



IDENTIFYING DATA

(*)Recoñecemento Biométrico

Subject	(*)Recoñecemento Biométrico			
Code	V05M038V01204			
Study programme	(*)Máster Universitario en Teoría do Sinal e Comunicacións.			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	1st	2nd
Teaching language	Spanish English			
Department				
Coordinator	Alba Castro, José Luis			
Lecturers	Alba Castro, José Luis García Mateo, Carmen			
E-mail	jalba@gts.uvigo.es			
Web	http://www.faitic.uvigo.es			
General description	Recognition of people from their biometric traits is entering relentlessly in the society by the push of the applications in security, privacy or natural man-machine interaction. Because of the different nature of the biometric traits and the peculiarities of the information acquisition, preprocessing, feature extraction and pattern matching of [biometric signatures], the study of these technologies has to be addressed with a multidisciplinary vision. In this course we explain the technics of uni- and multi-dimensional signal processing and the technics of pattern recognition that are behind the current biometric systems. Also, less fundamental and more practical aspects of these systems are discussed from a point of view of his real applicability. The main pedagogical aim consists in that the student acquire the skill to use his knowledges on signal processing in an application in which exist external conditionings that impose important operation restrictions and that he/she is able to value the pros and cons of algorithmic decisions that are taken in the design of these systems.			

Competencies

Code	
A12	(*)describir las ventajas y limitaciones de los diferentes sistemas de identificación biométrica
B2	(*)Que los estudiantes aprendan a desarrollar conceptos, teorías o principios originales con los que dar solución a problemas nuevos derivado de avances que hayan tenido lugar en las disciplinas científicas básicas que integran su campo de estudio
B5	(*)Que los estudiantes adquieran habilidades de aprendizaje que les permitan actualizar sus conocimientos de un modo autónomo, consciente y crítico
B8	(*)transmitir el conocimiento adquirido redactando un informe con la extensión adecuada y al nivel exigido por el destinatario del mismo
B9	(*)comunicar con soltura, tanto en castellano como en inglés, por escrito y oralmente, en informes y en presentaciones, las ideas y argumentos para una audiencia determinada
B11	(*)definir, realizar y ejecutar modelos de simulación en un lenguaje de programación de alto nivel como el Matlab o de bajo nivel como el C/C++
B13	(*)demostrar que puede trabajar en equipo de forma coordinada y complementaria y, concretamente en aprendizaje virtual, que utiliza provechosamente las herramientas de e-learning hacia estos objetivos
B14	(*)juzgar críticamente pero de forma positiva los razonamientos de sus compañeros en los foros de la herramienta e-learning y permitir que los demás juzguen los suyos, sacando así provecho de la puesta en común
B15	(*)desenvolverse en un contexto de trabajo internacional, sin prejuicios ni valoraciones infundadas sobre las capacidades de los demás compañeros
B16	(*)demostrar su capacidad para aprender nuevos conceptos, metodologías y técnicas en el campo del procesado de señal y comunicaciones de forma autónoma
B18	(*)tener iniciativa y creatividad en la propuesta de soluciones sistémicas y algorítmicas alternativas a las estándar

Learning aims

Expected results from this subject	Typology	Training and Learning Results
Use of uni-and bi-dimensional signal processing techniques for the extraction and representation of biometric information.	Know How	A12 B2 B5 B9 B16
To know how to describe the pros and cons of the current biometric systems and their main parameters.	know Know How	A12 B8 B9 B11 B13 B14 B15 B18

