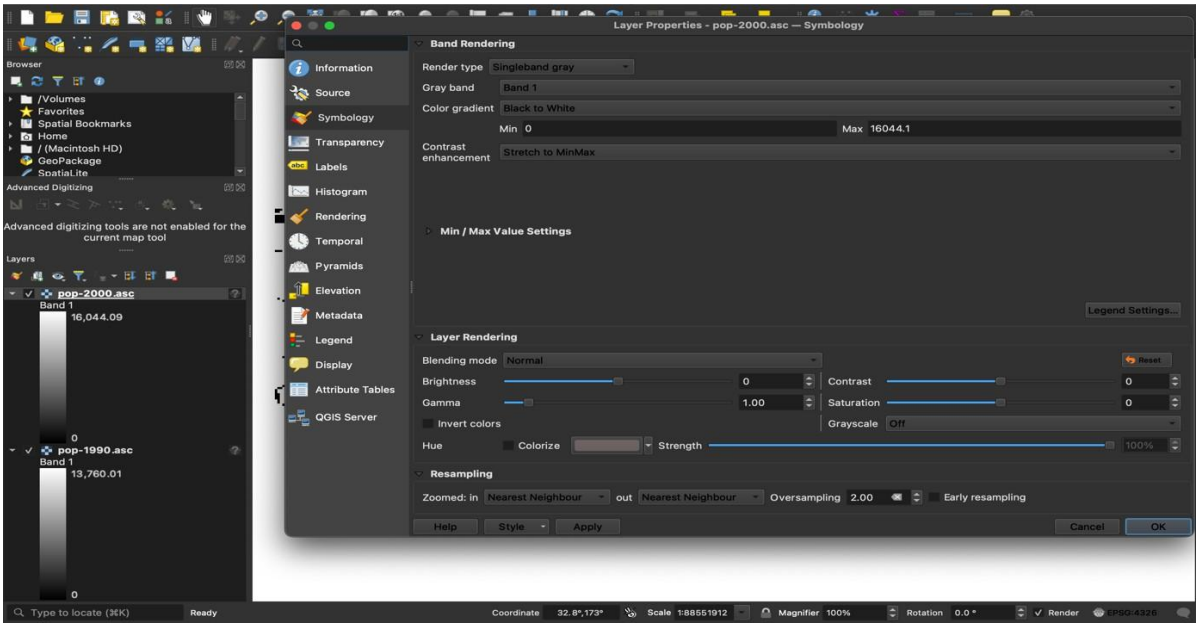
Step 1 : Start QGIS and load your raster data (e.g., GeoTIFF, JPEG, etc.).



Step 2 : Open the Layer Styling Panel:

