Information Management

&

Information Systems Degree

2021/2022

Geospatial Intelligence

2nd Year – Autumn Semester

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GI FINAL PROJECT

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1. CONTEXT

During your degree in Information Management or Information Systems you'll obtain skills related to the process of data acquisition, extraction, management, and analysis of several data sources including geographic information. The main goal of this project is to solve a spatial problem using GIS technology and spatial analysis.

Besides a Final Report, you'll need to publish your results in a Web application through a Story Map, a technology that supports the creation of dynamic maps to explore your main results.

The Story Map will be the tool to present your work (instead of the traditional ppt) in a discussion session in January. In this session, we will evaluate the presentation clarity and synthesis skills, as well the project overall. The presentation will have a duration of 10 minutes in which all group members should present. Another 5 minutes will be added for discussion.

Before this last presentation session in January, there will be an intermediate evaluation (in the 8th week of classes) where you will make a presentation, in ppt, about the progress of your project, what have your group done so far and what are the next steps in your project.

This project will be executed by groups of 4 students. The project report and the presentations are both mandatory. Once the grade is published there is no possibility of improving it. Please, name the files following the Group ID (e.g. G1_GI2021; G2_GI2021).

2. PROJECT GOALS & EVALUATION CRITERIA

The main goal of this project is to demonstrate that you gather technical and scientific skills that allow you to use GIS methods and tools in order to solve a geographic problem. Depending on your creativity, complexity and imagination level, you'll get a better or worse grade.

The project will be evaluated as the follows:

- Intermediate Presentation – 35%

- Final Project presentation + Report – 60%

Any academic work needs a thorough bibliographic research that can be made in physical libraries or on the internet. As NOVA IMS students, you'll have access to online resources through B-On Consortium of Portugal.

Finally, we'll evaluate your work according to the following criteria:

- a) Geographic analysis;
- b) Creativity;
- c) Report quality and its graphical elements, mainly the maps;
- d) Difficulty level;
- e) Bibliographic references;
- f) Respecting the deadlines;
- g) Discussion;
- h) Oral presentation;
- i) Web application quality (Story Maps).

3. EXPECTED FINAL DELIVERABLES & OUTPUTS

The Final Project consists of to deliver a report in digital format (.pdf) which will describe the executed work (maximum **10 pages**, including page cover and references, and excluding Annex). The project and report should be executed by groups of **4 students** (maximum).

The Report should be delivered until **26 December (deadline),** in the Moodle platform. There is a daily delay penalty of -2,5 % after that date.

Do not send any spatial data (shapefiles, geodatabases, projects-aprx), **only send the Report itself**.

The Report should make a reference to at least **4 scientific articles** and/or **reference books** in the field of **GIS**. The main goal is to show that you've made a literature review to check out if someone already published a paper or an application about the same spatial problem. By following this procedure you'll show that you are aware of the current GIS applications. The references must be well cited throughout the report.

All your analysis and maps must be included in the Report document that you'll handover. Maps should be visually pleasant with all the necessary layout elements.

Besides the Report, you must publish your main findings and results on the Web through a Story Map. The final presentation, held in January, must be done only with your Story Map. The session will take 10 minutes and all group members must present. Another 5 minutes will be added for discussion.

It is mandatory that the project is written in English. The project presentation must be also presented and discussed in the English language.

It is also needed to use at least **3 different criteria** in which you will apply using at least **3 different spatial analysis techniques**.

During this semester you'll have some exclusive practical classes dedicated to helping you with the project.

4. REPORT STRUCTURE

The final report could have the following structure (this is an example, and you are not limited to follow this approach):

- **Title;**

    The title of your manuscript should be concise, specific and relevant.

- **Authors;**

    Authors' full first and last names must be provided

- **Abstract (200 words maximum);**

    The abstract should be a total of about 200 words maximum. The abstract should be a single paragraph and should follow the style of structured abstracts, but without headings: 1) Background: Place the question addressed in a broad context and highlight the purpose of the study; 2) Methods: Briefly describe the main methods or treatments applied. 3) Results: Summarize the article's main findings; and 4) Conclusion: Indicate the main conclusions or interpretations. The abstract should be an objective representation of the report: it must not contain results which are not presented and substantiated in the main text and should not exaggerate the main conclusions.

