

# **Reunió informativa Graus TIC-UPF**

## **Curs 2024-2025**

9 d'abril 2024

**Optatives, mobilitat, pràctiques, TFG**

**Equip directiu de l'Escola d'Enginyeria  
de la Universitat Pompeu Fabra**

## Pla d'estudis

- Assignatures bàsiques i obligatòries
- Crèdits optatius: a partir de 3r (matriculat almenys d'una assignatura obligatòria de 3r)
- TFG: assignatura de 4t (aplica el règim de progressió)

## Progressió en els estudis

- Accés a 3r curs → Cal superar el 90% 1r curs i el 50% dels crèdits d'assignatures de 2n curs (54 de 1r curs, 30 de 2n curs)
- Accés a 4t curs → Cal superar tot 1r curs, el 90% dels crèdits de 2n i el 50% de 3r curs (60 de 1r curs, 54 de 2n curs i 30 de 3r curs)

## Crèdits optatius

- Assignatures optatives
- Assignatures obligatòries d'altres graus de l'Escola
- Pràctiques en empreses o a la universitat
- Mobilitat fóra UPF
- Formació transversal de lliure elecció: <https://www.upf.edu/web/formacio-transversal>
- Crèdits RAC (Reconeixement Acadèmic de Crèdits): <https://www.upf.edu/web/upfparticipacio/oferta-activitats-credits>
- I per títol de llengua estrangera: <https://seuelectronica.upf.edu/normativa-de-reconeixement-academic-en-credits-per-aprenentatge-de-llengues-en-els-estudis-de-grau>

## Mínim i màxim de crèdits en cada apartat

- GEI: <https://www.upf.edu/web/etic/engineyria-informatica-2016-informacio-estudiant>  
Restricció GEI → dels 70 crèdits optatius que s'han de fer, 35 han de ser d'unes assignatures concretes (al Pla d'Estudis marcats amb un \* a la web)
- GEXT: <https://www.upf.edu/web/etic/engineyria-telecomunicacions-2016-informacio-estudiant>
- GESA: <https://www.upf.edu/web/etic/engineyria-sistemes-audiovisuals-2016-informacio-estudiant>
- GEMCD: <https://www.upf.edu/web/etic/engineyria-matematica-2016-informacio-estudiant>

# Pla d'estudis Grau Enginyeria Informàtica, 3r-4t

- Matèries bàsiques: 62 crèdits
- Matèries obligatòries: 93 crèdits
- Matèries optatives: 70 crèdits (inclosos fins a 15 crèdits de pràcticum professional en empreses; inclosos fins a 20 crèdits de mobilitat)
- Treball de Fi de Grau: 15 crèdits

3r	Trim 1	Comunicació Tècnica en Anglès (5)	Bases de Dades (5)	Teoria de la Computació (5)	Intel·ligència Artificial (5)
	Trim 2	Compiladors (5)	Criptografia i Seguretat (5)	Sistemes Distribuïts de Gran Escala (5)	(5)
	Trim 3	(5)	(5)	(5)	(5)
4t	Trim 1	(5)	(5)	(5)	(5)
	Trim 2	(5)	(5)	(5)	(5)
	Trim 3	TFG (15)	(5)	(5)	(5)



Coordinador GEI:  
Victor Dalmau  
[victor.dalmau@upf.edu](mailto:victor.dalmau@upf.edu)

# Pla d'estudis Grau Enginyeria Matemàtica en Ciència de Dades, 3r-4t

- Matèries bàsiques: 62 crèdits
- Matèries obligatòries: 118 crèdits
- Matèries optatives: 45 crèdits (inclosos fins a 15 crèdits de pràcticum professional en empreses; inclosos fins a 20 crèdits de mobilitat)
- Treball de Fi de Grau: 15 crèdits

3r	Trim 1	Comunicació Tècnica en Anglès (5)	Bases de Dades (5)	Mineria de Dades Massives (5)	Mètodes Estadístics (5)
	Trim 2	Organització d'Empreses TIC (5)	Criptografia i Seguretat (5)	Sistemes Distribuïts de Gran Escala (5)	Models Gràfics Probabilístics (5)
	Trim 3	(5)	(5)	(5)	(5)
4t	Trim 1	Gestió de Projectes (5)	Analítica Visual (5)	Recuperació de la Informació i Anàlisi de la Web (5)	Processos Estocàstics (5)
	Trim 2	TFG (15)	(5)	(5)	(5)
	Trim 3		(5)	(5)	



Coordinador GEMCD:  
Pablo Arias  
[pablo.arias@upf.edu](mailto:pablo.arias@upf.edu)

# Pla d'estudis Grau Enginyeria en Sistemes Audiovisuals, 3r-4t

- Matèries bàsiques: 62 crèdits
- Matèries obligatòries: 123 crèdits
- Matèries optatives: 40 crèdits (inclosos fins a 15 crèdits de pràcticum professional en empreses; inclosos fins a 20 crèdits de mobilitat)
- Treball de Fi de Grau: 15 crèdits

3r	Trim 1	Comunicació Tècnica en Anglès (5)	Bases de Dades (5)	Enginyeria Acústica (5)	Transmissió Digital de Dades (5)
	Trim 2	Organització d'Empreses TIC (5)	Enginyeria Òptica (5)	Processament de Vídeo (5)	Processament de So, Parla i Música (5)
	Trim 3	(5)	(5)	(5)	(5)
4t	Trim 1	Gestió de Projectes (5)	Equips i Sistemes d'Àudio (5)	Sistemes de Codificació d'Àudio i Vídeo (5)	Visualització Avançada (5)
	Trim 2	TFG (15)	Equips i Sistemes de Vídeo (5)	(5)	(5)
	Trim 3		(5)	(5)	



Coordinadora GESA:  
Gloria Haro  
[gloria.haro@upf.edu](mailto:gloria.haro@upf.edu)

# Pla d'estudis Grau Enginyeria en Xarxes de Telecomunicació, 3r-4t

- Matèries bàsiques: 62 crèdits
- Matèries obligatòries: 123 crèdits
- Matèries optatives: 40 crèdits (inclosos fins a 15 crèdits de pràcticum professional en empreses; inclosos fins a 20 crèdits de mobilitat)
- Treball de Fi de Grau: 15 crèdits

3r	Trim 1	Comunicació Tècnica en Anglès (5)	Bases de Dades (5)	Simulació i Modelització de Xarxes (5)	Transmissió Digital de Dades (5)
	Trim 2	Organització d'Empreses TIC (5)	Criptografia i Seguretat (5)	Sistemes de Radiocomunicacions (5)	Aplicacions Telemàtiques (5)
	Trim 3	(5)	(5)	(5)	(5)
4t	Trim 1	Gestió de Projectes (5)	Xarxes Òptiques (5)	Comunicacions Mòbils (5)	(5)
	Trim 2	TFG (15)	Gestió de Xarxes i Serveis TIC (5)	Laboratori de Xarxes (5)	(5)
	Trim 3		(5)	(5)	



Coordinador GEXT:  
Josep Font  
[josep.font@upf.edu](mailto:josep.font@upf.edu)



# Optatives

# Assignatures optatives – Informació pràctica

Aspectes importants a considerar:

- Horaris imperfectes: pot haver-hi alguna superposició, especialment amb assignatures optatives d'altres graus
- Pensar en solucions per si una assignatura optativa no pot seguir-se per qualsevol raó
- Durant els anys: superposicions no crítiques, flexibilitat professor/estudiant
- Flexibilitat de Secretaria per a la matrícula

**Obtenir tota la informació possible dels professors (plans docents, etc.) i d'anterior estudiants**

TRIM	Assignatura	OBSERVACIONS
1	La Internet de les Coses	
	Aplicacions Intel·ligents per a la Web	
	Avenços en Tecnologies de la Parla	
2	Anàlisi de Gestos i Cares	
	Robòtica	
	Imatge Sintètica	
	Entorns de Comunicació Virtual	
	Narrativa i Videojocs	
	Teoria de Jocs Algorísmica	
	Processament de Dades	
Aprent Automàtic per a Aplicac en BM	EGBM	
3	Enginyeria de Soft.per a Aplicac Web	
	Sistemes Interactius	
	Interacció Persona-Màquina	
	Jocs Electrònics	
	Canvi Social, Canvi Tecnològic	
	Xarxes de Sensors Sense Fils	
	Gestió de la Innovació	
	Àudio 3D	
	Visió Tridimensional	
	Taller de Tecnologia Musical	
	Seguretat en Computadors	
	Aprentatge Profund	
	Tecnologies Blockchain	
	Visió per Computador natural per a aplicacions quotidianes	
	Gràfics en Temps Real	
Ciència de Dades i Models Computacionals en Biomedicina	EGBM	

# Assignatures optatives – Selecció incomplerta i esbiaixada dels coordinadors

- A continuació petita introducció d'algunes d'assignatures optatives recomanades pels diferents graus de part dels coordinadors
- La llista és **incomplerta i esbiaixada**, només per utilitzar-se com referència informativa
- Aneu a la llista complerta d'optatives per cada grau (i els seus plans docents) per prendre les decisions finals
- S'han agrupat les optatives en **diferents àrees de coneixement**

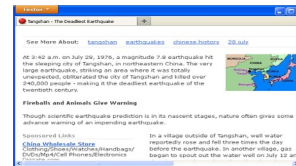
# Optatives – Intelligent Computing

# Intelligent Web Applications

- We focus on Natural Language Processing (NLP) tasks
  - *Classification, Information Extraction, Text Summarization, Opinion Mining, etc.*
- We use current NLP tools and Machine Learning techniques to solve problems
- In seminar and laboratory we develop prototypes
- In theory sessions we review the concepts and present contemporary research
- Inquiries: Horacio Saggion (horacio.saggion@upf.edu)



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Country	China



Other elective courses in this area:

- Introduction to Natural Language Processing Techniques for Everyday Applications

# Optatives – Internet & Security



# 25162 Software Engineering of Web Applications

Basic introduction to web technologies. Materials are in English but the course will be taught in Catalan/Spanish.

**Goal:** During the course you will have to *design and code a Twitter-like web application* using Java in the backend and Javascript in the frontend.

**Methodology:** To develop your web application you will work in groups of 3-4 students. In *theory* classes you will be *introduced to the basic* concepts of the world wide web. During the *seminars* you will use *basic software engineering techniques to design the core functionalities of your app.* Finally, in *labs* you will *implement the web application* you have designed.