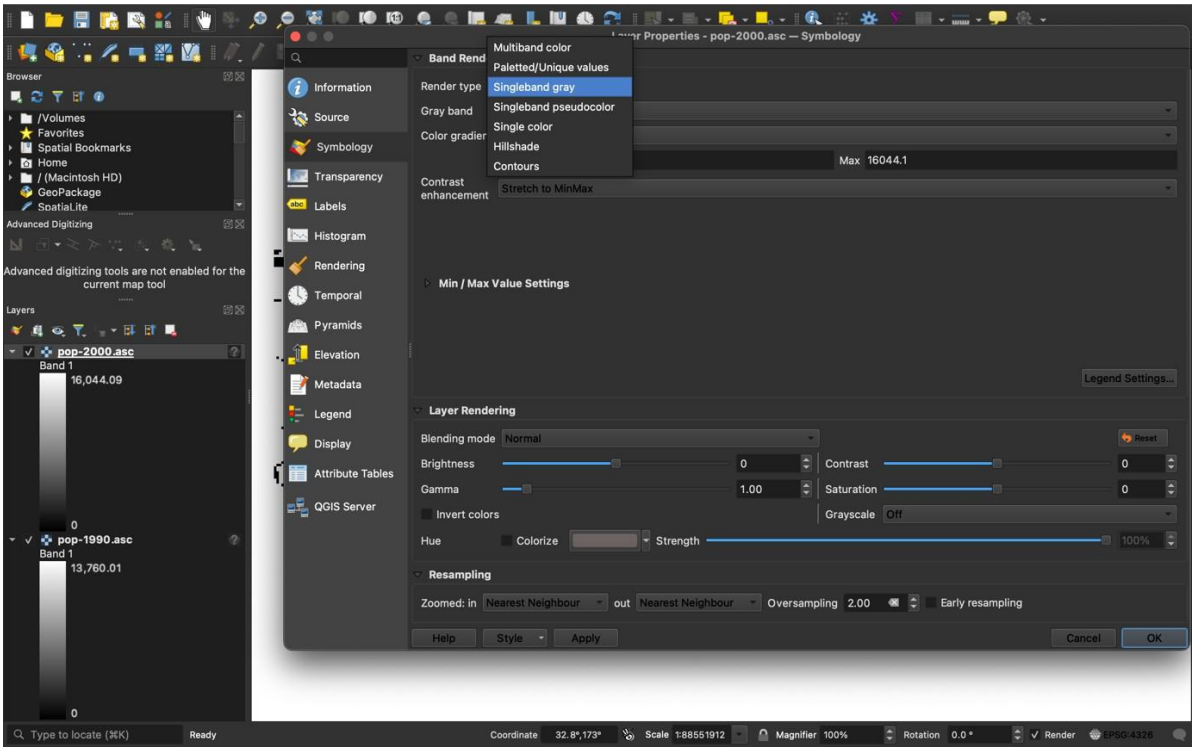


Step 3 : Select your raster layer in the Layers panel. Right-click the layer and choose "Properties" or click on the "Layer Styling" panel on the right.

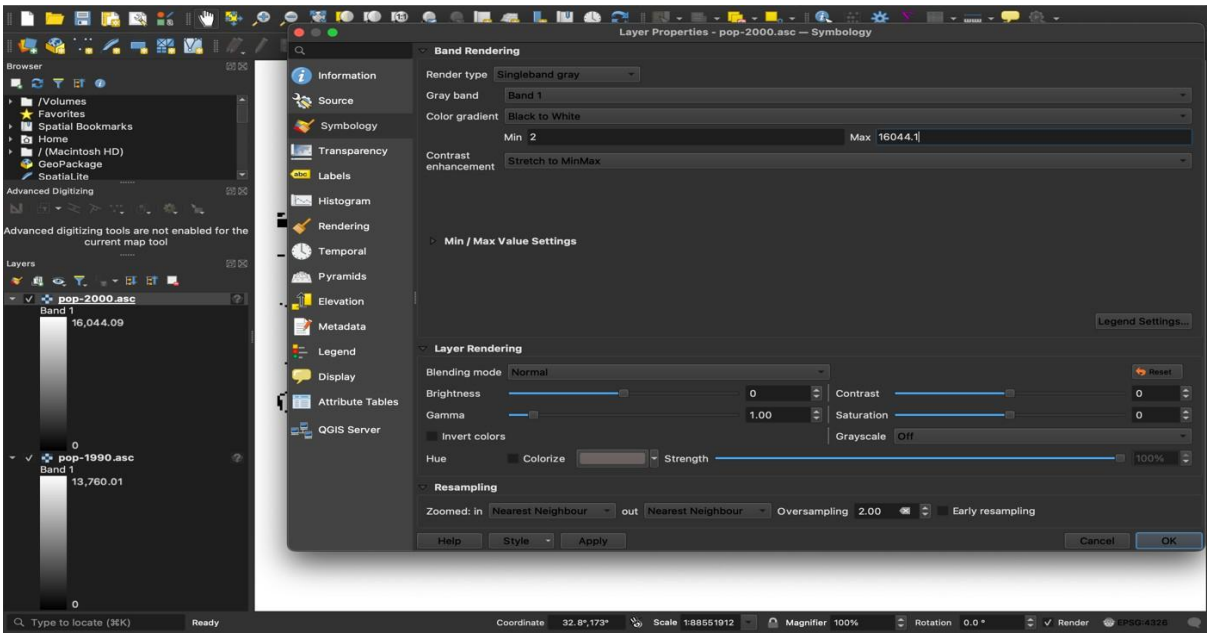


Step 4 : Select a Render Type: In the Layer Properties window, go to the "Symbology" tab.