- **Keywords (3 to 5);**

We recommend that the keywords are specific to the report, yet reasonably common within the subject discipline.

- **Introduction;**

The introduction should briefly place the study in a broad context and highlight why it is important. It should define the purpose of the work and its significance, including specific hypotheses being tested. The current state of the research field should be reviewed carefully, and key publications cited. Please highlight controversial and diverging hypotheses when necessary. Finally, briefly mention the main aim of the work and highlight the main conclusions. Keep the introduction comprehensible to general readers working outside the research topic studied.

- **Study Area;**

The study area can be a separated topic or included with a subheading in the methods section.

- **Methods;**

Materials and methods should be described with sufficient detail to allow others to replicate and build on published results. New methods and protocols should be described in detail while well-established methods can be briefly described and appropriately cited. Give the name and version of any software used and make clear whether computer code used is available. Include any pre-registration codes.

- **Results;**

Provide a concise and precise description of the experimental results, their interpretation as well as the experimental conclusions that can be drawn.

- **Discussion;**

Authors should discuss the results and how they can be interpreted in perspective of previous studies and of the working hypotheses. The findings and their implications should be discussed in the broadest context possible, and limitations of the work highlighted. Future research directions may also be mentioned. This section may be combined with Results.

- **Conclusions;**

This section must be added in the end of the report highlighting the main contributions of the study.

- **References;**

Please, include only the references that are cited in the text. It is also mandatory to use the same citation styles to all the document. We suggest using Mendeley software or equivalent (e.g. EndNote; Reference Manager)

- **Annex (optional):** including just elements that are relevant.

NOTES:

1. Do not include commands descriptions of the software. The focus should be the problem analysis, results interpretation, and solution proposal about the problem. You need to include the name of the used software and tools, but never describing the commands. An example:

- Wrong-way*: I double-clicked on the layer, went to the symbology tab, selected the field Population and created a map with 5 classes.*

- Correct Way: *I used the field Population in the attribute table in order to create a thematic map with the population of Lisbon.*

2. All the maps in the Report should be visually pleasing and with high quality.

3. The methods section should cover a description with all the used data sources (metadata) and software. All steps must describe, and it is advisable to include a diagram that should synthesize the developed work. If you use the Model Builder representing your methodology that will be positively graded.

4. The report must be written in English

5. All figures and maps must contain a caption, numbering and a source (if the figure isn't yours).

6. The Report should not exceed 10 pages. Anything else should be in the Annex.

5. PROJECT SUBJECT

THE PROJECT SUBJECT IS OPEN!

What do we mean by open? Well, you can choose what you prefer to do. It can be an environmental problem, a demographic issue, or a business analysis. Use the available data resources and build your project. You'll need to **use Geographical Information System Multi-Criteria Assessment (GIS-MCA)** in line of what you've learned in class.

You have until the **2ⁿᵈ of October** to send to susana.marques@novaims.unl.pt a project subject draft, with a provisory title and a small summary of what you intend to do (so that, the Professor can determine if it is a possible subject in the context of the curricular unit or not). A recommended project subject file to be delivered to the teacher should include the following: group number; students ID and name; summary; keywords; goals; study area; data sources; expected results.

CONTEXT: You need to create a clear context for your project. This means you need to explain, for example, the company's market, or the research that it is needed, or anything else you want to work on.

SCENARIO: In this point, you will need to explain the details mentioned on the context.

What organization (company/research institute/governmental entity) did you choose?

What is this organization asking you to do? What kind of analysis/research?

Why is this analysis/research necessary? What are the objectives?

What is you part in this analysis/research? Imagine you work for this organization and your superiors give you the task to answer an important question, by using spatial analysis and Geographical Information System Multi-Criteria Assessment (GIS-MCA). What question is this?

Your goal is to use spatial analysis to make the best decision according to a set of established criteria. We can define this type of approach as a suitability analysis.

You may want to consider the following aspects:

- Topographic parameters (slope, aspect, elevation; http://srtm.usgs.gov)

- Population (Census data)

- Proximity to roads (Teleatlas)

- You can use Google Sketch Up to do 3D model.

