

# TEMA DE PROYECTOS FIN DE CARRERA (PFC-PLAN 2000)

**Título del tema:** ‘Hyperspectral Imaging’, ‘Machine Learning’ and ‘High-Performance, Reconfigurable Embedded Systems’

**Departamento:** Ingeniería Telemática y Electrónica

**Nº de alumnos que podrían realizar su PFC en este tema:**

6

## Descripción del tema:

This research-oriented proposal goes into the exciting and promising world of *High Performance, Reconfigurable Embedded Systems* for *Machine Learning* and *Hyperspectral Imaging* (high-dimensional data processing) applications. Cutting-edge manycore processors for the embedded domain featured by low power consumption and restricted memory, such as *massively parallel processor arrays* and embedded *GPGPUs*, as well as newly heterogeneous and dynamically reconfigurable *FPGAs*, are being used to work as accelerators of the main system processor to achieve real time processing.

*Hyperspectral Imaging* (HI) is an emerging technology that collects hundreds of narrow and contiguous bands from the electromagnetic spectrum, instead of just the three bands used in typical RGB images. The resulting massive spectral/spatial information is a data-cube composed of a series of images captured at different wavelengths. By analyzing the reflectance of every spatial pixel in the hyperspectral image, a better determination of the underlying chemical structure of the material under evaluation is achieved.

*Machine Learning* (ML) has arisen in the last years as an effective tool able to deal with the increasingly large amounts of data being generated in very different scenarios (from personal portable computing to scientific disciplines and business domains). Using ML, computers are provided automatic learning capabilities without being explicitly programmed to by using algorithms that learn and predict from data.

We are currently combining HI processing and ML for real-time *brain cancer detection*, providing surgeons in the operating room with a classification tool that automatically detects tumour boundaries and shows the computed cancer probability for each pixel in the image.

## Requisitos para realizar el PFC en este tema:

The candidates have ideally acquired the standard set of outcomes from their Program, with an emphasis on either C programming for microprocessors or FPGA-based design. Additional skills on any or similar topics to the following, are a plus: multi/many-core and heterogeneous devices (Massively Parallel Processor Arrays, GPGPUs, FPGAs), OpenCL, OpenMP, CUDA, Python and Octave/Matlab.

You have a basic understanding of English to deal with the documentation and learning process, as well as high motivation for research-oriented design projects.

## Profesores que serán tutores de los PFC:

Nombre y apellidos	Correo electrónico	Despacho
Rubén Salvador Perea	<a href="mailto:ruben.salvador@upm.es">ruben.salvador@upm.es</a>	A4204
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**Más información (tablonés de anuncios, páginas Web, etc.):**

Madrid, 17 de Febrero de 2017

## **OFERTA PFC DEPARTAMENTO DTE** **(ÁREAS: TELEMÁTICA y ELECTRÓNICA)** **PRIMAVERA 2016-17**

### **Procedimiento y plazos para solicitar el PFC en el Dpto.**

- La oferta de PFC se publicará el jueves 23 de febrero en los tablones del dpto. (4ª planta) y en la web de la ETSIST (oferta global).
- El plazo de presentación de instancias de Proyecto Fin de Carrera en el Departamento será desde el miércoles 1 de marzo hasta el miércoles 8 de marzo de 2017.
- Las instancias se recogerán y entregarán una vez cumplimentadas en el despacho nº A4427 (en caso de no estar la Secretaría abierta, la instancia se dejará en los buzones que hay en la entrada del Dpto.). Junto con la instancia, es necesario adjuntar un listado de notas.
- La publicación de los alumnos asignados a los temas se realizará el día **16 de marzo de 2017**.

Madrid, 23 de febrero de 2017