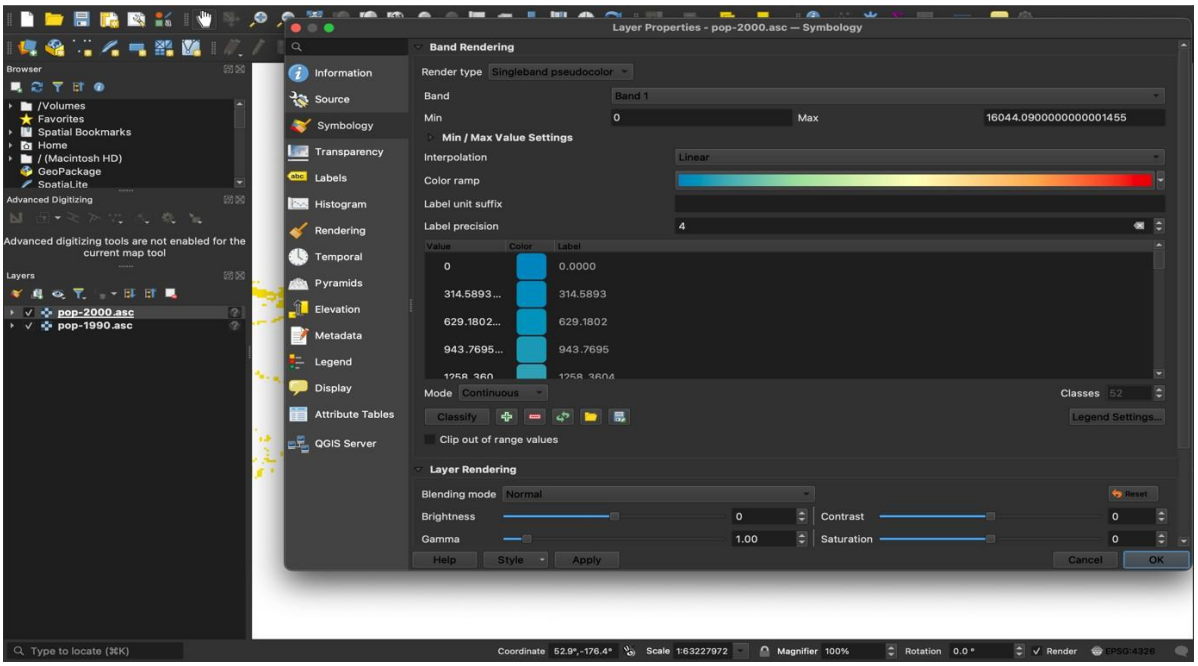
Step 5: Choose a render type (e.g., Singleband gray, Singleband pseudocolor).