## Contents, ordered by block.

- Introduction to Web technologies.
- HTML & CSS basics + MySQL reminder.
- Server-side technologies,
  - Backend.
  - Administration of Apache Tomcat Web server:
    - Servlets + JSP + JSTL + MySQL.
- Client-side technologies.
  - Frontend.
  - DOM + JS, jQuery, CSS Frameworks.
- Integration of technologies under the MVC (Model-View-Controller).
- New trends
  - WebSockets.
  - WebRTC.
  - WebGL.
  - Emscripten.
- Introduction to Node.js & MongoDB (NoSQL).
- Laws to consider while publishing a web application.
  - GDPR + WCAG 2.0.

contact: [oriol.martinez@upf.edu](mailto:oriol.martinez@upf.edu)

## Blockchain Technology (3rd term, 5 ECTS, English)

- Interested in how Blockchain is shaping the new Internet? Do you want to know more about **smart contracts, consensus protocols or tokenization**?



- Blockchain Technologies** will provide you a practical approach to understand how blocks are mined and the chain is built in a trustable way

More info: Vanesa Daza ([vanesa.daza@upf.edu](mailto:vanesa.daza@upf.edu))

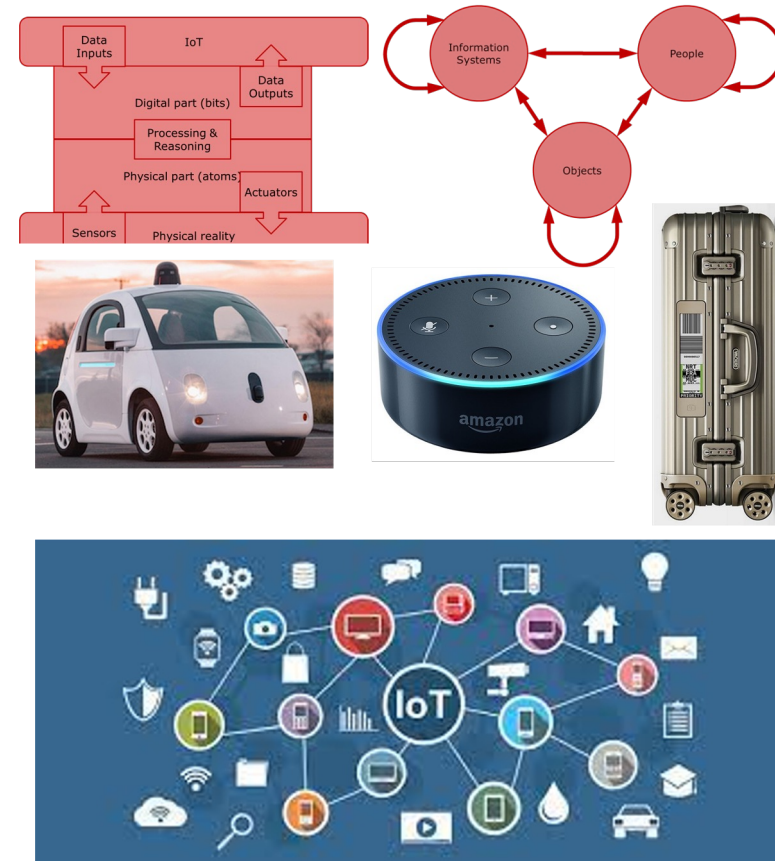
# Computers security

- Footprinting, recognition, System scanning and enumeration
- Network security and system vulnerability
- Windows and Linux System Hacking
- Web Server hacking
- Sniffing, Detection and Prevention



# Internet of Things (IoT)

- Can objects perform tasks by themselves, fulfil goals, and cooperate with other objects?
- Can objects interact with the physical world through sensors and actuators, and also with cloud-based intelligence through ubiquitous wireless networks?
- In this class we will learn how and, most importantly, we will ask ourselves, why?
- The classroom sessions will be highly participative, and we will discuss the conceptual models, the building blocks, and the use cases that will conform the IoT in the coming decade.
- There is also a laboratory part in which you will develop your own IoT use case.
- Inquiries: Rafael Pous (rafael.pous@upf.edu)



Other elective courses in this area:

- Virtual Communication Environments (also listed on the section 'Interaction')

# Optatives - Technology & Society

# Fairness, Accountability, Transparency, and Ethics (FATE) in Data Processing

This **interdisciplinary** course is offered by professors in computer science, moral philosophy, and law:

1. **Personal data protection:** privacy, confidentiality, surveillance, recourse, and power differentials
2. **Data-driven decision support:** biases and transparency in data processing and data-rich communication
3. **Automated decision-making:** with an emphasis on avoiding discrimination in scenarios with automation

Half of the course studies algorithmic fairness **technologies**; the other half studies different conceptualizations of **power** around data processing pipelines, analyzes **bias** and **discrimination** (by gender, race, sexual orientation, national origin, age, ...) in computer systems from an **ethical** perspective, and overviews relevant European **law**.



Check the course materials:

<https://sites.google.com/view/upf-fate/>

Coordinator:

[Carlos Castillo](#)

# Social change, technological change

Society and technology evolve, bringing benefits and costs, sometimes unevenly.

We'll jointly reflect about how technology affects society, and vice versa, how societal progress affects technological development. A bit of history, economics, psychology, biology, and everything else, around the questions

- How can we make technological development work for us?
- Has it worked for us in the past?

with a special focus on equality and dilemmas around it.

Course in Spanish, with materials mostly in English





# Algorithmic Game Theory – Implementable rationality

The Internet created a new economy : both as a foundation for exchange and commerce, and in its own right. But the Internet itself is the outcome of actions of many non-cooperating participants and its works.

But there are other settings, like climate change, where common good escapes. Why?

- **How can agents make strategic decisions?**
- **What motivates selfish individuals to cooperate?**
- **Can we design mechanism where despite the selfish non-cooperative behavior of participants, we reach a social good?**
- **Can these be implemented by artificial agents?**
- **Game theory** is the study of mathematical models of strategic interactions among rational agents. It has applications in all fields of social science, as well as in logic, systems science and computer science.
- **Algorithmic game theory** designs effective procedures to compute solutions to games.

# **Optatives – Interaction & Graphics**

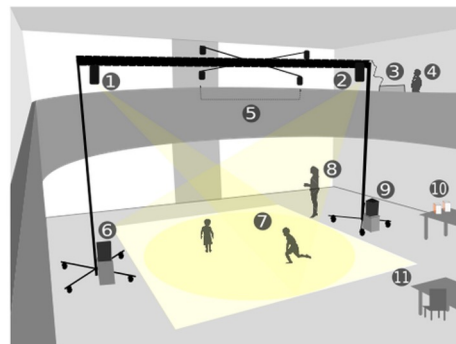
# Interactive Systems

A **practically oriented subject** which will take the students through the **development of a fully functional Real-Time Full-Body Interactive Experience**, using **Unity**, in the **Mixed Reality platform** of our Full-Body Interaction Lab (FuBIntLab).

Theory classes will support the development with the concepts needed to understand **eXtended Reality (XR) systems**; technologies associated with **Virtual, Augmented, Mixed and Artificial Reality**.

This will place them in an **excellent professional position** to develop XR experiences.

**Coordinator:** Prof. Narcís Parés  
<narcis.pares@upf.edu>



- 1 Projector
- 2 Projector
- 3 Controls
- 4 Researcher
- 5 Tracking cameras (4)
- 6 Speaker
- 7 Screen
- 8 Psychologist
- 9 Speaker
- 10 Snack table
- 11 Parent table



This platform is currently used in research to help children with Autism practice social initiation behaviors. However, the platform can be used for many other application domains: Interactive Learning, Digital Heritage, Interactive Playgrounds, Entertainment, etc.

## Person Machine Interaction

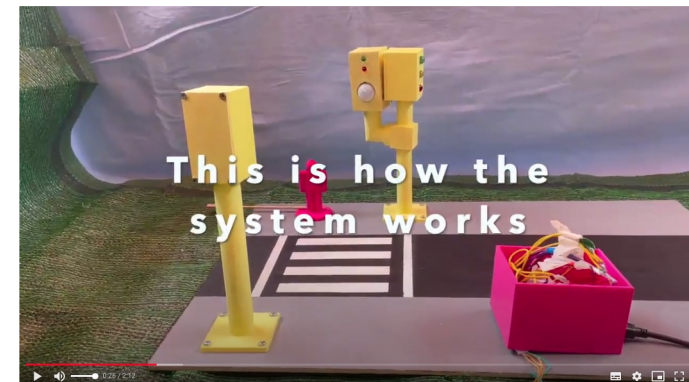
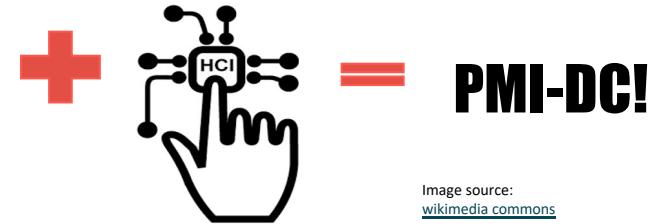
The goal of the PMI course is to provide the students with a grounding in **HCI research**, which is currently focused on **User Experience (UX)**, framed in the context of previous generations of HCI, which focused first on Human Factors, and later, on Human Actors.

Different perspectives of the current paradigm are explored. The course zeros in on users in their social context. Another aspect that is explored is the **engineering perspective**, and attention is paid to **design thinking**, and implementation of prototypes to test and advance ideas.

For the **PMI-Design Challenge (PMI-DC)**, we invite students to contribute by submitting physical examples of their project proposal, communicating their experiments, expertise and approaches.

**A STUDENT DESIGN CHALLENGE:** *Why HCI technologies can be key in our quest to hit the Sustainable Development Goals?*

**Coordinator:** Patricia Santos <patricia.santos@upf.edu>



Example of project: <https://bit.ly/PMIdemo>

# Electronic Games

The course will provide the students with **Industry level knowledge about Game Development**. The focus will be set to the more technical and low level aspects of it, developing the foundation of the game itself.

Students will **code two games** within the course using two small **c++ frameworks**. The games can be a nice entry for their portfolios.

We'll **focus in code topics** like memory management, assets, rendering, collisions, physics, animation, AI, GUI, audio and more.

But we'll also cover other things like game design, roles in Game Development and how to publish a game.



# Virtual Communication Environments

In this course students will learn to develop an online community on the browser using standard web technologies (HTML + CSS + Javascript).

Students will learn to be a full-stack developer (coding the front-end and the backend), how to code modern Javascript, how to develop your own backend, how to connect with it (synchronize environments among users), how to structure a realtime browser application and how to draw 2D and 3D environments on a browser.

There are three assignments: on the first one students will create a **text chat**, on the second an **interactive Chat with 2D characters**, and on the third one a **virtual community with 3D characters**.

