

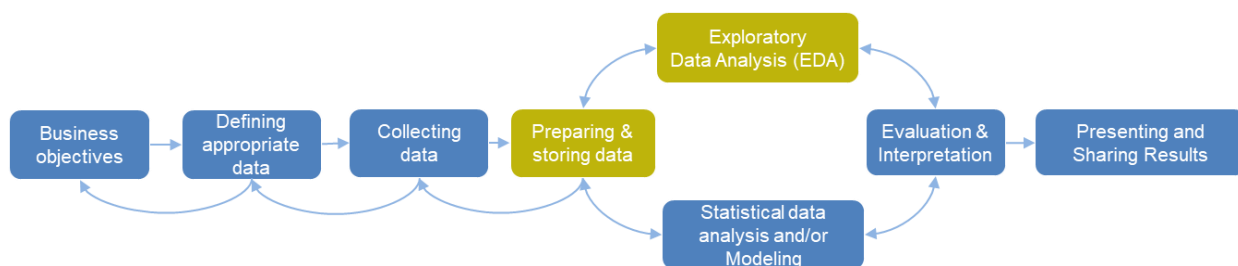
# Data Analytics – Exercises

## (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.retorte.ch/map>, search for a single address and look at the coordinates of that address on the left side 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.
- Below 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    | Parkring 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 <b>8400 Winterthur</b> |
| 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:

- Download the whole data-analytics repository from github using this link: [https://github.com/mario-gellrich-zhaw/data\\_analytics/archive/refs/heads/master.zip](https://github.com/mario-gellrich-zhaw/data_analytics/archive/refs/heads/master.zip)
- Unpack the downloaded ZIP archive and locate the "Geodata" folder in the "Week\_05" folder. Use this folder to load the required files into QGIS
- 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](#)'.