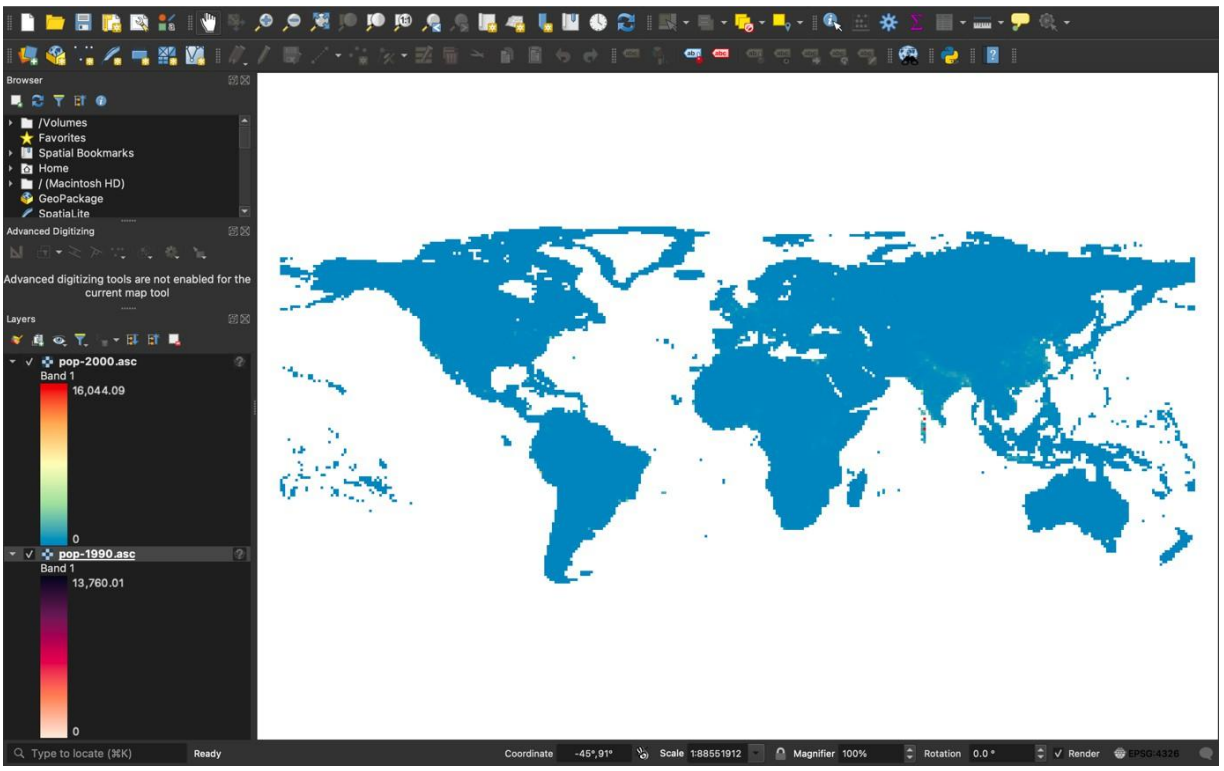


Step 6 : Singleband Gray: For grayscale images, choose "Singleband gray." Adjust the Min and Max values or use the "Load Min/Max Values" button. Choose a Contrast Enhancement mode (e.g., Stretch to MinMax, Stretch and Clip to MinMax).



Step 7 : Single band Pseudocolor: For continuous data, choose "Single band pseudocolor." Select a color ramp and adjust the Min and Max values. Click "Classify" to generate a color map based on the selected color ramp.





Task: Install QGIS Software version 3.38. Select different features and perform the vector data and raster data styling. Insert the output images for the respective task.

Platform used by the student: QGIS

Following points should be written by students

Different steps in Vector data styling and raster data styling

Vector

1. **Load Vector Layer**
   - Layer > Add Layer > Add Vector Layer
   - Choose your shapefile (e.g., roads, boundaries, etc.)
2. **Open Layer Properties**
   - Right-click the layer > Properties
3. **Go to the "Symbology" Tab**
   - Default is "Single Symbol"
   - Comment: Useful for uniform styling of all features.
4. **Change Symbol Type**
   - Choose from: Single Symbol, Categorized, Graduated, Rule-based, etc.
5. **Categorized Styling**
   - Choose attribute field (e.g., land use type)
   - Click "Classify" to auto-assign colors
   - Comment: Good for visualizing discrete categories.
6. **Graduated Styling**
   - Select numeric field (e.g., population)
   - Choose color ramp and classification method (e.g., Equal Interval)
   - Comment: Used for quantitative data ranges.
7. **Adjust Symbol Color, Outline, and Size**
   - Click on symbol preview to customize styles
8. **Apply and Save**
   - Click Apply then OK to see the changes on map
   -

