

Object Oriented Software Engineering: Spatial Algorithms PGGE11106
Semester 2 weeks 6-11, 9am-1pm, room 1.26 Drummond Street

The course assumes a prior working knowledge of the Python programming language and some knowledge of Object-Oriented design principles. It uses these to develop an understanding of computational algorithms used to manipulate and analyse spatial data. A range of examples are used to identify and utilise generic algorithmic principles across a variety of different spatial data types and problems. Concepts of algorithm efficiency are addressed but emphasis is also placed on clarity of design and implementation. There is a strong practical emphasis to learning on the course and it is delivered through a sequence of five, four-hour workshops that allow you to iteratively learn about aspects of algorithm design and then to implement these in practice for yourself. PGGE 11234 Technological Infrastructures for GIS or other equivalent experience is a pre-requisite for this course.

Course Description (week by week breakdown of the course)

Week 1:

Handling Spatial Data: Simple geometric calculations, range searching and data sorting.

Week 2

Divide and Conquer methods: Binary searching, Recursion, Line generalization.

Week 3

Grid Data and Arrays. Handling, traversing and searching raster data. Point and focal functions.

Week 4

Problem solving by task partitioning. Nearest Neighbour analysis and cartogram generation examples.

Week 5

TBC – strike action pending either it will be: Review, Coursework Project Help. Or an unassessed session on integrating Python with ArcMap

Assessment Details

There is an ongoing learning diary (40%) set Monday Week 1 of the course. You are expected to submit a blog entry each week on Learn that reflects on the lecture and reading material and various programming tasks set during the workshops lecture. These tasks will be made clear each week in the lecture/Workshop. Entries are expected for weeks 1, 2, 3 and 4. A programming project (60%) will be set in Week 4 of the course (Monday 19th March) due at the end of Block 4 (Friday 6th April at 12:00).

Reading List:

<http://www.python.org/>

Martelli A, (2009), Python in a Nutshell, O'Reiley

Lutz M, Learning Python(2013), O'Reiley

Sedgewick R, and Wayne K (2011);,Algorithms 4th edition

Westra, E 2015 Python GeoSpatial Analysis essentials. Packt publishing

Learning Outcomes:

On completion of this course the student will be able to:

- Identify how different spatial data models can be implemented in object-oriented designs.
- Have an understanding the principles of algorithm development and of generic concepts employed in algorithm design and be familiar with a range of algorithms used to manipulate and analyse spatial data.
- Be able to develop Python classes suited to the representation and analysis of spatial data.
- Be able to undertake spatial data Input/Output in standard formats and to interface Python with other proprietary software.
- Be able to complete programming and software documentation within specified parameters and to a professional standard.