SDG Africa Partnership

Workshop with Ellen and Charles, two scientists from Makerere University Kampala, Uganda, together with Clein and Rolf from HSRW 🙂

2023-11-07

- Download and install of QGIS
- Download and install anaconda
- conda environment creation
- installation of libraries according to https://github.com/rolfbecker/EE_3.07_Geodata_WS2022/tree/main/gdms0020_Course_Preparation
- Correction of packages: jupyterlab pandas geopandas shapely fiona pyproj rasterio sqlalchemy psycopg2 ipython-sql bs4
- https://cs231n.github.io/python-numpy-tutorial/ up to numpy

Extra material:

- pandas tutorial (comprehensive): https://github.com/ageron/handson-ml3/blob/main/tools_pandas.ipynb

2023-11-08

- * Finished the numpy tutorial from cs231. Skipped the image processing for now
- * Followed partially the hands-on-ml3 tutorial (tools_pandas.ipynb). Material covered:
- * import pandas and alias
- * Series: create from list, give index, give name, create from dictionary. slicing, alignment, plotting
- * Handle time with pd.date_range()
- * Creating a Dataframe: by dictionary.
- * selecting columns, accesing values, filtering, transposing. **skipped multi-indexing, stacking and unstacking**,
- * datafream read: read_csv and read_excel. And dat frame write

Homework: explore the real data: https://firebasestorage.googleapis.com/v0/b/fao-aquastat.appspot.com/o/Excel%2FAfrica-dams_eng.xlsx?alt=media&token=b621f090-60cf-46f1-8472-9003ce314066

2023-11-09

- **first notebook gnb0101_DWD_**

To correct:

1. 1) Explain what the grabfile function is doing with doc string
2. 2) Show them what the problem of the file is by uploading in QGIS
3. 3) Let them import the file by themselves, So they see the problem again
4. 4) Notice that station ID is being read as integer. So correct that by a dtype dictionary
5. 5) Update the administrative boundaries links

- **geopandas notebook gnb0131_Geopandas_**

To correct:

1. Give the LL and UR coordinates and let the. figure out the rest
2. Show an example of usage for Point and for Line in shapely. Ask then for creating the polygon
3. geopandas as a tool to have data frames with georeferenced data. So let them use the example and modify the data as they need it
4. Show how to find the correct item in the documentation
5. Let them practice by repeating the steps with a different bounding box or with a different shape

- **gnb0135_beutifulsoup_DTM scrapper**

To correct:

1. For didactic reasons, makes more sense to have the imports together with the section that they are being used into
2. Ask the students to copy one file name as example.
3. run the helper function there to see the output
4. let them do again a polygon with that output
5. Now look at the full picture and let them do the lists by themselves
6. create the gdf and give them the previous notebook as parallel.
7. Instructions on how to change the visibility and display the labels on QGIS. Maybe add a clipping operation or an intersection.

2023-11-10

1. Selenium as alternative for webscrapping
2. Letting the driver install by itself when needed
3. Database fundamentals with Anup
4. Exercise on creating own database in postgresql and pgadmin4
5. Exercise on creating own tables
6. Exercise on creating primary key and foreign key
7. Exercise on populating database

2023-11-13

Material for HSRW divided in possible lecture days:

1. Introduction to Geodata. Spatio-temporal data. First approach to python (getting familiar with Notebooks and downloading the material). Installing all the dependencies. (could be replaced by JupyterHub)
2. DWD_NRW: Using python to download data. Using the ftp server. Using os.makedirs. Data

wrangling (“working with data in other languages”). Saving csv data. Importing csv data into QGIS. Import vector data (the admin. Boundaries). Mapping
3. Get started in QGIS. Baruch college tutorial. Getting started
4. CRS Theory, but also a practical. Using 4 different files as example for the CRS practical. Divide the data by regions or so. (maybe its more helpful if they are geographically close instead of overlaying)
5. Geopandas 0130: Creating a polygon layer. Scrapping data with Beatiful soup. To create the generalized polygon vector (DTMs)

WMS, WFS and WCS

1. Introduction to DTM (Remote Sensing) Airborne laser scanner. Gdal translate from XYZ to TIF. Import layer in QGIS Hillshade model Merging layers
2. Warming stripes (merging and average calculation) (python) → Change by precipitation instead To show temporal controller
3. Altitude Vs Temperature (python)
4. Georeferencing (digitizing)
5. Database management systems (installing Postgresql). Database Setup. Create users and databases. Create example relations. Create tables. Relational Algebra
6. Database normalization. Examples and 1NF, 2NF and 3NF
7. Groundwater Lanuv: Reading the data from Lanuv. Problem with data obfuscation. PostGIS: using geopandas. Time series. SQL
8. Time Series management (generating videos and co.)
9. Satellite imagery (NDVI and so on)

Material from Makerere University: Course GIS and Remote Sensing in Natural Resource Management

1. Lecture 1 introduction to RS
2. Lecture 2 RS
3. Lecture 3 Remote Sensing
4. Lecture 4 Photogrametry → Drones
5. Lecture 5 Introduction to GIS → Data acquisition, input… GIS functions
6. Lecture 6 If time allows DBMS. Joins primary key, foreign key…. Spatial Reference Systems (CRS)

Practicals:

1. Practical GIS Divided in 3 sessions. Input data, Working with CRS,
2. Querying by attribute and by location (Geospatial). Data Visualizations and treating different data types. Creating layers. Summarizing data from Att Table. Creating maps.
3. GPS own data creation. Digitize of maps

Practical Remote Sensing: Download satellite imagery Creating composite images (Indices) Python → As classification toolchain? Image classification Accuracy assessment (how to use cancilliary data) Change detection

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