Universitat Autònoma de Barcelona

2018/2019

Support Systems for Diagnosis and Intervention

Code: 44027
ECTS Credits: 6

Degree	Type	Year	Semester
4316624 Internet of Things for e-Health	OT	0	2

Contact

Name: Debora Gil Resina

Email: Debora.Gil@uab.cat

Use of languages

Principal working language: english (eng)

Teachers

Enric Martí Godia

Aura Hernández Sabaté

External teachers

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Prerequisites

Knowledge of programming languages (prefearably C++, Python or Matlab) and good mathematical background is highly recommended

Objectives and Contextualisation

An important area of application within IoT for digital health are the systems of support to the clinical decision making (diagnosis and intervention). To facilitate its use in the largest number of clinical centers, these systems are beginning to develop as a service in the cloud (Diagnosis as a service). This module provides the student with the necessary techniques through use cases.
A cloud diagnostic service requires a client application that allows the interactive visualization of large volumes of augmented multimodal data with clinically relevant information extracted using AI-specific techniques and processing Image in the cloud. AI techniques and image processing should be able to customize the models for each patient efficiently in order to have all the information in the same intelligent intervention room that allows the doctor to interact with the application without Alter the usual protocol. In addition, the clinical validation of the system requires the use of statistical techniques that allow to contemplate the variability between clinical experts and possible replicas in the experimental design

Skills

- Analyse and model phenomena with data, graphics and complex images in the context of IoT in the area of health using techniques of probability, statistics and artificial intelligence.
- Apply basic research tools in the area of IoT in health.
- Apply the ethical rules applicable in the health sector.
- Continue the learning process, to a large extent autonomously.

- Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
- Understand, analyse and evaluate theories, results and developments in the language of reference (English) as well as the mother tongue (Catalan, Spanish) in the area of IoT in health.

Learning outcomes

1. Apply basic research tools in the area of IoT in health.
2. Continue the learning process, to a large extent autonomously.
3. Identify the basic problems to be solved in graphic computing, as well as the most optimal specific algorithms in a support system for clinical decision-making installed in the procedures room.
4. Identify the best applicable methodologies for the conceptualising, designing, developing and evaluating of an application that requires image processing from medical scanners and videos to obtain personalised patient models.
5. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
6. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
7. Understand the ethical consequences of using support systems for diagnosis and intervention.
8. Understand, analyse and evaluate theories, results and developments in the language of reference (English) as well as the mother tongue (Catalan, Spanish) in the area of IoT in health.

Content

• Interactive visualization devices and interfaces
• Animation and graphics techniques
• Virtual and augmented reality
• Definition of GroundTruth and variability between observers
• Multiple multifaceted replicas, random effects regression models
• CrowdSouring Techniques for data collection
• Modeling of the anatomy and physiology of the patient
• Advanced Medical Scanner processing techniques: 3d reconstruction methods, multimodal data integration

Methodology

We will follow a problem based methodology, so learning will we based on the solution of usage cases related to real applications in the field of Iot. Students will be provided with the basic materials and tools required to solve each usage case. Teachers will also give some explanations at some lectures in order that students can understand usage cases and the provided tools. The remainining lectures will focus on helping students to solve the proposed usage cases and extending explanations related to techniques.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Lecture Sessions	50	2	3, 4, 7
Type: Supervised			
Tutorized classroom activities (resolution of usage cases)	92	3.68	1, 2, 3, 4, 5, 6, 7, 8

Evaluation

Resolution of Usage Cases. Following a PBL methodology, students will solve some usage cases in groups and with the help of the teacher (who will take the role of expert) during the course.

Individual Tests. Students' capability to apply the techniques will be also evaluated individually.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Individual Tests	up to 50%	2	0.08	1, 3, 4
Resolution of Usage Cases (Project)	up to 50%	6	0.24	1, 2, 3, 4, 5, 6, 7, 8

Bibliography

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Hosmer, D.W, Jr and Lemeshow, S. (1989), Applied Logistic Regression - John Wiley & Sons, Inc.

A. Watt, , 3rd edition, , 2000. 3D Computer Graphics Addison-Wesley

P. Shirley, Fundamentals of Computer Graphics, 3rd ed., AK Peters, 2002