Keywords: HTML, CSS, Javascript, HTTP, JSON, NodeJS, WebSockets, Canvas2D, WebGL, WebRTC, Redis, MySQL, MongoDB, GLTF, Blender.

All the material of the course is available in [this website](#).

**Coordinator:** Javi Agenjo <javier.agenjo@upf.edu>



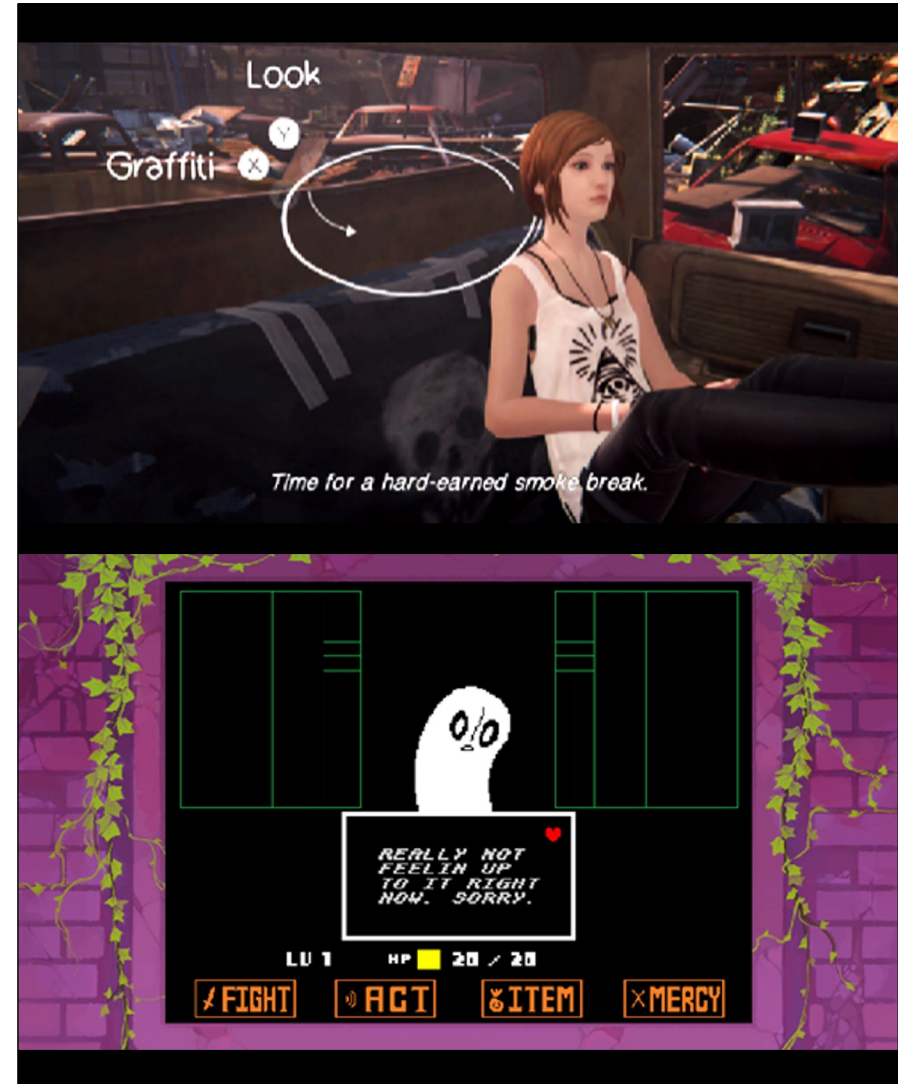
# Audiovisual Narrative and Videogames

A collaboration between the UPF Engineering and Communication Departments.

In the theoretical block, students learn audiovisual communication notions: including the **academic analysis of videogames**, the **usage of the video-ludic language**, and how to convey a story through the design of digital audiovisual narratives and videogames.

The practical block is a workshop in which **students develop their own video game projects (including the design document and actual prototype)**, focusing on the communication angle. They write a **game design document** that transforms a story into game content and mechanics. Through specialized prototyping techniques, a **playable demo** is implemented and presented.

**Inquiries:** Alan Tapscott <alan.tapscott@upf.edu> & Joaquim Colás <joaquim.colas@upf.edu>



# Real-Time Graphics

The course will provide the students with **Industry level knowledge about coding real-time 3D graphics engines**. The focus will be on current pipelines used by game engines to achieve photorealistic visuals at 30 frames per second.

Students will **code their own engine** using a small **C++ framework**.

We'll **focus in code topics** like **shaders, render pipelines, realtime shadows, irradiance, volumetrics, postprocessing** and more.

Students will learn how to get **code a GPU** to get the most of it.

It is a good continuation to Electronic Games or Computer Graphics.

All the material of the course is available in [this website](#).

**Coordinator:** Javi Agenjo <javier.agenjo@upf.edu>





# Imatge Sintètica

## Ray Tracing for Realistic Image Synthesis

### Objective

Compute realistic images (should look like a real photo) from a model of a virtual scene.

### Major Aim

Develop **your own ray tracer** in C++ (groups of 2 students).

### Course Content

**Theory:** Fundamentals of Ray Tracing; Ray Tracing Applications integrated with

**Seminars & Labs:** 5 Assignments + Final project

**Evaluation:** 5 assignments (50 %); Final project and presentation (50 %)



# Optatives – Entrepreneurship

## Project Management (1st term, 5 ECTS, groups in English and Catalan) (compulsory GEMCD, GESA, GEXT)

- Introduction to project management with a *learning by doing* approach
- Use of **PM2 methodology** as the one adopted by the EU Commission
- Course linked with the **EUTOPIA** learning communities
- Teamwork, leadership, risk analysis, agile-scrum, workshops, analysis of project cases
- With professionals and mentors with long experience in PM
- **Develop your first real project** with academic supervision



### The PM<sup>2</sup> Methodology: Europe's Methodology

PM<sup>2</sup> (pronounced "P-M squared") is a Project Management Methodology developed by the European Commission.

More info: [miquel.oliver@upf.edu](mailto:miquel.oliver@upf.edu)

# IT Business Management/Organització d'empreses TIC

(2nd Term, 5 ects, groups in English and Catalan)  
(compulsory GEMCD, GESA, GEXT)

- To understand how IT-intensive organizations and companies are organized and managed
- To **develop your first business plan** from your own business idea.
- With the supervision of part-time **professors with extended experience in the IT sector**
- With connections to the entrepreneurship context (UPF Ventures, access to the **MWC**)
- Course linked with the **EUTOPIA** learning communities

More info: [miquel.oliver@upf.edu](mailto:miquel.oliver@upf.edu)



OETIC students at the MWC



## Gestió de la Innovació

**La innovació** ha esdevingut el principal motor de competitivitat empresarial i prosperitat de les nacions. Es tracta d'un fenomen de caire estratègic que requereix, no obstant, d'una gestió sistemàtica i rigorosa per a que generi els fruits desitjats.

**L'objectiu fonamental** de l'assignatura és introduir l'alumne en els conceptes principals, les metodologies, activitats i les millors pràctiques relacionades amb la innovació i la seva gestió, tant a empreses com a centres de recerca i organitzacions públiques.

S'estableix una **dinàmica** que afavoreix la reflexió en grup sobre els conceptes, la pràctica de la creativitat i l'estudi comparat de casos reals d'innovació.

S'hi fa un especial accent en la **innovació de base tecnològica**, donat el perfil dels participants i per les característiques especialment interessants d'aquest tipus d'innovació.

Professorat: Oriol Alcoba – [oriol.alcoba@upf.edu](mailto:oriol.alcoba@upf.edu) → [linkedin](#)  
Marta Albertí – [marta.alberti@upf.edu](mailto:marta.alberti@upf.edu) → [linkedin](#)

# **Optatives – Data Science & Basics**

# Deep Learning

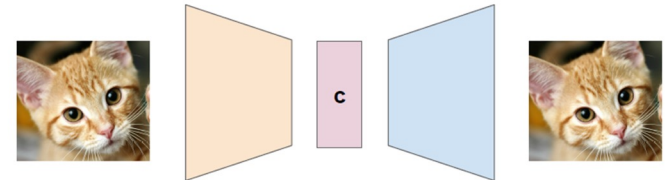
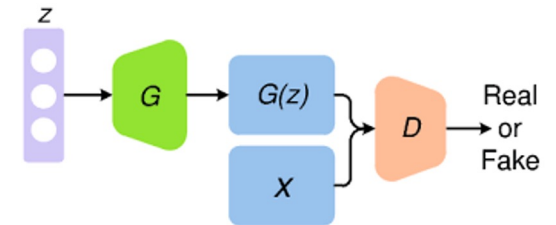
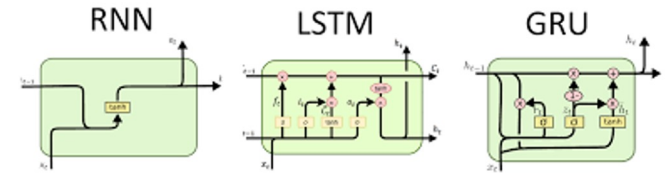
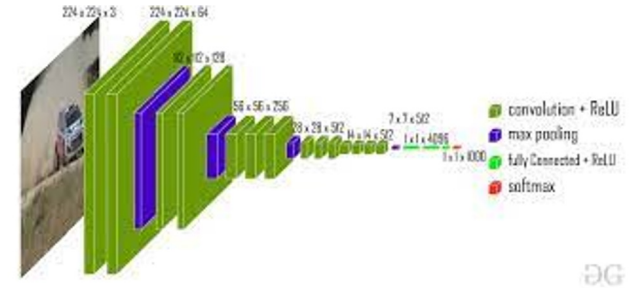
Deep Learning, as a part of Machine Learning, refers to statistical modeling of data to make predictions or to extract useful information for decision making. Deep learning does this by using neural networks with many hidden layers, big data, and powerful computational resources.

In this course, we present the most important concepts and programming tools to face challenging applications of this transversal field. The subject consists of 4 blocks:

1. **Neural Networks: basic concepts & training of deep nets**
2. **Modeling sequences with Recurrent Neural Networks**
3. **Computer vision w/Convolutional Neural Networks**
4. **Autoencoders and Generative Adversarial Networks**

The subject is organized in lectures and lab sessions. Lectures introduce the main concepts and provides pointers to the relevant literature and state of the art. Lab sessions are “hands-on”, using Python and project-based.

Coordinator: Federico Sukno  
[federico.sukno@upf.edu](mailto:federico.sukno@upf.edu)



# Mining of Massive Datasets (compulsory GEMCD)

“a glimpse of what it is to be  
a data scientist for real.”



