Universitat Autònoma de Barcelona

2023/2024

Data Compression Technologies

Code: 105073
ECTS Credits: 6

Degree	Type	Year	Semester
2502441 Computer Engineering	OT	4	1

Contact

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Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Teachers

Joan Serra Sagrista

Prerequisites

- Basic concepts of Linux and bash.

Objectives and Contextualisation

The aim of the subject of Data Compression Technologies is to acquire specific knowledge about data compression systems. This allows students to have sufficient ability to evaluate the performance and features of compression systems for a specific scenario, as well as design / modify existing systems. This subject allows to build a knowledge base to develop the final degree project (TFG) related to this topic and / or continue with related postgraduate studies. The possibility of simultaneous this subject and the TFG is contemplated.

Competences

- Acquire personal work habits.
- Acquire thinking habits.
- Capacity to design, develop, evaluate and ensure the accessibility, ergonomics, usability and security of computer systems, services and applications, as well as of the information that they manage.
- Capacity to design, develop, select and evaluate computer applications and systems, ensuring reliability, security and quality, in accordance with ethical principles, and applicable standards and legislation.

- Have the capacity to conceive, draft, organise, plan, develop and sign projects in the field of computer engineering for the conception, development and exploitation of computer systems, services and applications.
- Have the capacity to select, deploy, integrate and manage information systems that satisfy the needs of an organisation, identifying the cost and quality criteria.
- Work in teams.

Learning Outcomes

1. Analyse the main protocols and know about the international standards and standardisation bodies.
2. Apply basic multimedia content processes for their transmission.
3. Design and evaluate an integrated information system based on its cost and quality.
4. Design, develop, select and evaluate applications, ensuring their reliability and security.
5. Develop a capacity for analysis, synthesis and prospection.
6. Identify performance anomalies and inefficiencies when running a uniprocessor computer program both in terms of computing and memory access, and propose modifications to the program to improve performance.
7. Identify the criteria used to evaluate proposed solutions.
8. Implement basic algorithms for geometrical transformation and modelling (2D and 3D).
9. Know how to use different 1D and 2D data compression algorithms.
10. Work cooperatively.
11. Work independently.

Content

1. Acquisition and data types

2. Basic concepts

3. Decorrelation of the acquired data

4. Quantization

5. Entropy Coding

6. Current data compression systems

Methodology

This subject is taught through a combination of introductory sessions of techniques used in compression and their use in the practices that students will develop throughout the course. For each concept, students will be encouraged to actively participate in solving examples. In addition, for a small set of concepts, a guided practice will be provided, where students will be required to answer a few questions. The Virtual Campus will be used for communication between teachers and students (material, updates, announcements, etc.).

During the course there will be different activities:

Learning activities
• Type: Activities aimed at teachers
o Theoretical classes / conferences
o Practical classes / conferences
• Type: Supervised activities
o Activity supervision practices

o Supervision of oral presentation
o Tutoring and consultations
• Type: Self-employed
o Preparation of the practical activity
o Preparation of the oral presentation activity

During the theoretical and practical classes, the contents of the subject will be presented and debated. They will be active debates in which progress will be made constructively by identifying the main objectives.

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			
Theoretical and practical classes / lectures	50	2	1, 2, 9, 3, 4, 6, 7, 8, 10
Type: Supervised			
Preparing a work supervising	6	0.24	1, 9, 4, 6, 8, 11
Problems and Practicum supervising	6	0.24	1, 2, 9, 4, 6, 7, 8, 10
Tutoring and consultation	5	0.2	1, 9, 4, 6, 8, 11
Type: Autonomous			
Preparing a work	36	1.44	1, 2, 9, 7, 10
Preparing exercices and practicum	40	1.6	1, 2, 9, 4, 7, 8, 10, 11

Assessment

Continuous assessment dates will be posted on the Virtual Campus. Specific deadlines may change - only when necessary. All modifications will always be communicated to students through the Virtual Campus.

The evaluation of the subject (out of 10 points) will be carried out as follows:

1. Solution of exercises, 3 points. As part of the continuous assessment, a series of exercises and/or questions to be solved and/or answered will be proposed in the classes. Minimum score to pass the subject: 1.5 out of 3 points.
2. Project in Python of a data compression tool, 4 points. Minimum score to pass the subject: 2 out of 4 points.
3. Oral presentation, 3 points. It consists of two parts. On the one hand, it will be necessary to make an oral presentation on some topic related to the subject (to be agreed with the teaching staff). On the other hand, in each session where presentations are made by students, all student listeners (not presenters) must ask questions and/or comments related to the content of the presentation. Minimum score to pass the subject: 1.5 out of 3 points.

Active participation in classes in this subject is relevant, as regards the resolution of the exercises, monitoring of the project and the oral presentation. It is for this reason that class attendance for this subject is mandatory.

• To pass the course, an overall grade higher than or equal to 5 is required. A "non-assessable" grade cannot be assigned to students who have made submissions, or who have actively participated in any of the training activities, or who have 'have submitted to the recovery test.

• Recovery test, 6 points. Those students who have a final grade lower than 5. They will be able to pass the subject by doing an extra activity described by the teaching staff.

• To pass the course with honors, the final grade must be 9.0 or higher. As the number of students with this distinction cannot exceed 5% of the number of students enrolled in the course, this distinction will be awarded to the one with the highest final grade. In the event of a tie, the results obtained and the participation throughout the coursewill be taken into account.

• It is important to keep in mind that they will not carry out assessment activities on a date or time other than the established one, except for justified reasons and duly notified before the activity and with the prior consent of the teacher. In all other cases, if no activity has been performed, it cannot be re-evaluated.

• Students who do not pass the grade for not achieving any of the minimum grades will be graded with a maximumof 4.

- Repeating students will not have any special treatment.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exercise resolution	40%	3	0.12	2, 9, 6, 7, 11
Work Part-1	30%	2	0.08	2, 9, 5, 3, 4, 6, 7, 8, 10
Work Part-2	30%	2	0.08	1, 2, 9, 5, 3, 4, 7, 8, 10

Bibliography

- Thomas M. Cover and Joy A. Thomas (1991). Elements of Information Theory, John Wiley & Sons, Inc
- Mark Nelson (1991). The Data Compression Book, Prentice Hall.
- D.S.Taubman and M.W.Marcellin (2002). JPEG 2000. Kluwer Academic Publishers.
- David Salomon (2006, 4th Edition). Data Compression: The Complete Reference(Hardcover), Springer. ISBN 1-84628-602-5.
- Several documentation will be provided to the students according their election of the oral presentation topic.

Software

Freely distributed code provided by teachers. C, Java, Python, Bash, and/or others.