GEOSPATIAL DATA- ANALYSIS, VISUALIZATION AND INTERPRETATION USING MACHINE LEARNING

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***Abstract**: About 35,000 years ago, on the walls of caves near Lascaux, France, Cro-Magnon hunters drew images of the animals they hunted, imitating the structure of geospatial data with two elements, namely an image associated with attribute information. At the beginning of the twentieth century, with the development of computerized hardware, new data analysis software for making maps, the first algorithms for managing these spatial data appear. Today, the analysis, visualization, and statistical interpretation of geospatial data can be solved using various modules developed in machine learning such as: Python, Matlab, Carto, etc. These languages use different web libraries: Google Maps, Web Map Service (WMS), Global Maps, etc. depending on the result of viewing geospatial data on the user's map.*

Starting from these arguments, in the scientific paper we will present the analysis, visualization, and interpretation of geospatial data using computer applications, which can combine data with base map layers from multiple sources in a single map display.

***Keywords:** machine learning, data, analysis, visualization, maps*

1. Introduction

Maps have been one of the most important human inventions of the millennia, allowing people to explain and navigate the world. Before the advent of computers, analysis and processing programs, the Internet, maps were created manually to "discover" and shape the world as we know today, being engraved in clay representing the first space areas.

Figure 1. Babylonia (https://storymaps.arcgis.com/)

The evolution of these clay maps has led to the creation of much more accurate maps and the ability to store and manipulate them digitally, thanks to the technology that has changed continuously thus responding to the new requirements of generations of producers and users.

Figure 2. Modern Age in making maps (https://www.swisstopo.admin.ch/en/knowledge-facts/maps-and-more/map-production/technology.html)

In the twentieth century, aerial photography, satellite imagery and remote sensing provided efficient and accurate methods for mapping physical characteristics, such as coasts, roads, buildings, river basins and topography.

Modern cartography is a lot of theoretical and practical foundations of geographical information systems (GIS) and the science of geographical information (GISc) so that it has changed immensely in the last decade. With the appearance of data extraction, of learning machines, of mobile applications, of the Internet and other recent additions to the landscape of computing, there are orders of magnitude more data available on each field of use, and the race to make things useful and interesting is in full acceleration [1].

2. New perspectives of machine learning for geospatial data

Many people have become familiar with Free Online Services such as: Google Maps and OpenStreet, such as Google Maps Engine, have made the exact maps of the world more accessible than ever. In fact, there are many alternatives that better suit specific needs, whether these needs display something very basic with a minimum level or a complex application with many components and various integrations.

