

# FOSS Python tools for geospatial analysis - Nishadh K A

## About the speaker

I am a research associate at <http://www.urbanemissions.info/>. My doctoral study was related to interoperable management of data from air pollution monitors and atmospheric models. I used free and open source libraries of Python programming language for the study, especially on geospatial data compilation, analysis and visualisation. Freedom and programmability of free and open source languages such as of R and Python were immense. After Conda python package manager came into existence, Python becomes my primary computing tool. I quickly started to realise its importance and power especially while using it for processing data from global atmospheric model outputs and large geospatial data sources. Python developer and user community is a huge support for me to get help and learn from basic to apply it in most difficult problems in the field of study. Recently I am trying to volunteer local Python user community to improve my programming comprehension and share experiences. I have conducted a workshop related to the topic <https://www.meetup.com/KovaiPy/events/243141335/>

## Abstract

Geospatial representation are so prevalent in day to day life, such as even in simple travel related conversation to maps, aerial images etc. In digital era, geospatial data is extensively produced and consumed in ever growing proportion. Python with its free and open source libraries are giving wide variety yet simple and effective set of tools to analyse geospatial data. The current workshop is directed for beginners of Python programming language, who have basic understanding on computing and data formats. The primary objective of the workshop is to introduce and give hands on training on selected list of FOSS libraries for geospatial analysis. The workshop as a do it yourself fashion tries to solve two real world problems in Geographical Information System (GIS) and its geospatial data sources.

The workshop comprised of three components:

### Component 1

Python environment and work flow setup, an assisted task of setting up the Anaconda distribution and Jupyter notebook setup. Setting up the Geographical Information System (GIS) environment with extended discussion. Setting up of GIS tools such as QGIS and Google earth. This component is comprised of four exercises. 1. Introduction to vector data, 2. Introduction to raster data, 3. binary and text file formats of geospatial data, 4. Introduction to tools of GIS, 5. Introduction to literal programming- Jupyter notebook

### Component 2

Find characteristics of road network(type of road network, length of the type) within a 1X1 km grid. The data source is Open Street Map (OSM) road network data on a city level (60X60km size). This operation is operationally simple such as measure a line feature but computationally intensive as the operation comprised of geometry within operation on dense road network seen in urban setup. Libraries such as Shapely, Fiona, Geopandas and rtree index will be used for the fast processing of this operation. This component comprised of three exercises 1. Find distance between two points 2. Find distance between two points constrained by another vector 3. Find distance between large number of points in for loop

### Component 3

Find cloud cover percentage over area of interest. The data source is Landsat satellite imagery. Searching cloud free Landsat images over an Area of Interest for a temporal extent of a year or more is manual and time consuming. Applying cloud cover detection algorithm could make this operation automatic. Libraries such as rasterio, Geopandas, Fiona, and libraries related to lands at algorithms will be used for this task. This component comprised of two exercises 1. Convert the imagery in geotiff into numpy arrays 2. Apply the algorithms to find the cloud cover

## Prerequisite

1. A laptop with 64 bit OS
2. Docker software installed and running with container image named jupyterhub/jupyterhub
3. Test and setup the docker container with other python libraries listed in workshop github repo <https://github.com/nishadhka/FOSS-Python-GeospatialAnalysis>

4. Sample data set downloaded from the workshop github repo
5. Installation of following software
  - A. Google earth
  - B. QGIS, <http://www.qgis.org/en/site/forusers/download.html>