Contents

Topic	
Principios básicos de las técnicas biométricas, características de los datos biométricos y tecnologías biométricas actuales.	Identity versus biometric traits. Types of biometric traits. Within and between variance of biometric signatures. Sensors dependency of biometric signatures. The seven pillars of biometrics. Feature extraction. Compression. Representation versus discrimination Differences among recognition, identification, verification and authentication. Types of errors: TER, ERR, FAR, FRR. Physiologic features: fingerprints, iris, face, palm, speech. Behavioral features: signature (static and dynamic), speech, expression, typing rate. Specificities, pros and cons when using every biometric trait.
Face recognition	The problem of face detection and normalization. Holistic techniques (eigenfaces, fisherfaces) versus local techniques (template matching, NCC, Elastic Bunch Graph Matching). The problem of variation in face pose and illumination. Shape and Appearance Models.
Iris recognition	Iris representation. Daugman algorithm. Wildes algorithm. IrisCode. Pros and cons of iris recognition.
Fingerprint recognition	Types of sensors. Minutiae representation and local texture representation. Hausdorff distance. Gabor filtering. Deformation tolerance.
Speaker recognition	Gaussian Mixture Models. Universal Model of Speakers. Cohorts. Text dependent or independent speaker recognition. HMM. Intra-modal fusion. State of the art systems.
handwritten signature recognition	Types of sensors. Feature extraction of static signatures: image statistics. Feature extraction of dynamic signatures: temporal parameters. DTW modeling, HMM modeling, Edit distance between chains. The problem of skilled forgeries.
Combination of classifiers	Combination of classifiers. Independent or uncorrelated sources. Classifiers fusion: intra-modal, extra-modal, algorithmic or scores fusion. State of the art systems for multimodal recognition.
(*)Seguridade e privacidade das mostras biométricas	(*)Técnicas de transformación do espazo de características ("salting", "hashing"). Sistemas criptobiométricos (métodos "key-binding" e "key-generation"). Ocultación de datos en biometría.

Planning

	Class hours	Hours outside the classroom	Total hours
(*)Sesión maxistral	25	12.5	37.5
(*)Estudo de casos/análises de situacións	5	22.5	27.5
(*)Foros de discusión	5	8	13
(*) Eventos docentes e/ou divulgativos	10	5	15
(*)Probas de resposta curta	2	30	32

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
(*)Sesión maxistral	Study of the educational material and virtual or real assistance to the seminars. The student has to assimilate the new concepts exposed in the accessible educational material in the Learning Management System. The professors encourage the study by means of complementary readings and questions in the forums.

(*)Estudo de casos/análises de situações	For the most advanced topics the teacher proposes the critical reading of research articles of different qualities and the exhibition of the conclusions.
(*)Foros de discusión	The teacher fosters the critical analysis and the discussion between the student and the professor, privately; as well as the exhibition of arguments and contrast of the same with the other students, so much for the questions realised by the professors and for the review of works of the mates.
(*) Eventos docentes e/ou divulgativos	Virtual or real assistance to the seminars of experts of recognised prestige.

Personalized attention

Methodologies	Description
Sesión maxistral	For these three activities of learning the teachers recommend some hours of personalized attention. The student can consult presentially or virtually his doubts with the professor of the subject or with a invited lecturer. For this he can use the tools enabled in the program: presential query, query by email, query in the forums, chat.
Eventos docentes e/ou divulgativos	For these three activities of learning the teachers recommend some hours of personalized attention. The student can consult presentially or virtually his doubts with the professor of the subject or with a invited lecturer. For this he can use the tools enabled in the program: presential query, query by email, query in the forums, chat.
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Assessment

	Description	Qualification
(*)Estudo de casos/análises de situações	Evaluation of short papers. It could have also evaluation by pairs or evaluation of evaluators.	20
(*)Foros de discusión	Continuous evaluation of the acquired knowledge. Continuous evaluation of the activities: opportunity, precision and originality of the posts.	30
(*)Probas de resposta curta	Evaluation of the tasks and reports. It could have also evaluation by pairs or evaluation of evaluators.	50

Other comments on the Evaluation

Should the student fail to pass the defined activities in the first chance, the coordinator of the subject will tell the student (during the next 15 days after the corresponding semester activities), the assignments that must be completed to pass the subject in the second chance.

Sources of information

Biometrics. Personal Identification in Networked Society, Anil Jain, Ruud Bolle y Sarta Pankanti, Kluwer Academic Publishers,

Recommendations

Subjects that are recommended to be taken simultaneously

(*)Recoñecemento de Fala/V05M038V01203

(*)Visión Artificial/V05M038V01110

Subjects that it is recommended to have taken before

(*)Recoñecemento Estatístico de Patróns e Redes Neuronais/V05M038V01103