PMS 509 Knowledge Technologies
Class Project. **Due on: March 31**

Design Mobile Applications using Copernicus Service Products that are made available as Linked Geospatial Data

(Grade: 25%)

February 26, 2019

Copernicus (http://www.copernicus.eu/main/overview) is a European Union Programme aimed at developing European information services based on satellite Earth Observation (EO) and in situ (non-space) data. Vast amounts of global data from satellites and from ground-based, airborne and seaborne measurement systems are being used to provide information to help service providers, public authorities and other international organisations improve the quality of life for the citizens of Europe. The information services provided are **freely and openly** accessible to its users.

The Copernicus Services transform this wealth of satellite and in situ data into value-added information by processing and analysing the data. Datasets stretching back for years and decades are made comparable and searchable, thus ensuring the monitoring of changes; patterns are examined and used to create better forecasts, for example, of the ocean and the atmosphere. Maps are created from imagery, features and anomalies are identified and statistical information is extracted.

The Copernicus programme is a cornerstone of the European Union's efforts to monitor the Earth and its diverse ecosystems, whilst ensuring that we are prepared and protected in the face of a natural or man-made disaster. But Copernicus can also drive economic growth (http://publications.europa.eu/resource/cellar/cb805ac6-bc49-11e6-a237-01aa75ed71a1.0001.04/DOC_1), because it can act as a data source for applications and services. It is a symbol of European strategic cooperation in space research and industrial development. The images and data from a constellation of satellites and in-situ components are used by a wide range of economic sectors with applications in precision farming, civil protection and insurance, oil & gas exploration, meteorology or urban monitoring, to name just a few. Sales of data, value added services and applications related to Earth Observation, are undergoing a remarkable growth with an average annual rate of more than 13%. The close link between satellite images and the wider geoinformation products sector reinforces the strength of these downstream markets. The increasingly central role of Big Data is leading to the downstream development of commercial activities.

While Copernicus data are very useful, they have not been officially released in formats or via tools popular among mobile developers, nor have they been offered as linked open data. Offering intuitive tools the community can use to link its information to Copernicus data will make Copernicus an increasingly essential node in the web of data, which means it will see more exposure and usage by the crowd without the need for additional investment.

In this project you should use various data that are available as linked open data on the web, along with the Corine Land Cover dataset for Greece (http://linkedopendata.gr/dataset/corine-land-cover-of-greece) and design a mockup application for scientific or citizen use. You are able to use any of the datasets that you have already used in past exercises (e.g., GADM, Kallikratis, DBpedia, YAGO) along with any other dataset that you are able to find. A good start would be the LOD cloud.

This project will be carried out in two stages:

STAGE 1: Transformation into RDF
Transforming data into the RDF model consists of two basic steps: (i) design an ontology and (ii) use this ontology to transform the data using a parser.

When facing the transformation problem in Linked Data, in most cases it is easy and straightforward to transform the data in RDF using the tool GeoTriples. GeoTriples is a tool for transforming data from their original formats (e.g., shapefiles or spatially-enabled relational databases) into RDF and can also handle geospatial information. The following input formats are supported: spatially-enabled relational databases (PostGIS and MonetDB), ESRI shapefiles and XML, GML, KML, JSON, GeoJSON and CSV documents.
If the a dataset of your choice has an active SPARQL endpoint, you can use that in your queries to combine it's information with the other sources.

STAGE 2: Application Design
Using the selected datasets, you will design a mobile mockup application that shows how Earth Observation data can be enhanced and assist us in our scientific or societal needs. You do not need to implement a full working application. You should create a mockup with some of the functionality that will help us understand your scenario, the use of EO data and the role of the application.

For this purpose, you will create a map using the tool Sextant, that illustrates some of the GeoSPQRQL queries you used in your application. Sextant is a web based and mobile ready platform for visualizing, exploring and interacting with linked geospatial data. The core feature of Sextant is the ability to create thematic maps by combining geospatial and temporal information that exists in a number of heterogeneous data sources ranging from standard SPARQL endpoints, to SPARQL endpoints following the standard GeoSPARQL defined by the Open Geospatial Consortium (OGC), or well-adopted geospatial file formats, like KML, GML and GeoTIFF.

Finally, you will make a presentation of your work in a date that will be announced. For this presentation you will prepare some slides that present the data that you used and your idea for the application, along with the mockup/app/map that you have created with some sample GeoSPARQL queries in Sextant.