A student from  
the 2021 edition  
of the course

The course gives you **many tools to do practical data analysis**, including algorithms to pre-process data, find duplicates and outliers, extract patterns, and issue recommendations and forecasts.

It has **a ton of practical work**, but by the end of the course, you will be able to say something interesting to anyone who gives you a dataset.



Course materials:

<https://github.com/chatox/data-mining-course/>

Coordinator:

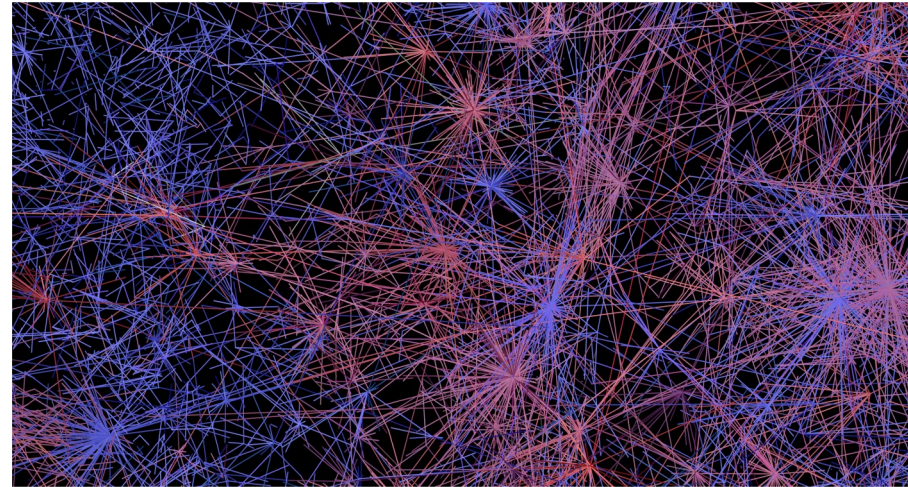
[Carlos Castillo](#)



# Introduction to Networks Science (compulsory for GEMCD)

Dolphins that swim together. Air traffic routes. Protein interactions. TikTok, Twitter, Instagram. Co-parenting in penguins. Neurons in the brains of animals. Sexual and affective relationships in high school ...

... complex systems contain complex networks that are surprisingly similar to each other. The course focuses on **network growth** models, **community** detection algorithms, and abstractions that help explain the **spread** of ideas, memes, and viruses.



Course materials:

<https://github.com/chattox/networks-science-course/>

Coordinator:

[Carlos Castillo](#)

# Stochastic processes

(First term, 5 ECTS, English)  
(compulsory for GEMCD)

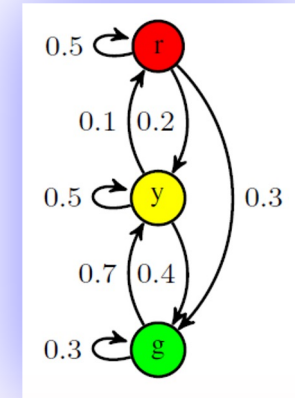
*Random does not mean following no rules. In this course you can learn about the rules underlying stochastic processes.*

- Reinforcing basic concepts from random variables.
- Providing an introduction to stochastic processes.
- Balancing between theory, examples and practice.

Content:

Random variables, Expectation, Gaussian random variables, Bernoulli and binomial distribution, Random processes, Autoregressive processes, Stationarity, Autocorrelation sequence, Cross-correlation sequence, Power spectral density, Gaussian random processes, Linear systems, Poisson Process, Markov chains

**Contact:** Ralph Andrzejak <ralph.andrzejak@upf.edu>



$$\vartheta_\nu(\mathcal{X}) = \sum_{s=-\infty}^{s=\infty} \varphi_s(\mathcal{X}) e^{-i2\pi\nu s} \quad \text{for} \quad -\frac{1}{2} \leq \nu \leq \frac{1}{2}$$

$$\varphi_s(\mathcal{X}) = \int_{\nu=-1/2}^{\nu=1/2} \vartheta_\nu(\mathcal{X}) e^{i2\pi\nu s} d\nu \quad \text{for} \quad -\infty \leq s \leq \infty$$

# 23965 — Signals and Systems 2

(Second term, 5 ECTS, English/Spanish)  
(compulsory for GESA, GEXT)

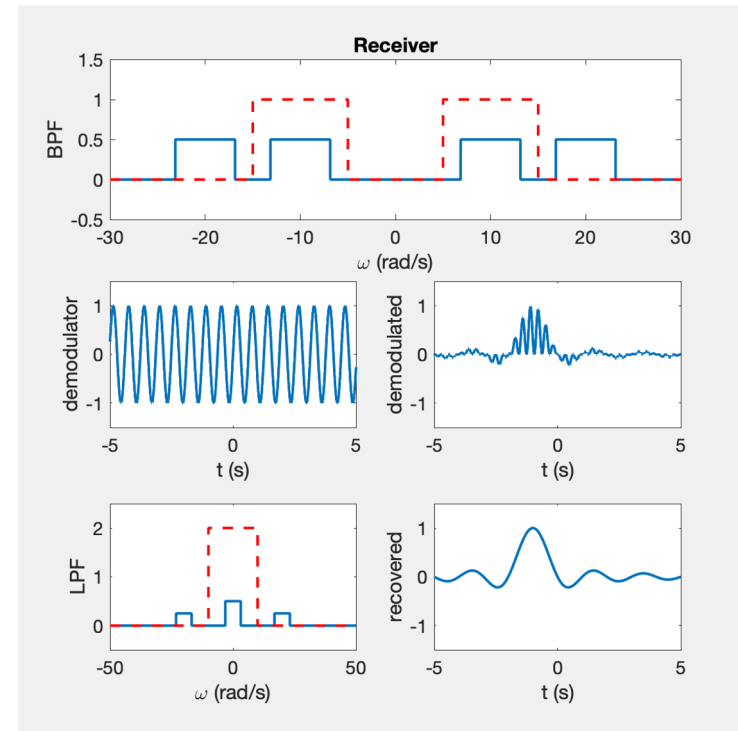
Focuses on the representation of continuous-time signals and systems in the time and frequency domains.

Key concepts covered:

- Continuous-time signals and systems
- Fourier/Laplace transforms and their properties
- Sampling and reconstruction of signals
- Basic communication systems

Strong mathematical component. Requires solid basics of linear algebra and differential/integral calculus.

$$X(j\omega) = \int_{-\infty}^{\infty} x(t)e^{-j\omega t} dt$$



Example of Lab activity

**Materials:** <https://www.upf.edu/web/giovanni-geraci/teaching>

**Contact:** Giovanni Geraci <giovanni.geraci@upf.edu>

# Optatives – Networks

# 23973 — Network Engineering

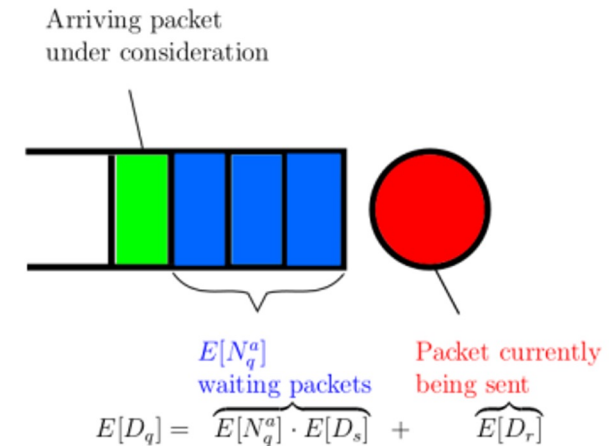
(Second term, 5 ECTS, English/Catalan)  
(compulsory for GEXT)

Performance evaluation of Computer Networks and Systems using probability models and simulation techniques.

Key concepts covered:

- Applied probability, stochastic models, queueing theory.
- Relationship between user demands, system resources and performance metrics such as delay and throughput.
- Use-cases: Wi-Fi networks, Data-centers, Cloud-gaming / XR delivery, etc.

**Contact:** Boris Bellalta <boris.bellalta@upf.edu>



$$E[D_q] = \lambda \cdot E[D_q] \cdot E[D_s] + E[D_r]$$

$$E[D_q] = \rho \cdot E[D_q] + E[D_r]$$

$$E[D_q](1 - \rho) = E[D_r]$$

$$E[D_q] = \frac{E[D_r]}{(1 - \rho)}$$

# Networks' Architectures

(Third Term - 4 ECTS)  
(compulsory for GEXT, GEMCD)

In this subject we focus on different concepts related with nowadays networks' architectures in a practical way. We divide the subject in 6 main themes by introducing the key theory concepts and then viewing in a more practical way through the labs sessions. Finally, the students works on a final project focused on one of the contents work during the subject.

Key concepts covered:

- Review of the network basics
- Network virtualization
- Network topologies & Network abstraction using graphs
- Network Performance
- Network Simulation – Introduction to Mininet
- Network Programmability
- Cloud computing & distributed clouds
- Content Delivery Platforms



**Contact:** Boris Bellalta <[boris.bellalta@upf.edu](mailto:boris.bellalta@upf.edu)>

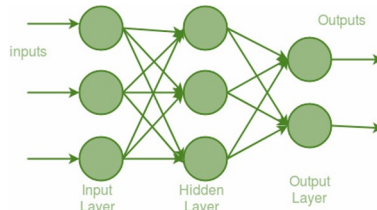
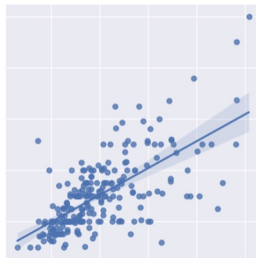
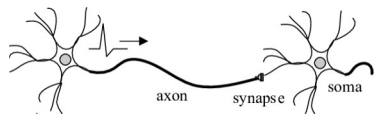
# **Optatives – Image/Audio processing & Vision**

# Audiovisual Perception and Cognition (compulsory for GESA)

Coordinator: Gustavo Deco (UPF)

Email: [gustavo.deco@upf.edu](mailto:gustavo.deco@upf.edu)