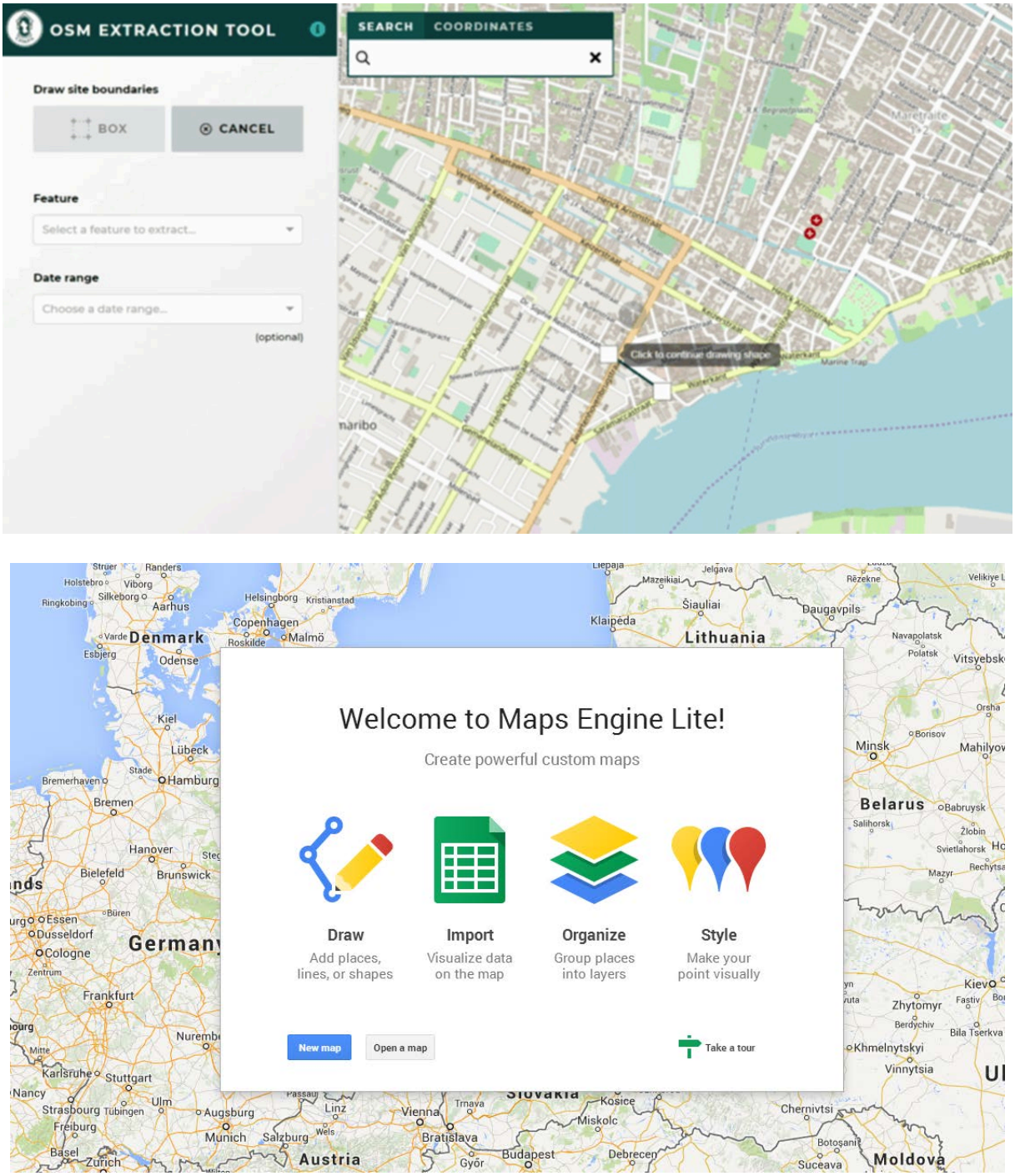

Figure 3. Free Online Services

Creating satellite images that can be analysis using the Copernicus Sentinel, Landsad, etc. database leads to storing large data when we want to make thematic maps for analysis and visualization.

The storage of this information can be done using program languages that use these databases for the analysis, visualization, and statistical forecasts of different types of maps. Machine learning is revolutionizing digital and data-intensive disciplines by offering tools to analysis and extract valuable information from very large quantities of unstructured data [2].

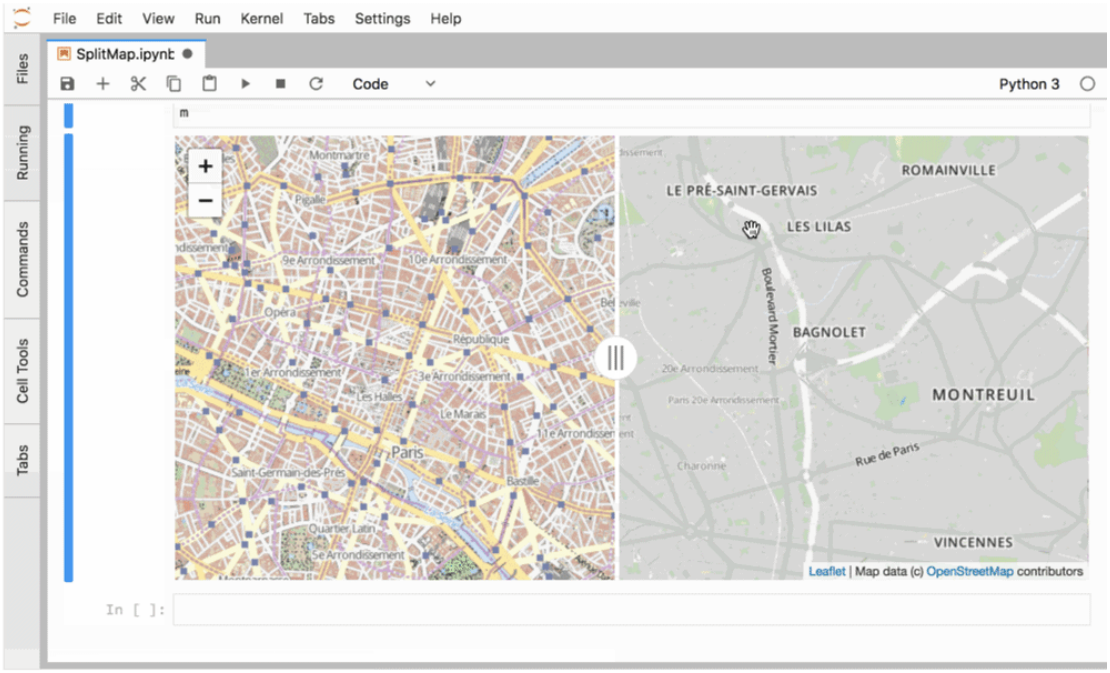

Figure 4. Interactive maps visualization in machine learning

3. Conclusions

Machine learning is adaptive, extremely powerful universal tools that provide modules for: analysis and modelling geospatial data, viewing data, such as modelling and extracting predictions of models for data exploitation and forecasting.

It should be noted that being data-based models, in-depth knowledge of users is needed to be applied correctly and efficiently from pre-processing geospatial data to interpretation and justification of results.

4. References

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