

Data Analytics – Exercises

(Week 05)

In these exercises, you will learn:

- how to geocode address data
- basic GIS functionalities of the GIS-Software QGIS
(Install **QGIS** from: <https://qgis.org/en/site/forusers/download.html>)
- how to perform point-in-polygon analysis
- how to perform a nearest neighbor analysis

In the data analytics process model, these exercises cover part of the steps “Preparing & storing data” and “Exploratory Data Analysis (EDA)” (see figure 1). Results of the exercises must be uploaded as separate files (**no .zip files!**) by each student on Moodle. Details on how to submit the results can be found in the tasks below.

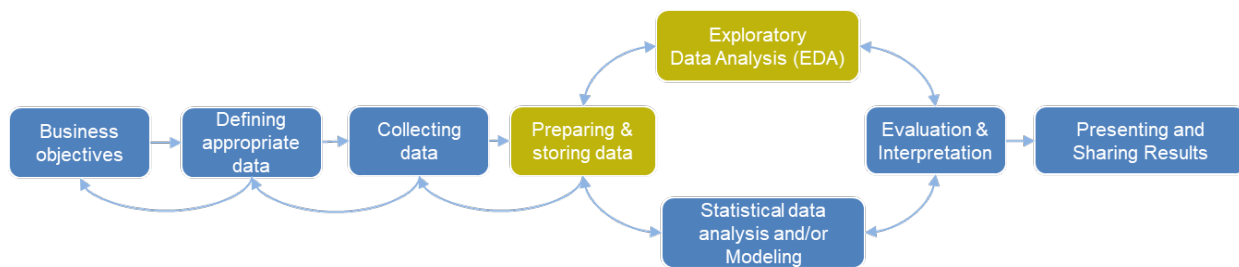


Figure 1: Data analytics process model (see slides of week 01)

Task 1

In this exercise, you will learn to geocode address data using Python. The tasks are:

- Go to the web page <https://tools.retrorte.ch/map>, search for a single address and look at the coordinates of that address on the left site of the webpage. You can find Swiss coordinates as well as World Geodetic System 1984 (WGS84) coordinates of this address.
- Run the Jupyter notebook '[geocoding_addresses.ipynb](#)' step by step and try to understand what the code does.
- In the section 'Geocoding a single address' of the Jupyter notebook, change the address "8400 winterthur, Theaterstrasse 17" to an address of your choice, then geocode the address in section 'Server request & response' of the Jupyter notebook.
- In the section 'Intersect municipality polygon-map with lat and lon ...' of the Jupyter notebook, you can find the following table, which is a merge of the geocoded address data with a map of municipalities. Look at the following table.

	web-scraper-order	address_raw	lat	lon	bfs_number	bfs_name
0	1662023695-433	Sonnenbergstrasse 15, 8633 Wolfhausen, ZH	47.255714	8.804976	112	Bubikon
24	1662023720-634	Blumenbergstrasse 7, 8633 Wolfhausen, ZH	47.254879	8.793746	112	Bubikon
1	1662023745-820	Lavaterstr. 63, 8002 Zürich, ZH	47.361378	8.533339	261	Zürich
4	1662023739-771	Parking 59, 8002 Zürich, ZH	47.366898	8.528817	261	Zürich
6	1662023720-640	Flobotstrasse 2, 8044 Zürich, ZH	47.379578	8.570285	261	Zürich

- e) In the table above, the first address 'sunnenbergstrasse 15, 8633 wolfhausen, ZH' contains 'Wolfhausen' as residence, but the municipality from the merge is 'Bubikon'. Find out, whether this is an error by going to <https://tools.retorte.ch/map>, search the address and make a screenshot of the area around the address. If this is not an error, the municipality of Bubikon should also be on the map. Info for all exchange students: In Switzerland we have municipalities (administrative units) and residences (parts of a municipality).

To be submitted on Moodle:

- A screenshot of your own geocoded address as 'address_geocoded.png' analog to the example from the Jupyter notebook below:

	attrs
featureid	2323240_0
label	Theaterstrasse 17 8400 Winterthur
lat	47.503517
lon	8.727852
x	262215.90625
y	697129.5

- A screenshot of the map according to e)

Task 2

In this exercise, you will learn basic GIS functionalities of QGIS and how to intersect points (geocoded apartment data) with polygons (municipality map). The tasks are:

- Open QGIS, then look at the video provided on Moodle: 'qgis_tutorial_01.mp4'.
- Import the municipality layer (map) and the geocoded apartment data to QGIS as shown in the video.
- Perform a point-in-polygon intersection (points = apartments, polygon = municipalities) as shown in the video.

To be submitted on Moodle:

- A screenshot of your QGIS environment with the municipality map and the apartment data as points as 'municipalities_and_points_map.png'.

- A screenshot of your QGIS environment with the attribute table showing the result of the point-in-polygon intersection as '[table_point_in_polygon_intersection.png](#)'.

Task 3

In this exercise, you will learn to create a choropleth map (colored map) in QGIS and to perform nearest neighbor analysis. The tasks are:

- a) Open QGIS, then follow the instructions in the video '[qgis_tutorial_02.mp4](#)'.
- b) Create a choropleth map as shown in the videos.
- c) Add the names of municipalities to the map as shown in the video.
- d) Add transparency to the map as shown in the video.
- e) Perform nearest-neighbor analysis based on the apartment data and supermarket data as shown in the video '[qgis_tutorial_03.mp4](#)'.

To be submitted on Moodle:

- A screenshot of your QGIS environment with the choropleth map as '[screenshot_choropleth_map.png](#)'.
- A screenshot of the table with the results of the nearest-neighbor analysis as '[table_nearest_neighbor_analysis.png](#)'.