

COS787 – Spatial databases



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Assignment 1: UML and PostGIS

Due Date: 13 March 2019 (Wednesday)

Instructions:

1. **This practical assignment should be completed in groups of two.**
2. Practical assignment 1 consists of two sections. Complete ALL TWO sections.
3. Include ALL THE CODE in your submission, as you will have to execute and demonstrate the code during for practical assignment 1. **Submit your deliverables by 13 March in a single ZIP file containing two folders, one for each section.** Students whose submissions are not received on ClickUP, will not be allowed to demo their assignment (*Hint: To avoid disappointment, submit an intermediate solution on Wednesday evening*).
4. An online booking system will be available a week before the deadline. Book a **30 minute** time slot for your practical assignment. During the demonstration, you will be asked to demonstrate (including execution of queries) and explain what you have done. You are allowed to bring your own laptop to the demonstration, but you will have to demonstrate and execute the files from the Click UP submission (the ZIP file will be given to you on a USB stick). **Make sure that everything works – there will be no additional time.**
5. Refer to the end of the document for various resources that might be useful.
6. Plagiarism will not be tolerated. Refer to the UP-plagiarism policy on the library website at <http://www.library.up.ac.za/plagiarism/index.htm>

Section	Marks
Section 1 (UML)	25
Section 2 (PostgreSQL and PostGIS – vector)	40
Impression mark	5
Total	70

Deliverables:

The table below describes the deliverables required for the practical assignment 1.

Question	Deliverable
Section 1	Digital copy of the UML model uploaded to ClickUP (PDF) and a printout of the UML model for the demo.
Section 2	SQL file with the queries uploaded to ClickUP. You will be asked to execute the queries and explain them.

Section 1 (UML):

[25]

OpenStreetMap (<https://www.openstreetmap.org>) is a collaborative project to create a free editable map of the world. The OpenStreetMap (OSM) data model is quite powerful, yet simple. It uses tags, nodes, ways, relations and identifiers.

Read more about the OSM data model here, <http://en.flossmanuals.net/openstreetmap/the-osm-data-model/> and http://wiki.openstreetmap.org/wiki/OSM_XML.

To complete this task, you will need to do the following:

- 1.1. Download the OSM data for South Africa from Geofabrik (<https://www.geofabrik.de>). Make sure that you get the data that contains the OSM user information.

Use osm2pgsql to load the data into a PostGIS database. Once the data is loaded, clip the tables to the area of Mossel Bay. [5]

- 1.2. Create a UML model that describes the OSM Mossel Bay map and data. [20]

Note: OSM dumps data only in three main shapefiles: points, lines and polygons, however, you may use more classes.

Section 2 (PostgreSQL and PostGIS – vector):

[40]

This section consists of two main tasks: firstly, implement the UML design from section 1 and then solve the various questions using spatial SQL queries.

- 2.1. Implement the UML designed Section 1 in PostgreSQL with PostGIS.

Note: Write the SQL queries required for extracting the different classes. For example, you would be able to extract highways from the lines shapefile [20]

- 2.2. Calculate the total length of all roads in Mossel Bay. [2]
- 2.3. Count all the administrative areas that consist of more than one polygon. [2]
- 2.4. What percentage of the Mossel Bay area is covered by buildings? [3]
- 2.5. What is the name of the largest beach in Mossel Bay? [2]
- 2.6. Which roads pass through the Mossel Bay Golf Estate? [2]
- 2.7. How many POI is along the Mossel Bay coast line? [3]
- 2.8. Which user added the greatest number of buildings to OSM for Mossel Bay? [3]
- 2.9. On which date in 2018 was the greatest number of lines edited (meaning existing lines updated)? [3]