230561 - IMPROCES - Image Processing in Biophotonics

Degree competences to which the subject contributes

Transversal:
1. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
2. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding how companies are organised and the principles that govern their activity, and being able to understand employment regulations and the relationships between planning, industrial and commercial strategies, quality and profit.
3. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.
4. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.
5. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibily and making commitments in view of the resources that are available.

Teaching methodology

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Learning objectives of the subject

This subject overviews several advanced topics on digital image processing; especial emphasis is made on biophotonics applications. The course provides an in-depth treatment of advanced image processing techniques, emphasizing software principles and practical implementation. This is a hands-on course and a basic knowledge of the MATLAB/Octave computing environment is required.

BIBLIOGRAPHY

Further reading
230561 - IMPROCES - Image Processing in Biophotonics

- 3D deconvolution package for microscopic images, http://bigwww.epfl.ch/algorithms/deconvolutionlab/
- Detecting cells using imatge segmentation

Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group:</th>
<th>22h 30m</th>
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<td></td>
<td>Hours medium group:</td>
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<td>Hours small group:</td>
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<td></td>
<td>Guided activities:</td>
<td>2h 15m</td>
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<td>Self study:</td>
<td>50h 15m</td>
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Content

1.- Fundamentals

Degree competences to which the content contributes:

Description:
1.2.- Intensity transformations and Spatial Filtering.
1.3.- Colour image processing.
1.4.- Frequency (Fourier) domain processing.
1.5.- Image restoration algorithms.
1.6.- Image/video capture.

2.- Applications

Degree competences to which the content contributes:

Description:
2.1.- Point spread function analysis and restoration in optical microscopy.
2.2.- Single particle tracking.
2.3.- Cell segmentation.

Qualification system

- Students have to implement one of the algorithms analyzed in the course, providing examples of how it is used in practice. A written report of his/her work is required (100%)
Bibliography