

Assignment 4: Vector Analysis with GeoPandas

(60 Points Total)

Data available under Resources>Assignment Data.

Produce code to complete the requested tasks. Deliver your results in a Jupyter Notebook. To complete this exercise, you will need to have set up a **conda environment** with the following: (1) **NumPy**, (2) **Pandas**, (3) **GeoPandas**, (4) all dependencies for **GeoPandas**, (5) **matplotlib**, and (6) **contextily**.

The **Portland_Data>portland_data.gpkg** GeoPackage contains three data layers for Portland, Oregon:

neighborhoods: boundaries of Portland neighborhoods

park_trees: mapped trees in parks

street_trees: mapped trees along streets

The **neighborhood** boundaries were obtained from the City of Portland (<https://www.portlandoregon.gov/28130>) while the **tree** inventory data were obtained from the City of Portland Office of Parks & Recreation (<https://www.portlandoregon.gov/parks/article/433143>). In this exercise, you will only work with the **park_trees** and **neighborhoods** datasets.

Variable	Explanation
DBH	Diameter at breast height in inches
Condition	Condition of tree
TreeHeight	Height of tree in feet
CrownWidth	Crown width in feet
Family	Tree family
Genus	Tree genus
Common	Tree common name
Genus_spec	Tree genus and species
Native	Whether or not tree is a native species

Your Tasks

T1: Read in the **park_trees** and **neighborhoods** data layers as GeoPandas DataFrames. (6 Points)

T2: Use `head()` to plot the first set of records in both datasets. (6 Points)

T3: Create a map of the **neighborhoods** data. You do not need to map any attributes to the feature colors. (6 Points)

T4: Map the **neighborhoods** data as borders only over a base map. **(6 Points)**

T5: Count the number of **park_trees** in each species within each **neighborhood**. Add these counts to the GeoPandas DataFrame of the **neighborhoods**. This can be accomplished with GeoPandas. Have a look at this post:

<https://gis.stackexchange.com/questions/306674/geopandas-spatial-join-and-count>. **(18 Points)**

T6: Create a figure with four map layouts where color is used to show the count of species in each of four genera: *Quercus*, *Acer*, *Ulmus*, and *Pseudotsuga*. The layout should include the following: **(18 Points)**

- Two rows and two columns.
- A title for each subplot that provides the name of the genus being mapped.
- Legends for each map.
- A color ramp defined for each map. You can use the same color ramp if you'd like.
- The axes labels turned off.
- The neighborhood boundaries displayed as outlines above the choropleth layer.

Deliverables

- Jupyter Notebook

