



Subject: Biometrics (BIOM)
Code: 32444
Institution: Escuela Politécnica Superior
Degree: Master's program in Research and Innovation in Information and Communications Technologies (I2-ICT)
Level: Master
Type: Elective [Biometric Security and Videosurveillance]
ECTS: 6

COURSE GUIDE: Biometrics (BIOM)

Academic year: 2015-2016

Program: Master's program in Research and Innovation in Information and Communications Technologies (I2-ICT)

Center: Escuela Politécnica Superior

University: Universidad Autónoma de Madrid

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1. COURSE TITLE

Biometrics (BIOM)

1.1. Course area

Signal Theory and Communications

1.2. Year

First year

1.3. Semester

Second Semester

1.4. Credits

6 ECTS

1.5. Language of instruction

The lectures and lecture notes are in English. Some of the lectures and seminars can be in Spanish.

1.6. Related subjects

It is useful to have previous knowledge in linear systems, digital signal processing, speech and audio processing, random processes and signals, and statistical pattern recognition.

Related subjects are:

- Introduction to the Analysis of Video Sequences
- Machine Learning: theory and applications
- Applied Bayesian Methods
- Temporal Information Processing
- Biomedical signal processing and its applications



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1.7. Faculty data

Add @uam.es to all email addresses below.

Lecturers and labs:

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1.8. Course objectives

En esta asignatura se describen las tecnologías básicas que hacen uso de algún tipo de información biométrica en forma de señales o imágenes tomadas de la fisonomía o comportamiento de las personas para su reconocimiento, verificación o identificación automática o semi-automática. La asignatura comienza con un bloque dedicado fundamentalmente a la detección de personas en secuencias de imágenes y video. El segundo bloque se centrará en tecnologías concretas para el reconocimiento de diferentes rasgos biométricos como la huella dactilar, imágenes faciales, o imágenes del iris; con aplicaciones prácticas en los ámbitos de seguridad e investigación forense.

This subject will describe the basic technologies behind automatic and semi-automatic person recognition, verification, and identification based on biometric signals or images captured from the physiology or the behavior of the people. The first unit of the subject will focus on people detection on images and video sequences, including the most important challenges and its solutions. The second unit of the signature will be focused on specific technologies for different biometric modalities such as fingerprint, face, or iris images; with practical applications in the areas of security and forensic science.



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UNIT BY UNIT SPECIFIC OBJECTIVES	
UNIT 1.- People Detection in Image/Video	
1.1.	Understanding the basic or canonical architecture of any people detection system, and the different processing tasks that imply the automatic people detection in video sequences.
1.2.	Deeply understanding the fundamentals of people detection systems, including object detection and modelling.
1.3.	Deeply understanding the problems of people detection systems and understanding the current approaches to compensate it.
1.4.	Acquire knowledge about performance evaluation mythologies related to people detection.
UNIT 2.- Biometric Recognition	
2.1.	Understanding the methods and basic algorithms for the biometric modalities most important in practical applications: face, fingerprint, iris, voice, signature, handwriting, hand and others.
2.2.	Understanding the most important security of privacy issue related to biometric systems.
2.3.	Understanding the issues and specificities of biometrics applied to forensic science.
2.4.	Knowing the main standards and standardization bodies related to biometrics.

1.9. Course contents

Both Units are divided into the following topics:

1. **People detection in image/video**
 - 1.1. Introduction to people detection in video sequences
 - 1.2. People detection systems
 - 1.3. Critical factors and current solutions
 - 1.4. Performance evaluation
2. **Biometric Recognition**
 - 2.1. Face recognition
 - 2.2. Fingerprint recognition
 - 2.3. Iris recognition
 - 2.4. Signature/handwriting recognition
 - 2.5. Speaker recognition
 - 2.6. Fusion in Biometrics
 - 2.7. Forensic Biometrics



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1.10. Course bibliography

- S.A. Velastin, P. Remagnino, "Intelligent Distributed Video Surveillance Systems", IET, 2006
- O. Javed, M. Shah, "Automated Multi-camera Surveillance: Algorithms and Practice", Springer 2008
- E. Maggio, A. Cavallaro, "Video Tracking: Theory and Practice", Wiley, 2011.
- Selected papers in relevant journals and conferences for topics covered in the course
- Pradeep K. Atrey, Mohan S. Kankanhalli, Andrea Cavallaro, "Intelligent Multimedia Surveillance: Current Trends and Research", Springer 2013
- Introduction to Biometrics, A. K. Jain, Arun A. Ross, and Karthik Nandakumar, Spinger, 2011.
- Handbook of Biometrics, A. K. Jain, Patrick J. Flynn, and Arun A. Ross (Eds.), Springer, 2010.
- Handbook of Fingerprint Recognition, Davide Maltoni, Dario Maio, Anil K. Jain, and Salil Prabhakar, Springer, 2009.

1.11. Coursework and evaluation

The course involves lectures and laboratory sessions. It involves two theoretical evaluations (one per module, TE-1 and TE-2) and two evaluations of the practical work (one per module, PR-1 and PR-2).

In both the ordinary and the extraordinary exam period it is necessary to have a pass grade (≥ 5) in all the theoretical evaluations (TE-1 and TE-2), and positive evaluations of the laboratory work (PR-1 and PR-2).

In the ordinary exam period, the evaluation will be made according to the following scheme:

- 60% exam (mean of TE-1 and TE-2; minimum grade: 5 in both).
- 40% laboratory work (mean of PR-1 and PR-2 minimum grade: 5 in both). **This part has to be passed before the end of the ordinary exam period unless a truly justified reason exists, otherwise the subject will be failed also in the extraordinary exam period.**

The grades of the individual parts are kept for the extraordinary exam period.



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1.12. Schedule

This is a tentative schedule for the course:

- UNIT 1: People Detection
 - Lectures and Labs: 6 weeks
 - Evaluation: 1 week
- UNIT 2: Biometric Recognition
 - Lectures and Labs: 6 weeks
 - Evaluation: 1 week