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Sentrum vir Geografiese Analise • Centre for Geographical Analysis

Advanced Earth Observation short course

Advanced Earth Observation is a course aimed at **intermediate earth observation (EO) practitioners** who require instruction in the principles and techniques fundamental to GEOBIA, including image segmentation, object features, supervised and rule-based classification, use of thematic and ancillary data, and assessment of accuracy in an object-based environment. Upon completion, participants should understand the basic principles of GEOBIA and be able to carry out a GEOBIA workflow in the remote sensing software package of eCognition.

Course structure

Option 1: Accredited option @ R 8 000

The course duration is a total of **8 weeks**. The first **4 weeks** students receive access to lectures and practical exercises requiring about 8 to 10 hours of effort per week. At the end of the 5th week students are required to write an examination. This is followed by a final 3 weeks during which students' complete assignments. Students will be assisted during the course by having access to forums and once weekly online q & a sessions. A preliminary course schedule is provided below.

Students need not be on campus during the duration of this course but need access to a computer loaded with **eCognition Developer 8** and **ArcGIS Pro** software. An eCognition and ArcGIS Pro temporary licence (valid for two months) can be supplied if necessary.

Option 2: Attend-only option @ R 6 000

Students who are not interested in being assessed may choose to **register for the first 4 weeks only** (i.e., only get access to the lectures and exercises and not write the exam or complete any assignments). Students choosing this option will receive a certificate of attendance.

Standard course fees are reduced by 20% for Stellenbosch University students and staff members if paid via an internal university cost point.

Accreditation

This course is accredited by Stellenbosch University, an accredited higher education provider. The content of the course is identical to a component of the three-year BSc GeoInformatics programme that is accredited by the South African Geomatics Council (SAGC). Upon successful completion of both the contact and assessment components, an official Stellenbosch University certificate of competence will be awarded.

Objectives and outcomes

The general aim of this short course is to build on the Introduction to Earth Observation course by exposing students to the advanced techniques in image analysis, focussing primarily on Geographic Object-Based Image Analysis (GEOBIA). The expected outcomes are:

- » Understand and explain the need for pre-processing satellite imagery;
- » Understand and explain the principles of supervised, unsupervised and expert system (rule-based) classification approaches;

- » Describe frequently used image classification algorithms;
- » Understand and explain the need for and application of image transformations;
- » Understand the principals of accuracy assessment and sound field work;
- » Describe the fundamentals of geographical object-based image analysis (GEOBIA);
- » Understand object creation and describe a range of image segmentation algorithms;
- » Describe various image object features, including spectral, textural, geometrical, contextual and relational features.
- » Implement a simple image processing workflow in an object-based environment;
- » Select, apply and assess various image transformations within an object-based environment;
- » Perform a simple accuracy assessment of a object-based classification product;
- » Integrate an earth observation product into a GIS application.

Prescribed reading

There is no prescribed textbook for this course, but participants are encouraged to read the following articles:

- *Geographic Object-Based Image Analysis – Towards a new paradigm* by Blaschke et. al (2014), Available at: <http://www.sciencedirect.com/science/article/pii/S0924271613002220>

- *Object based image analysis for remote sensing* by Blaschke (2010). Available at: <http://www.sciencedirect.com/science/article/pii/S0924271609000884>

- *Multiresolution Segmentation: an optimization approach for high quality multi-scale image segmentation* by Baatz & Schäpe (1999). Available at: http://www.ecognition.com/sites/default/files/405_baatz_fp_12.pdf

Assessments

Students who register for the full course will write an exam in the 5th week of the course. The test will count towards 50% of the final course mark and will contain questions relating to the lectures, exercises and the prescribed reading. A practical assignment will have to be completed within the 3 weeks following the examination. The assignment will include a report in which students must explain the methods used and interpret the results. This will count towards 50% of the final course mark.

Course fees and registration

The course fees are R 8 000 per student (R 6 000 if registering for the first 4 weeks only). Standard course fees may be reduced by 20% for Stellenbosch University students and staff members when paying via an internal university cost point.

To register for this short course:

1. Go to <http://www.shortcourses.sun.ac.za/courses.html> and search under "G" for the relevant course
2. Choose the relevant course and option and proceed with the registration.
3. Make sure to choose the correct **Option** (i.e. 1: Attendance vs 2: Competence)

Please forward any queries to:

Ms Jessica Eichhoff
 Email: eichhoffj@sun.ac.za
 Tel: 021 808 3112
 Web: www.sun.ac.za/cga

Registrations for the course close two week prior to the start date. Please enquire about the availability of seats before paying.

PRELIMINARY COURSE CONTENT AND SCHEDULE

Week 1
Welcome and course orientation
Lecture: Intro to GEOBIA
Practical exercise 1: Introduction to eCognition
Lecture: eCognition segmentation demonstration video
Practical exercise 2: Segmentation
Week 2
Lecture: Image segmentation
Lecture: Object Features
Practical 3: Object features and classification
Lecture: Scale and Hierarchy in GEOBIA
Practical exercise 4: Supervised classification and thematic layers
Week 3
Practical exercise 4: continued
Lecture: Accuracy Assessment and Field Work
Practical 6: Accuracy Assessment
Lecture: Advanced classification
Lecture: Data fusion and image transforms
Week 4
Lecture: Fuzzy classification
Practical exercise 5: Fuzzy classification
Practical exercise 7: Manual Editing
Lecture: LiDAR and Terrain Analysis
Practical exercise 8: Terrain Analysis
Lecture: Expert systems and rule-based classification/processing workflows
Practical exercise 9: Rule-set Development for Urban Land Cover

Only for those doing full course:

Week 5
Theory exam
Week 6 – 8
Assignment