- In the methodology section, you can explain your methods by creating a visual model with model builder. That will be a plus!

- You can create hypotheses based on evidence and choose the most appropriated one.

- You will need to weight each criterion that you would apply in your analysis.

- As you acknowledge, your best location for whatever you are trying to locate is not random. It should be considered by your own criteria which need to be clearly explained. You must produce certain maps until you find the final location. Use your business and spatial skills to produce a good result! GIS will lead and help you to get the best answer!

- Try to maximize the input of tools and analysis that you learned in the classes, but don't just limit to those; Use specific GIS analysis tools such as network analyst. Yet do not use a geoprocessing tool "just because". You need to have a purpose to use certain tools for certain specific spatial analysis, thus, avoiding noise in your analysis. It is important that you state how and why you use a specific tool and for which purpose.

- **Remember:** It is mandatory to use at least 3 different criteria in which you will apply 3 different spatial analysis techniques.

- Be creative! Create a scenario that looks real!

6. DATA

You'll need to collect several spatial and alphanumerical data on your own.

The following bullet points suggest **some free data sources** and related information that you **should search on the internet** and perchance add to your analysis:

- **Geofabrik**

- **Official Administrative map of Portugal (CAOP).** CAOP represents the official administrative limits for Portugal You can download the shapefile (use Mozilla Firefox browser) and clip Lisbon´s area:

    - Go to : http://mapas.dgterritorio.pt/inspire/atom/CDG_UA_Continente_Atom.xml and search for "CAOP"

- **Land Use Land Cover map of Portugal** (COS). COS is a vector data model with a thematic nomenclature of 48 land cover classes. You can download the shapefile (use Mozilla Firefox browser):

    - Go to : http://mapas.dgterritorio.pt/inspire/atom/CDG_UA_Continente_Atom.xml and search for "Carta de Uso e Ocupação do Solo"

- **Census 2021 Data -** The lowest and more detailed level is "Subsecção Estatística".

    - https://censos.ine.pt/xportal/xmain?xpgid=censos21_main&xpid=CENSOS21&xlang=pt

- **Statistics Portugal** (INE):

    - http://www.ine.pt/

- **Geodados – Geographic open data from Lisbon Municipality:**

- https://geodados-cml.hub.arcgis.com/datasets/vidr%C3%B5es

- **Urban Atlas:**

    - https://land.copernicus.eu/local/urban-atlas

- **European Settlement Map:**

- https://land.copernicus.eu/pan-european/GHSL/european-settlement-map

- **European Digital Elevation Model:**

  - https://land.copernicus.eu/pan-european/satellite-derived-products/eu-dem

- **Global Digital Elevation Model:**

  - https://earthexplorer.usgs.gov/

- **You have other sources to explore if needed. Even if you do not use them, you may have an idea and register on where you can find free and sometimes open GIS data. Below are some examples:**

  - https://www.pordata.pt/

  - http://www.diva-gis.org/gdata

  - https://dados.gov.pt/pt/datasets/

  - https://earth.google.com

  - https://www.google.pt/maps/

  - https://www.openstreetmap.org

  - http://www.mapcruzin.com/free-portugal-arcgis-maps-shapefiles.htm

  - http://www.arcgis.com/home/group.html?id=24838c2d95e14dd18c25e9bad55a7f82#overview

  - http://hub.arcgis.com/pages/open-data

  - https://gisgeography.com/best-free-gis-data-sources-raster-vector/

  - https://gisgeography.com/free-satellite-imagery-data-list/

  - https://en.wikipedia.org/wiki/List_of_GIS_data_sources

  - https://ec.europa.eu/jrc/en/PVGIS/downloads/data

  - https://www.eea.europa.eu/data-and-maps/data/natura-12

7. ESRI STORY MAPS

When you finalize your work, you will need to tell your story in a compelling way with a Story Map! Citing ESRI: "Story Maps let you combine authoritative maps with narrative text, images, and multimedia content. They make it easy to harness the power of maps and geography to tell your story."

This will be the tool that you need to use to present your work. During the semester, you will have dedicated classes to try ESRI Story Maps.

- **ESRI Story Maps –** http://storymaps.arcgis.com/en/