Single-neuron models	Gradient descent	Artificial neural networks	Visual system	Auditory system
<ul style="list-style-type: none"> <li><input type="checkbox"/> From neuronal biophysics to models of single neurons</li> <li><input type="checkbox"/> Ion channels, membrane potential, synaptic transmission</li> <li><input type="checkbox"/> Action potential generation</li> <li><input type="checkbox"/> Leaky integrate-and-fire model</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Linear regression</li> <li><input type="checkbox"/> Gradient descent algorithm</li> <li><input type="checkbox"/> Learning schemes (supervised, unsupervised, reinforcement)</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Perceptron</li> <li><input type="checkbox"/> Multi-layer perceptron</li> <li><input type="checkbox"/> Backpropagation</li> <li><input type="checkbox"/> Generalization</li> <li><input type="checkbox"/> Convolutional neural networks</li> <li><input type="checkbox"/> Deep learning</li> <li><input type="checkbox"/> Artificial vs. biological neural networks</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> From retina signal transduction to face recognition</li> <li><input type="checkbox"/> Receptive fields</li> <li><input type="checkbox"/> Functional maps</li> <li><input type="checkbox"/> Hierarchical organization</li> <li><input type="checkbox"/> Neural plasticity</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> From the cochlea to auditory cortex</li> <li><input type="checkbox"/> From sound detection/perception to language</li> <li><input type="checkbox"/> Neural activity recording techniques</li> </ul>





## Image Processing (compulsory for GESA)

The aim of this course is to introduce the students to image processing and computer vision including basics of the human visual system and image perception, acquisition and processing. It includes topics such as human visual system and perception laws, image formation, color, low-level pixel-based transforms, linear, nonlinear and morphological filtering, Fourier analysis, segmentation and, in general, methodologies for basic image processing algorithms. To put into practice the algorithms and techniques, the students will work on several lab projects along the course. Topics include:

1. Human visual system and perception laws. Image formation
2. Color
3. Fourier and applications to image processing
4. Probability and statistics applied to images. Equalization. Quantization
5. Mathematical Morphology and Applications
6. Texture synthesis
7. Image denoising
8. Image segmentation.
9. Introduction to Object Recognition

Coordinator: Coloma Ballester  
[coloma.ballester@upf.edu](mailto:coloma.ballester@upf.edu)



Vision for Smart Cars



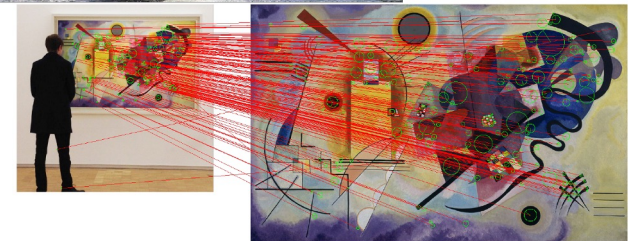
# Computer Vision

The course Computer Vision covers fundamental and advanced topics in artificial vision. The aim is to provide both a general and applied knowledge of a broad variety of computer vision techniques applied to solve real-world vision problems. The strategies to tackle these problems include both model-based approaches and data-driven (deep learning) methods. Topics include:

1. Introduction to vision and computer vision
2. Image models and priors. Extracting visual features
3. Object detection and recognition by feature matching
4. Patch-based methods and applications
5. Image and video segmentation and clustering
6. Image and video editing
7. Object recognition
8. Generative methods for data generation and understanding
9. Fake visual information and anomaly detection
10. Scene understanding
11. Time varying geometry



Fake visual news?



Coordinator: Coloma Ballester  
[coloma.ballester@upf.edu](mailto:coloma.ballester@upf.edu)

# Face & Gesture Analysis

This subject covers automatic face analysis techniques and provides an overview of the most relevant applications:

1. **Face Detection and Localization**
2. **Face Recognition: traditional and deep-learning methods**
3. **Facial Expressions and Emotions**
4. **Generative models to synthesize faces**
5. **Applications:** Beyond recognition, face technology is also used in affective computing, lie-detection, lip-reading, car-safety, health assessment, etc.

The subject is organized in lectures and lab sessions. Lectures introduce the main concepts and provides pointers to the relevant literature and state of the art. Lab sessions are “hands-on”, strongly focused on solving realistic problems related to face technology projects.

Coordinator: Federico Sukno  
[federico.sukno@upf.edu](mailto:federico.sukno@upf.edu)



# Three dimensional vision

The course will provide the students with tools for:

- i) modeling geometric relations among images from different viewpoints and between images and the 3D world,
- ii) extracting/reconstructing 3D information from images and depth sensors.

## Some lab projects (in Python):

3D reconstruction, image mosaics, augmented reality, camera calibration.

## Some applications:

digital humanities, special effects in cinema, realistic animation of virtual characters, augmented reality, computer-assisted surgery.

**Coordinator:** Gloria Haro, gloria.haro@upf.edu

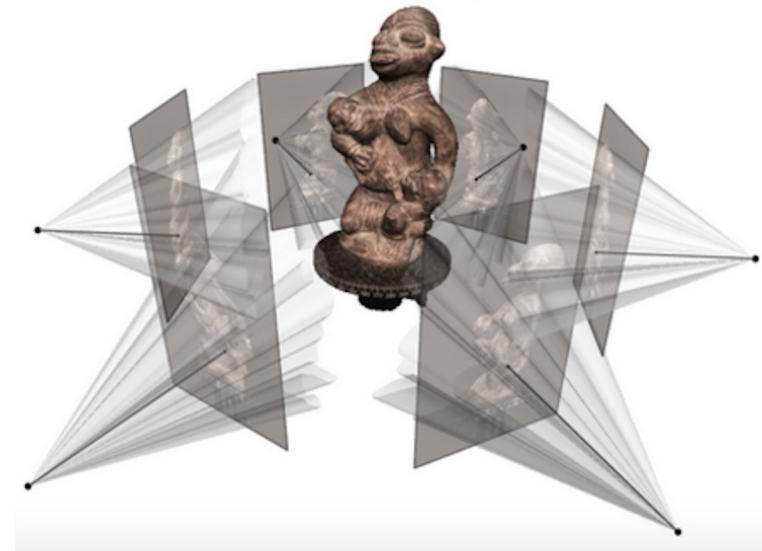


Image source: C. Hernández

# Advances in Speech Technologies

In this subject, we learn the basic concepts to understand how speech is analyzed and digitally processed from a technical and linguistic point of view.

The study of these basic concepts is applied to the three main applications in speech technologies:

- automatic speech recognition (ASR),
- speech synthesis, frequently called text-to- speech (TTS),
- dialogue systems

The objective of the subject unfolds around two core aspects: (i) to create and manage linguistic data in general and speech data specifically (known as corpora) to train speech technologies, and (ii) to use available software and tools to process speech data at a great scale.

**Coordinator:** Alicia Burga, [alicia.burga@upf.edu](mailto:alicia.burga@upf.edu)

# Àudio 3D

## Goals of the course

- Understand sound propagation in space
- Understand spatial hearing system
- **Spatial audio:** Know the main techniques for
  - recording and encoding
  - transmission
  - manipulation (postproduction)
  - exhibition

taking into account **spatial** properties.  
In **theory and practice**.

- Know current applications of 3D audio.

## 3D audio labs at Sala Aranyó



## Examples 3D audio labs

- Stereo and surround
- Binaural (headphones)
- Object-based formats (e.g. Dolby Atmos, VBAP)
- Ambisonics

# Music Technology Lab

Course in which the students carry out a practical software project in the field of music technology, learning the different tasks needed to go from a specified project idea to its practical implementation, evaluation and presentation.

**Teachers:** Xavier Serra (coordinator) + researchers from MTG

**General lectures:** Introduction (4h)

**Seminars:** Group project discussions (18h x 5)

**Exam:** Project presentation (4h)

- Project based learning. Students express their preference from 5 given project ideas and teams are created from that.
- 5-10 students per project, where each student has specific project responsibilities.
- Weekly meetings with teacher, in which each student presents the work done and where tasks to be done are discussed.
- Through the projects, students learn about project planning, software development, ethical issues, project evaluation and project presentation.
- At the end of the trimester each group presents the finished project.
- Grading of the course is based on a continuous evaluation, considering the tasks done and the participation of each student.

# **Optatives - Biomedical Engineering**



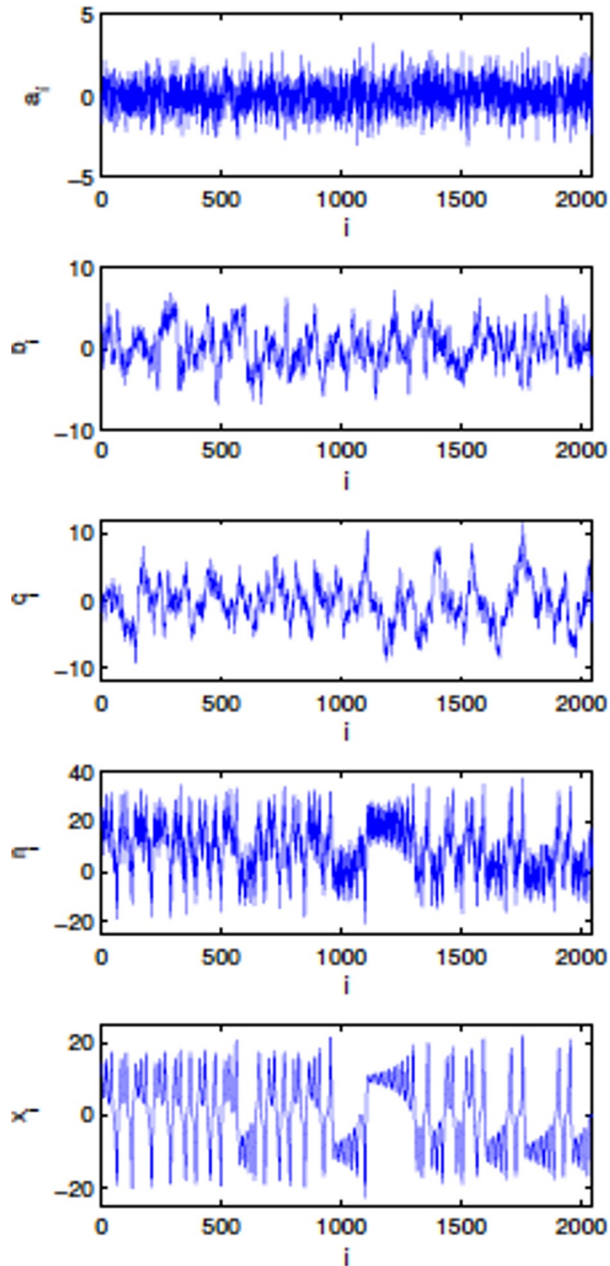
**ADVANCED ANALYSIS OF NEURONAL SIGNALS (2nd TRIMESTER, ENGLISH)** Professors: Ralph G. Andrzejak (DTIC) – ralph.andrzejak@upf.edu **Available in 2023-24**

