# GGS 366: Lab 4

## General guidelines

**Please submit the .ipynb notebook containing all the codes.** Make sure the notebook is properly formatted by following the instructions below.

* Separate answers to each question using text cells and markdown headings. See example syntax here: [Markdown Guide - Colab](https://colab.research.google.com/notebooks/markdown_guide.ipynb)
* Write the essay questions in your Python notebook using text cells.
* The function body (where appropriate) must include a docstring to provide a general description of the function.
* Each step of the code needs to be commented.
* The code needs to be properly indented and readable. For more on formatting guidelines: [PEP 8 – Style Guide for Python Code | peps.python.org](https://peps.python.org/pep-0008/) and [PEP 257 – Docstring Conventions | peps.python.org](https://peps.python.org/pep-0257/)

You may use GenAI as a supporting tool. However, directly copying code from GenAI will be considered plagiarism and hinder your learning process. This can negatively impact your performance in course exams and, ultimately, your professional success. Therefore, it is in your best interest to thoroughly understand the fundamental concepts and make a genuine effort to solve the problems on your own.

## Question 1 (10 points)

* Load the census tract data for the state of Virginia into Python.
* Extract the **Census Tract FIPS 480402**, located within **Fairfax County**.
* Next, visit the **Fairfax Open Data Portal**: [Open Geospatial Data | GIS and Mapping Services](https://www.fairfaxcounty.gov/maps/open-geospatial-data) and search for ***Buildings*** feature service
* Load the ***Buildings*** feature service in Python using the geojson URL from the ArcGIS Online Map Viewer. Once loaded,
  + Calculate **how many buildings are located within the Fairfax County census tract 480402**
  + Calculate **what percentage of the total buildings are located above a ground elevation of 300 meters**

## Question 2 (7 points)

* Load the park dataset we used in the lecture.
* In a column, calculate **the area for each park** in the dataset.
* Print the **unique park classifications** we have in this park dataset (**Do not hard code**).
* **Dissolve the park boundaries** based on this unique classification and calculate the total park area that falls into each classification.

## Question 3 (8 points)

* Using the dissolved dataset from the previous question, **select only the local park boundaries**.
* Draw **an 800-meter buffer** around it.
* **Identify the buildings located in this buffer area** using both “intersects” and “within” predicate. Do you see any difference in the output? Why so?

## Question 4 (10 points)

* Again, visit the **Fairfax Open Data Portal**: [Open Geospatial Data | GIS and Mapping Services](https://www.fairfaxcounty.gov/maps/open-geospatial-data) and search for ***School Facilities*** feature service
* Load the ***School Facilities*** feature service in Python using the geojson URL from the ArcGIS Online Map Viewer. Once loaded,
  + Draw a **3km buffer** around each school.
  + **Update the geometry column of the school dataset** with the newly-created buffer geometries.
  + Perform **spatial overlay** to identify a subset of **buildings that do not fall within the school buffer areas**. What spatial overlay operation did you use and why?
  + **Could you have used spatial join** in this case? If yes, explain how?