Universitat Autònoma de Barcelona

2022/2023

Methods for Obtaining Geographical Information

Code: 43383
ECTS Credits: 6

Degree	Type	Year	Semester
4314828 Remote Sensing and Geographical Information Systems	OB	0	2

Contact

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Use of Languages

Principal working language: spanish (spa)

Other comments on languages

Approximately 30 % of the classes are in Catalan and 70 % in Spanish. Most of the literature is in English

Teachers

Miquel Ninyerola Casals

Robert Benavente Vidal

Alaitz Zabala Torres

External teachers

Agustin Lobo Aleu

Prerequisites

Prerequisites are not required

Objectives and Contextualisation

At the end of the course, the student will be able to:

1. Master in digitizing and building topology structure, as well as in modelling, and in supervised, unsupervised and hybrid images classification techniques.
2. Proper use of the statistical concepts that sustain the automatic classification of satellite imagery, as well as the elements of the visual image interpretation.

Competences

- Continue the learning process, to a large extent autonomously.
- Identify and propose innovative, competitive applications based on the knowledge acquired.
- Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.

- Use different specialised GIS and remote sensing software, and other related software.
- Use the different techniques for obtaining information from remote images.
- Write up and publicly present work done individually or in a team in a scientific, professional context.

Learning Outcomes

1. Continue the learning process, to a large extent autonomously.
2. Identify and propose innovative, competitive applications based on the knowledge acquired.
3. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
4. Show expertise in using digitalisation and topological structuring tools, modelling tools, and tools for supervised, unsupervised and mixed image classification.
5. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
6. Work with the statistical concepts underpinning the automatic classification of satellite images, and the most suitable criteria for visually interpreting remote images.
7. Write up and publicly present work done individually or in a team in a scientific, professional context.

Content

PHOTOINTERPRETATION

1. Visual techniques for identifying covers
2. Recognition of different types of covers
3. Photointerpretation: Main applications in the study of the natural and artificial environment
4. Interpretation of multispectral images
5. Cartography of support for photointerpretation

STATISTICAL METHODS

1. Introduction to multivariate data. Characterization of distributions. Normality test. Correlation. Implications in Remote Sensing. Standardization. Principal Component Analysis
2. Statistical distances between individuals, populations and between individuals and populations. Implications of the scaling of the variables. Divergence measures
3. Obtaining new information (multitemporality, collateral data, indexes and transformations). Information reduction from the samples and from the variables. Introduction to obtaining continuous variables and categorical variables: linear and non-linear, simple and multiple regression, classification, etc.
4. Multiple regression applied to the interpolation of climatic surfaces
5. Generalized linear models applied to obtaining suitability surfaces based on the ecological niche modelling
6. Hierarchical and non-hierarchical classification. Supervised, unsupervised and hybrid classification; fuzzy classification
7. Segmentation of images. Scales and scene models. Processing methods that take spatial information into account. Segmentation methods. Classification by segments
8. Neural networks
9. Generalization of results in categorical cartography. Direct methods and smart methods
10. Verification of results in binary cartography. Sampling
11. Verification of results in categorical cartography. Sampling

Methodology

In this module there are 3 groups of learning activities:

Targeted activities consist of classes of theory and practices that will be carried out in a specialized computer room. At the beginning of each of the subjects that make up the module, the teachers will explain the structure of the theoretical-practical contents, as well as the evaluation method.

Supervised activities consist of classroom practices that will allow you to prepare the work and exercises of

each subject, as well as tutorial sessions with the teachers in case the students request it.

Autonomous activities are a set of activities related to the elaboration of works, exercises and exams, such as the study of different material in the form of journal articles, reports, data, etc., defined according to the needs of autonomous work of each student

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Master classes / exhibitions	38	1.52	4, 2, 6, 3, 1, 7, 5
Type: Supervised			
Classroom practices	35	1.4	4, 2, 6, 3, 1, 7, 5
Tutorials	2	0.08	4, 2, 6, 3, 1, 7, 5
Type: Autonomous			
Personal study	10	0.4	4, 2, 6, 3, 1, 7, 5
Reading of articles / reports of interest	1	0.04	4, 2, 6, 3, 1, 7, 5
Writing reports	64	2.56	4, 2, 6, 3, 1, 7, 5

Assessment

The evaluation of this subject consists of the following system:

- The accomplishment of different practical works proposed throughout the teaching of the module and delivered within the fixed term, that will be worth the 100% of the final note. A correct formal presentation and careful preparation will be assessed.

Aspects to take into account.

- Regular class attendance is highly recommended in order to follow the lessons properly. Follow on through streaming is only justified in cases of physical impossibility for face-to-face assistance, since an important part of the experiences and learning are fully achieved through contact with the teaching staff and classmates.

- If you have to deliver practical work, this delivery must be done within the deadlines for them to be evaluated.

- On carrying out each evaluation activity, Lecturers will inform of the procedures to be followed for reviewing all grades awarded, and the date on which such a review will take place.

Extraordinary exams.

- The exams or other evaluation procedures not reaching the minimum mark of 5 out of 10 must be repeated. This extraordinary exam is unique.

- Students will have the opportunity to take a extraordinary exam the day or days scheduled by the faculty.

Cheating: Copies and plagiarisms.

By copies, we refer to the evidence that the work, project, exam, etc has been partially or totally created/answered without the intellectual contribution of the author. In this definition, we also include the proven attempt to copy in the exams and delivered works and projects and the violation of the laws that assure intellectual authorship. Plagiarisms refer to the works and texts from other authors that someone pretends to be his/her own creation. It is a crime against intellectual property. In order to avoid committing plagiarism, quote all the sources that you use when writing the report of a project. According to UAB's law, copies and plagiarisms or any other attempt to alter the results of one's own evaluation or someone else's -allowing to copy, for example- implies a result in the corresponding part (theory, problems or practical tasks) of a 0 and, in this case, the student will fail the subject. This does not limit the right to take academic and legal actions against those who have participated. See UAB documentation about copies and plagiarisms http://wuster.uab.es/web_argumenta_obert/unit_20/sot_2_01.html

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Preparation of works	100 %	0	0	4, 2, 6, 3, 1, 7, 5

Bibliography

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Software

MiraMon, ArcGIS, QGIS, ENVI, Office Microsoft