*Nonlinear time series analysis*

- Analyze experimental signals to characterize the underlying dynamics
- Detect non-random structure in signals
- Test null hypothesis about signals
- Signals: model signals, electroencephalogram
- Dynamics: model systems, brain

Approach

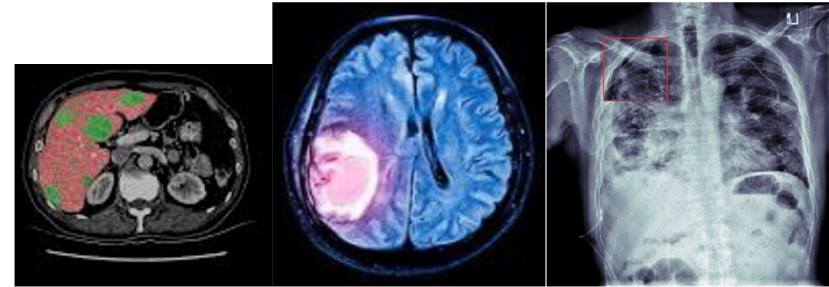
- Very strong emphasis on concrete examples to understand the theoretical concepts
- Analyze database of electroencephalographic signals from epilepsy patients (see <http://ntsa.upf.edu/nonlinear-time-series-analysis-group>)
- Matlab will be used in the theory, labs and seminars
- High degree of interaction in all sessions



## ADVANCED ANALYSIS OF BIOMEDICAL IMAGES (3<sup>rd</sup> TRIMESTER, ENGLISH)

Coordinator: José Pozo (ELEM)

[jmpoz@elem.bio](mailto:jmpoz@elem.bio)



The course covers **state-of-the-art techniques for biomedical image analysis** on real clinical applications (e.g., neuroimaging, cardiology, oncology) and all kind of medical images (e.g., X-ray, CT, MRI). Statistical atlases, Big Data analytics, radiomics, standard machine learning, **deep learning (DL)** and GAN techniques will be reviewed.

Note: Complementary subject to ML for Applications in Biomedicine (by R. Ramírez)

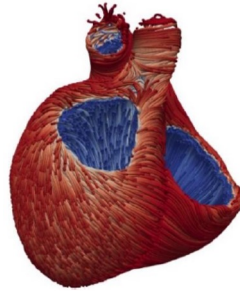
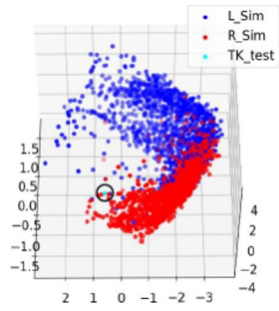
Seminars: tutorials in Python to get familiar with image analysis techniques

Imaging challenge project with DL techniques (50% mark): chosen by students to work during the whole trimester among available international imaging challenges (see <https://grand-challenge.org>). Last edition projects:

- Intra-cranial haemorrhage detection from CT scans
- Automatic evaluation of myocardial infarction from delayed-enhancement cardiac MRI
- Liver cancer segmentation in CT scans
- Identifying pneumothorax disease in chest X-rays
- Brain tumor segmentation from multimodal MRI

## DATA SCIENCE AND COMPUTATIONAL MODELS IN BIOMEDICINE (COMPBIOMED) (3<sup>rd</sup> TRIMESTER, ENGLISH)

Coordinator: Oscar Camara (DTIC)  
oscar.camara@upf.edu



The course is the first inter-department (MELIS, DTIC) initiative at UPF to **integrate students from medicine, biology, (biomedical) engineering and data science** degrees around **computational techniques in biomedicine**. Basic concepts, adapted to the level of each student typology, will be given on **Data Science, Artificial Intelligence and Machine (Deep) Learning, Digital Twin, Visual Analytics and High-Performance Computing**.

The subject will be implemented in collaboration with Universitat de València, which will facilitate the access to computational solvers, and is part of the CompBioMed European project (<https://www.compbiomed.eu/>)

Multi-disciplinary project (60% mark): The students will work together in **multi-disciplinary teams** leveraging the complementary skills from each discipline. Projects on cardiac/brain electrophysiology will be offered, but teams could propose alternative ones. Seminars will be used to present progress of the projects

Tutorials/labs: to get familiar on some computational biomedicine tools

## **PLANNING AND GUIDANCE FOR MINIMALLY-INVASIVE INTERVENTIONS (3rd TRIMESTER, ENGLISH)**

Professor: Miguel Ángel González Ballester (DTIC) – [ma.gonzalez@upf.edu](mailto:ma.gonzalez@upf.edu)

We will study the general architecture and implementation aspects of computer-assisted surgery, from planning and simulation to intraoperative navigation and surgical robotics. We will analyse several existing systems, also from the point of view of clinical applications.

### Topics

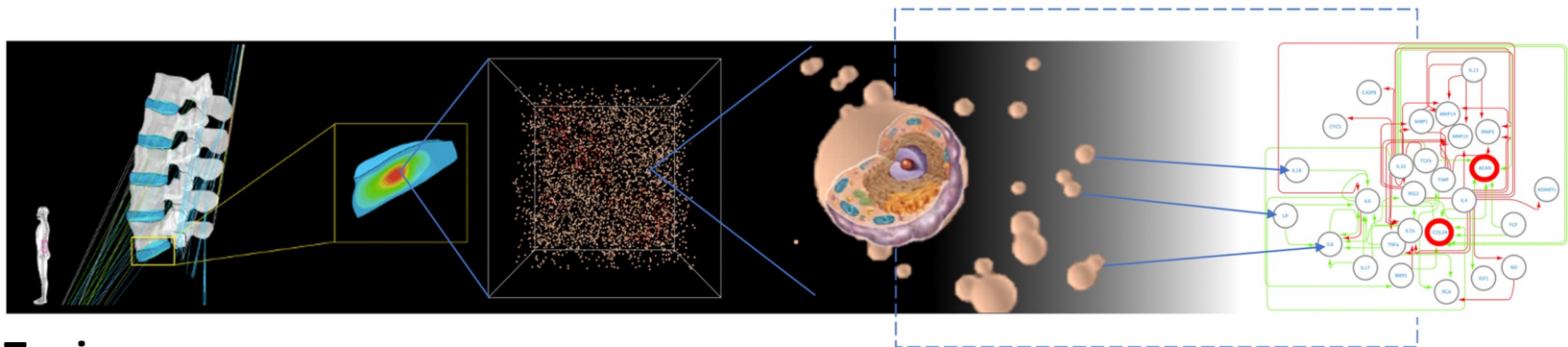
- Planning of pre-operative trajectories and structures
- Registration of pre-operative and intra-operative images
- Tracking of surgical instrumentation
- Augmented reality
- Biomechanical deformation models
- Applications in neuroradiology, neurosurgery, orthopaedics, hyperthermic ablations, endoscopy, among others

In labs sessions, students will become familiar to open-source libraries covering several topics in computer-assisted surgery

## ADVANCED BIOMECHANICS & SYSTEMS BIOLOGY (2n-3rd TRIMESTER, ENGLISH)

Coordination: Jérôme Noailly (DTIC) – [jerome.noailly@upf.edu](mailto:jerome.noailly@upf.edu)

Technological needs for models & simulations and interpretation thereof, for the exploration of **load-bearing systems at different scales** in health and disease



### Topics

- Mechanobiology & Mechanotransduction
- Nonlinear & Multiphysics constitutive tissue modelling
- Nonlinear finite element (FE) modelling
- Network modelling
- Agent-based (AB) modelling
- Model calibration & validation
- Surgery visit & discussions with medical doctors (new 2021-22)

Theoretical sessions & tutorized hands-ons  
☐ advanced use of FE & computational biology approaches. Research seminars & hands-ons integrated with the **VPH Summer School**

## **MACHINE LEARNING FOR APPLICATIONS IN BIOMEDICINE (3rd TRIMESTER, ENGLISH)**

Professor: Rafael Ramirez (DTIC) – [rafael.ramirez@upf.edu](mailto:rafael.ramirez@upf.edu)

This course introduces the theory and practice of solving problems with machine learning techniques. Special emphasis is given to problems in biomedicine

### Topics

- Supervised and unsupervised learning
- Dimensionality reduction
- Linear/logistic regression
- Decision trees
- Instance-based learning
- Neural networks and deep learning

Hands-on practical work based on Matlab/Python to conduct an end-to-end machine learning project

## iGEM (3rd TRIMESTER, ENGLISH)

Coordination: Javier Macia, Marc Güell (DCEXS) – javier.macia@upf.edu  
marc.guell@upf.edu



- iGEM sets the standard in synthetic biology with standardized parts. Learn more about the open-source technology and browse through 20,000+ standardized genetic parts in the **iGEM Registry**
- The International Genetically Engineered Machine (iGEM) Foundation is an independent, non-profit organization dedicated to the advancement of synthetic biology, education and competition, and the development of an open community and collaboration.
- iGEM's biggest program is the **iGEM Competition**. The GEBM gives UPF students the opportunity to participate to the iGEM Competition and push the boundaries of synthetic biology by tackling everyday issues facing the world
- Multidisciplinary teams are selected work together to design, build, test, and measure a system of their own design using interchangeable biological parts and standard molecular biology techniques.
- **Acceptance of students is limited and based on a previous selection process**

# Mobilitat



# Informació general & consells per mobilitat

## Mobilitat fóra UPF

- Enllaços d'interès:

Estudiar a l'estranger: <https://www.upf.edu/web/estudiarfora/estudiar-a-estranger>


Web de mobilitat de l'Escola d'Enginyeria: <https://www.upf.edu/web/etic/mobilitat>


Erasmus pràctiques: <https://www.upf.edu/web/estudiarfora/erasmus-practiques>

- Coordinador of mobilitat: Ernest Montbrió (DTIC), [coord-mobility@upf.edu](mailto:coord-mobility@upf.edu)
- Coordinador de pràctiques: coordinador de cada grau
- Secretaria: [mobility.etic@upf.edu](mailto:mobility.etic@upf.edu)
- Oficina de Mobilitat i Acollida (OMA): [oma.outgoing@upf.edu](mailto:oma.outgoing@upf.edu)


# Informació general & consells per mobilitat

Estudiar a l'estranger 

Erasmus pràctiques 

Estudiar a Espanya 

Ajuts 

Mobilitat solidària estiu  
(MApS) 

Informació acadèmica 

Contactes

 / Estudiar a l'estranger

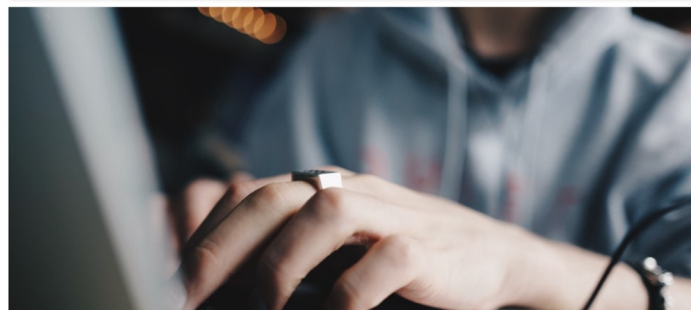
## Estudiar a l'estranger



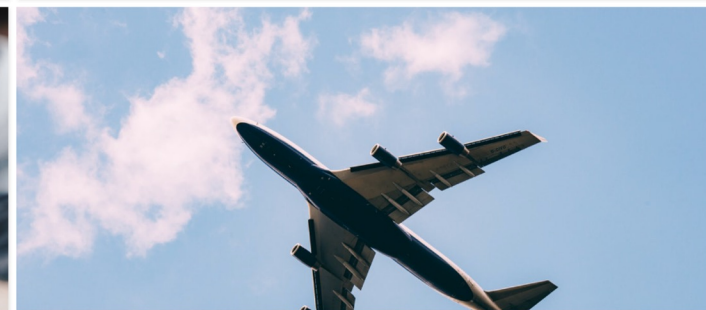
**Destinacions i factsheets**



**Com pots participar?**



**La teva sol·licitud**



**Ja tens una plaça d'intercanvi**

# Informació general & consells per mobilitat

Com pots participar?