Raster

1. **Load Raster Layer**
   - Layer > Add Layer > Add Raster Layer
   - Choose raster file (e.g., DEM, satellite image)
2. **Open Layer Properties**
   - Right-click the raster layer > Properties
3. **Go to the "Symbology" Tab**
4. **Render Type Options**
   - Options: Singleband gray, Singleband pseudocolor, Multiband color
   - Comment: DEM = pseudocolor; satellite = multiband
5. **Stretch and Contrast Settings**
   - Adjust Min/Max values for display
   - Choose Contrast Enhancement (e.g., Stretch to MinMax)
6. **Apply Color Ramps (for Pseudocolor)**

- Select color ramp (e.g., elevation gradient)
- Click “Classify” to assign colors to value ranges

7. **Apply and Save**
   - Click Apply then OK

Conclusion (Students should write in their own words):

Styling in GIS helps make spatial data easy to understand and analyze. By using appropriate symbols and colors, both vector and raster data can convey meaningful patterns and information effectively.

Post lab questions:

Q.1 How do different symbolization methods (e.g., simple symbols, graduated symbols, categorized symbols) impact the interpretation of vector data?

Symbolization methods are key to how vector data (points, lines, polygons) are visually interpreted on a map. The choice of symbolization affects **readability, clarity, and insight** from spatial data.

1. Simple Symbols

- **What it is**: A single symbol (same shape, color, size) is used for all features.
- **Impact**:
  - Easy to apply and interpret.
  - Suitable when features belong to the same category.
  - Does **not** convey variation in attributes.

2. Categorized Symbols (Unique Values)

- **What it is**: Features are symbolized based on a **categorical attribute** (e.g., land use type, soil class).
- **Impact**:
  - Helps distinguish between types or classes.
  - Makes **qualitative differences** visible.
  - Great for **thematic mapping**.

3. Graduated Symbols (Proportional)

- **What it is**: Features are styled based on **numeric values** using size or color gradients.
- **Impact**:
  - Communicates **quantitative differences**.
  - Shows patterns like density, magnitude, or ranking.
  - Enables comparison across space.

Q.2 How can attribute data be used to style vector layers effectively (e.g., using different colors for different categories or sizes based on numerical values)?

Attribute data is **non-spatial information** stored in the vector layer's attribute table. Styling based on this data allows **dynamic, informative, and analytical map visualization.**

1. By Category (Qualitative)

- Use categorical attributes to assign different colors or shapes.

- Example:
  - Land parcels colored by land use type: residential (blue), commercial (red), industrial (gray).
- Tool: Categorized renderer in QGIS or ArcGIS.

2. By Quantity (Quantitative)

- Use numeric attributes to vary symbol size, width, or color intensity.
- Examples:
  - Line width proportional to traffic volume.
  - Polygon color intensity based on population density.
- Tool: Graduated renderer or Proportional symbols.

3. By Expression

- Use formulas or custom rules combining multiple fields.
- Example: Style buildings with red if height > 50 and use = commercial.

4. Rule-Based Styling

- Create conditional rules for advanced symbolization.
- Example:
  - Green icons for trees >20 years old, orange for younger trees.

Q.3 Discuss in detail vector data styling and raster data styling.

Vector Data Styling

- Used for points, lines, and polygons.
- Styled using:
  - Simple symbols (same style),
  - Categorized symbols (different colors for categories),
  - Graduated symbols (size or color based on values).
- Can include labels, shapes, and transparency.
- Ideal for thematic maps (e.g., land use, roads, population).

Raster Data Styling

- Made of grid cells (pixels) with values.
- Styled using:
  - Color ramps (for elevation, temperature),
  - Classified styles (for land cover),
  - RGB composites (for satellite images).
- Best for continuous data like imagery or terrain.