<https://www.upf.edu/web/estudiarfora/com-pots-participar>

## Calendari-resum de la convocatòria de mobilitat internacional

Fins al 10 de novembre

Acredita l'idioma: Hauràs d'accedir a la [Secretaria virtual](#) per adjuntar el teu certificat d'idiomes.

13 al 17 de Novembre

Participa als [International Days](#) i assisteix a les [Sessions informatives](#) per estudis.

13 al 22 de Novembre

[Sol·licita les places d'intercanvi](#)

1 de desembre

Publicació al web de la llista provisional d'admesos i exclosos, a partir del qual s'obrirà un període d'al·legacions de 10 dies naturals.

Segona quinzena de gener

Revisa la primera assignació de places

Febrer

Segona assignació de places (Reassignació). Si no tens plaça o estàs en participació condicionada, sol·licita de nou.

Març

[Consulta](#) l'assignació definitiva de places i accepta la plaça adjudicada.

La UPF farà les nominacions a les universitat de destinació.

Març-Abril

Assisteix a les sessions informatives, on us informarem dels propers passos abans de marxar i les gestions per preparar l'estada a nivell pràctic i acadèmic

Maig-Juny

Consulta l'adjudicació d'ajuts, on us informarem de la documentació a complimentar

# Informació general & consells per mobilitat

## Consells i fets de mobilitat fóra UPF

- Podeu estar interessats en anar a una universitat encara sense conveni amb la UPF: parleu amb el vostre coordinador del grau i el coordinador de mobilitat (Ernest Montbrió) (tot i que el procés administratiu per establir acords de mobilitat entre universitat porta temps)
- **No necessiteu cap conveni Erasmus** per unes pràctiques o per realitzar el TFG a l'estranger (tot i què en aquest cas no tindreu cap beca)
- Els professors dels graus TIC tenen molts col·laboradors internacionals en el món acadèmic i industrial en molts camps diferents. Busqueu una bona oportunitat i (gentilment) pregunteu per possibles contactes.

# Pràctiques

Les pràctiques es poden fer en qualsevol moment de l'any acadèmic, en un entorn industrial i/o acadèmic. Només cal:

- Enregistrar-se al Campus Treball mitjançant el servei de Carreres Professionals i carregar el vostre CV – Més informació al següent enllaç: <https://www.upf.edu/web/carreres-professionals/nou-ct>
- Acordar les condicions de les pràctiques amb els supervisors de la institució d'acollida: dates, nombre d'hores per setmana, nombre total d'hores (**defineix el nombre de crèdits a validar**), tasques, etc.
- Validar els vostres crèdits al final del 3r trimestre com a molt tard. Més informació al següent enllaç: <https://www.upf.edu/web/etic/fer-practiques>

Teniu en compte els següents punts:

- 25 h de pràctiques ⇔ 1 ECTS
- L'objectiu de les pràctiques és el proporcionar a l'estudiant amb una experiència en un entorn professional dintre de l'àmbit de les enginyeries
- Els convenis de pràctiques han de ser aprovats pels coordinadors dels graus TIC
- Sereu avaluats pels vostres supervisors a la institució d'acollida (comportament, competències, qualitat de la feina, puntualitat, responsabilitat, ...) i pels coordinadors del grau TIC (petit informe)
- Les pràctiques requereixen una actitud professional i dedicació regular (no us comprometeu si ja teniu moltes d'altres obligacions)

## Passos a seguir:

- Contacteu amb Carreres Professionals per trobar empreses del vostre interès
- Mireu les ofertes al Campus Treball
- Parleu amb professors dels vostres graus i a anteriors alumnes en pràctiques
- **També les pots fer al DTIC-UPF!!!**
- Consultes a la Secretaria: [practicum.etic@upf.edu](mailto:practicum.etic@upf.edu)

## Curs 2022-23:

- 778 convenis de pràctiques per estudiants de grau
- 265 institucions d'acollida diferents (empreses, universitats, centres de recerca, hospitals)

ACCENTURE, S.L.	BIODIBERLAB	ERNST & YOUNG ABOGADOS, SLP	IDIBAPS	MMC	Socialpoint
ACCENTURE, S.L.U.	Biokit Research & Development SL	EVERIS SPAIN, S.L.U.	IDIBELL	MSL TECHNOLOGY S.L	Starke Energy S.L.
ACCIÓ - GENERALITAT DE CATALUNYA	BIT4ID	EY TRANSFORMA SERVICIOS DE CONSULTORIA	IGNITE Serious Play SL	MUTTER VENTURES	Starlab Barcelona
ADEVINTA PRODUCTS & TECHNOLOGY, SL	Bitbrain	EY TRANSFORMA SERVICIOS DE CONSULTORIA, S.L.	IGTP	MYCELIUM NETWORKS	Strands Labs
Adevinta Products & Technology, SLU	Bloobirds	FARRE SAURI NICOLAU	IMATGE MÈDICA INTERCENTRES SL	Near Space Labs	SUARA COOPERATIVA
Adevinta Spain	BMM Testlabs	Forma disseny	INBRAIN NEUROELECTRONICS S.L.	Nemuru	SYCAI TECHNOLOGIES S.L.
ADman Media	BNC10	FREEDA LANGUAGE SPACE S.L	INDRA SOLUCIONES TECNOLOGÍAS DE LA INFORMACIÓN	Nennisiwok, s.l.	Sycal Technologies SL
AED	BUFETE ESCURA, SLP	Fundació BarcelonaBeta Brain Research Ce	INSTITUT CATALÀ DE LA SALUT	Neuroelectrics	Talent Up
AERIAL INSIGHTS	BUYPOWER S.L	FUNDACIÓ IMIM	INSTITUT DE BIOINGENYERIA DE CATALUNYA (IBEC)	NTT DATA Spain Infrastructures Engineering, S.L.U	TIENDEO
Alma Medical Imaging	CAPGEMINI ESPAÑA, S.L	Fundació Institut de Recerca Vall d'Hebron	Institut de Biologia Evolutiva	NTT DATA Spain, S.L.U.	TINKERERS
ALTHAIA	CEGE	Fundació Sant Joan de Deu	Institut de Recerca Hospital Santa Creu i Sant Pau	ONIX RENTA S.L	TOP DOCTORS
AMES Group Sintering	Centro Médico Teknon	FUNDACIÓN UNIVERSIDAD-EMPRESA	INVINET SISTEMES 2003, SL	ONLEAN	TOP DOCTORS INC (SUC. EN ESPAÑA)
AMES MEDICAL	CIRCONTROL, S.A.	Futura Space	IOMED Medical Solutions	Opticks Security	TradeHeader
AMPLIFON	CISCO SYSTEMS	Gaes (AMPLIFON IBERICA SAU)	IQS	OYTEC	TREBOL SOLUCIONES ENERGÉTICAS, S.L.
ANCORADUAL SL	CLUBCONTROL	Getronics	IRTA	Pagantis	T-SYSTEMS ITC IBERIA, SAU
Apfutura Telecom S.L.	Codiwans	Glaszworks Barcelona	i-surance GmbH sucursal en España	Pandora Comunicació	UNIVERSIDAD DE LA REPÚBLICA
Aplicaciones en Informática Avanzada, S.L	COMPUTER SCIENCES BRAND,S.L.	GMV SOLUCIONES GLOBALES INTERNET	ITthinkUPC	PAPEL AUTOMATIC SA	UNIVERSIDAD DE VIGO
AQUA E-SOLUTIONS	CONSORCI MAR PARC SALUT BARCELONA	Grifols International S.A.	KANECODE S.L	PARLEM TELECOM	UNIVERSITAT DE BARCELONA
Aqua eSolutions, S.A.	CORPORACIÓ ALIMENTARIA GUISSONA S.A	GTD SCIENCE INFRASTRUCTURES & ROBOTICS	KEONN TECHNOLOGIES S.L	QMENTA	UNIVERSITAT POMPEU FABRA
Artificial Solutions	COTECNA	GTD SISTEMAS DE INFORMACION SAU	Kubbo Smart Logistics S.L	QUIRONSALUD	Universitat Pompeu Fabra - DCEXS
ASOCIACIÓN ESPAÑOLA DE DIRECTIVOS	CSUC	Haddock	LABIANA LIFE SCIENCIES, S.A.	Raona Enginyers	Universitat Pompeu Fabra - Enginyeries
Avanade Spain S.L.U.	CUATRECASAS GONÇALVES PEREIRA SLP	Helena Olcina	Leadtech	RBA PUBLIVENTAS, S.A.	UVE Solutions
AVANADE SPAIN, SL	Cuatrecasas, Gonçalves Pereira S.L.P	Henkel Iberica SA	LIDL SUPERMERCADOS, S.A.U.	REACH	UVE Solutions (UVE SERVICES ON DEMAND, SL)
Azbil Telstar	CUREEY	Holaluz	LIFE VASCULAR DEVICES BIOTECH SL	ROCHE DIAGNOSTICS, S.L	VALL D'HEBRON
B2Brouter	DatActionS	HOSPITAL SANT PAU I SANTA CREU	LUCHT PROBST ASSOCIATES	ROCHE DIAGNOSTICS, S.L.U.	Vip District, S.L.
Bacardi España, S.A.	DISPROQUIMA, S.A.	HOTSPOT BUILDERS, SL	Lyra Innovation	S2m-group Data Services & Software Holding	Visual Tagging Services SL
BARCELONA DE SERVEIS MUNICIPALS, S.A.	DOLBY	HP PRINTING AND COMPUTING SOLUTIONS SLU	Lyra Innovation S.L	Sana Meditech S.L.	Voicemod
BARCELONA SUPERCOMPUTING CENTER	EDITORIAL PLANETA DE AGOSTINI, S.A	IBEC	MANGO-PUNTO FA, S.L.	Schneider Electric España S.A.U.	VONZU TECH
BarcelonaBeta Brain Research Center	EIT Health	Ibermática	Mapit IoT	SEAT	Webcargo
BEABLOO	ELEM Biotech	ICFO-INSTITUT DE CIÈNCIES FOTÒNIQUES	METIS SOLUTIONS SL	SERVIZURICH	Welocalize Life Sciences
Berry Global	EM3 WORKS	Idea Sonora SL	Milestone Systems	Simon	WIN SYSTEMS
BIOIBERICA SAU	ENLEY	IDENCITY	MIWENDO SOLUTIONS, S.L	SISTEMES D'ORGANITZACIÓ SA	Worldline Iberia S.A

**4r any – TFG**





# 1r -2n -3r cursos, (gairebé) acabats! 4t és dur!!

Heu de:

- Cursar les darreres assignatures
- Fer pràctiques si voleu i no les heu fetes
- Escriure l'informe de pràctiques,
- Fer el TFG,
- Escriure el TFG (idealment en pseudo-anglès),
- Re-escriure el TFG (en anglès amb els comentaris del supervisor)
- Preparar la presentació del TFG
- Assajar la presentació del TFG
- Re-fer de nou la presentació del TFG
- Fer la presentació del TFG
- I TOT AMB BONES NOTES!!
- Preparar la sortida de la UPF (ofertes de feina, màsters, tesis, beques, etc.)

Objectiu de la sessió:

**Alarmar-vos!!**

<https://memegenerator.net/instance/60154134/nerd-dont-worry-were-here-to-help>



<https://es.postermymwall.com/index.php/art/template/19090572c24f2f1d3f16a4e9d462808b/now-panic-and-freak-out-poster-template#.Yk1StZNBz0o>

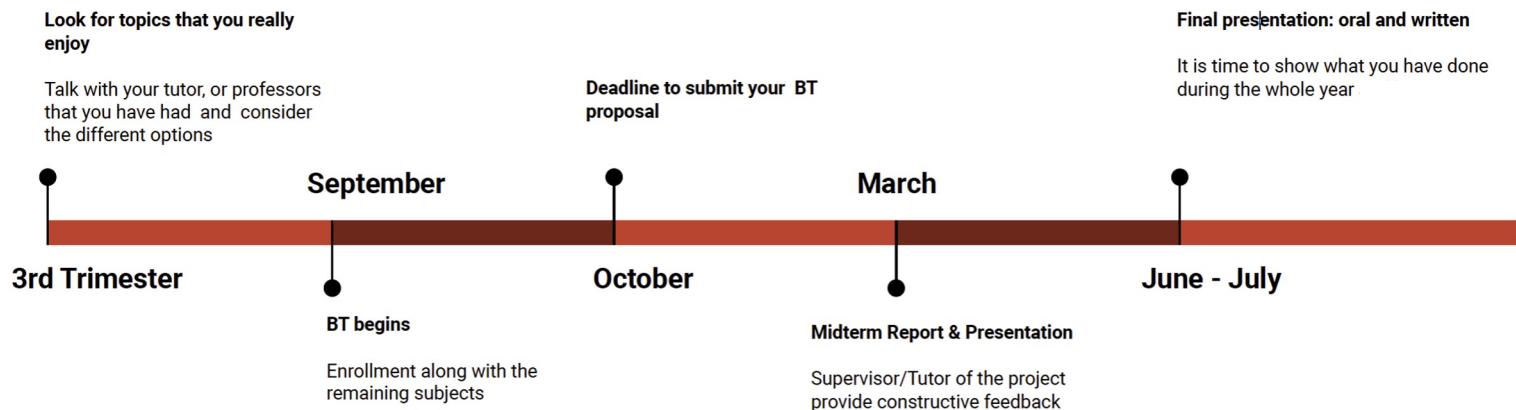
# Informació general & consells pel TFG



Coordinadora TFG:  
Carla Ràfols  
[carla.rafols@upf.edu](mailto:carla.rafols@upf.edu)

## A considerar

- El TFG es pot fer a la UPF o fóra, incloent a l'estranger
- Comenceu a pensar sobre el TFG a finals del 3r curs: parleu amb professors/alumnes, empreu l'experiència i contactes durant les pràctiques, contacteu empreses, ...
- El **TFG** ha d'estar **definit** (supervisor/s, títol) **l'1 d'octubre** del curs acadèmic corresponent al 4t any
- Idealment, el TFG es realitza durant tot el curs acadèmic, dintre de les possibilitats de cadascú i sense oblidar les altres assignatures (1r trimestre per entendre el tema, llegir literatura, explorar dades, primeres reunions, escriure la introducció i planificar la feina)



# Informació general & consells pel TFG

## Com començar:

- Informació general i procediments → <https://www.upf.edu/web/etic/treball-de-fi-de-grau1>
- Consultes a Secretaria → [tfg.etic@upf.edu](mailto:tfg.etic@upf.edu)
- Exploreu les ofertes de TFG (**llista no exhaustiva de possibilitats**) →
  - GEI: [http://tfg.esup.upf.edu/tfg/pfc\\_consultar\\_pfcs.jsp?estudi=ei](http://tfg.esup.upf.edu/tfg/pfc_consultar_pfcs.jsp?estudi=ei)
  - GESA: [http://tfg.esup.upf.edu/tfg/pfc\\_consultar\\_pfcs.jsp?estudi=esa](http://tfg.esup.upf.edu/tfg/pfc_consultar_pfcs.jsp?estudi=esa)
  - GEXT: [http://tfg.esup.upf.edu/tfg/pfc\\_consultar\\_pfcs.jsp?estudi=et](http://tfg.esup.upf.edu/tfg/pfc_consultar_pfcs.jsp?estudi=et)
  - GEMCD: [http://tfg.esup.upf.edu/tfg/pfc\\_consultar\\_pfcs.jsp?estudi=cd](http://tfg.esup.upf.edu/tfg/pfc_consultar_pfcs.jsp?estudi=cd)
- Parleu amb els professors i assegureu la vostra opció favorita: construïu el vostre projecte; col·laboració acadèmica o industrial; involucreu-vos en projectes de recerca en curs; aneu a l'estranger; etc.
- Per realitzar el TFG en una altra institució, necessitareu un tutor de la UPF (que no necessàriament supervisi el vostre TFG, només per revisar procediments)
- Possibilitat dels TFG Integrats: <https://www.upf.edu/web/tfg-integrats>
- Possibilitat de TFG dintre d'iniciatives globals, u4impact: <https://www.u4impact.org/>

# Informació general & consells pel TFG

## Durant el TFG

- Respecta estrictament els requisits de seguiment i dates límits proporcionades per la Coordinadora de TFG
- **Treball continu:** esforços continus són necessaris per evitar/confrontar problemes d'última hora
- Demana **reunions de seguiment regulars** amb el(s) teu(s) supervisor(s): una reunió/contacte cada setmana o bisetmanalment no és massa
- Informa adequadament i a temps el(s) teu(s) supervisor(s) i/o UPF de qualsevol problema (no us dormiu, el temps passa volant!)
- Gaudeix de les meravelloses propietats del cafè

# Informació general & consells pel TFG

## Document i defensa de TFG

- Les defenses de TFG són obertes al públic, amb una durada limitada (uns 20 minuts), més preguntes i respostes dels membres del tribunal
- El document i defensa de TFG han de reflectir els vostres esforços i la qualitat de la vostra feina
- El document de TFG ha de estar ben escrit i ben estructurat, sense errors (tipogràfics) i amb una longitud limitada (30 pàgines; informació addicional pot incloure's com annexes)
- Mireu exemples de documents de TFG dels anys passats al següent enllaç:  
<https://repositori.upf.edu/handle/10230/20650>
- Les presentacions han de ser visualment atractives, comprensibles tant per experts com no experts. I recordeu: **Informació no és Comunicació!**
- Respecteu escrupolosament el temps de la presentació (assageu, assageu, assageu)

“By failing to prepare, you are preparing to fail”

Benjamin Franklin

# Informació general & consells pel TFG

## Còpies i plagi

- Problema molt greu actual (un dels més importants) a l'Escola
- Manca de professionalisme i respecte envers el professorat i la resta de companys
- Es treballa actualment en un nou procediment per agilitzar les sancions i establir accions per evitar aquestes situacions
- Casos recents de plagi al TFG
- **SEMPRE** referencieu adequadament el contingut original!!!
- **Que no sigui de manera intencionada no és excusa!!**





# Informació general & consells pel TFG

## Ús del ChatGPT

0 Is it useful and recommended to use chatGPT to write the undergraduate thesis?



As an AI language model, ChatGPT can provide valuable assistance and generate ideas for your undergraduate thesis, but it should not be used as a substitute for your own critical thinking and analysis.



While ChatGPT can provide a wealth of information and potential sources for your thesis, it's important to understand that it's still an AI language model, which means that it may not have the same depth of understanding and contextual knowledge as a human expert in your field. Therefore, you should use the information and ideas generated by ChatGPT as a starting point for your research, and then supplement it with your own critical thinking, analysis, and evaluation of sources.

In addition, it's important to keep in mind that the primary purpose of an undergraduate thesis is to demonstrate your own research skills, critical thinking, and writing abilities. While ChatGPT can help with generating ideas and providing information, it's ultimately up to you to synthesize and analyze that information to develop your own original thesis statement and argument.

In summary, while ChatGPT can be a helpful tool in your research process, it should be used as a supplement to your own critical thinking and analysis, and should not be relied upon as a substitute for your own research and writing skills.



# Informació general & consells pel TFG

## Important



# (Nou) Equip directiu de l'Escola d'Enginyeria de la UPF

Moltes persones amb l'objectiu principal d'aconseguir una formació excel·lent a les enginyeries UPF



Dubtes

- 1) <https://www.upf.edu/web/etic/enginyeria-telecomunicacions-2016-informacio-estudiant>
- 2) CAU a Secretaria!!

**Thanks for your attention**