



# Master in Computer Vision *Barcelona*

## Academic year 2022-2023

### Welcome Session & Master presentation

*[mcv.uab.cat](http://mcv.uab.cat)*

Maria Vanrell



# Welcome session

1. About the Master
2. About the Partners
  - The UAB-CVC
  - The UOC
  - The UPC
  - The UPF
3. About the Students

# Aim of the Master in Computer Vision

To give to the students **updated knowledge** about Computer Vision,

from basic techniques to state-of-art algorithms

that is an **emerging technology** whose development and applicability to different fields is exponentially growing since the last 2 decades

new jobs, start-up opportunities, Phd studentships

By **joining 4 groups of experts** in the filed which are living in Barcelona

a big concentration of expertise in a singular place



UAB  
*Campus Bellaterra*



UPC  
*Campus Nord*



UPF  
*Campus Poblenou*



UOC  
*Virtual Campus*



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Image © 2013 TerraMetrics



# UAB

## Campus Bellaterra



Administration  
*Escola d'Enginyeria*

Image © 2013 Institut Cartogràfic de Catalunya



Computer Vision Center  
Google ea



# UPC Campus Nord







UPF  
*Campus Poblenou*







UOC  
*22@ Building*





# MCV is 1 year Official Master of 60 ECTS

Integrated in the **EEES** (*European Space of Superior Education*)

organized with the **ECTS** (*European Credit Transfer System*)

**ECTS** establishes the dedication of the student

**1 ECTS = 25 Hours** of student work

**MCV workload distribution:**

## On-site modules (M1 to M6)

5 h. on-site (20% approx.)  
20 h. homework (80% approx.)

## On-lines modules (M7, M8)

100 % homework



# MCV structure:

	Modules	ECTS	Univ.
M1	Introduction to human and CV	6	UPC
M2	Optimization and Inference techniques for CV	6	UPF
M3	Machine Learning techniques for CV	6	UAB
M4	3D Vision	6	UPC
M5	Visual Recognition	6	UAB
M6	Video Analysis	6	UPF
M7	Introduction to Research Dissemination	6	UOC
M8	Research and Technology Transfer Management	6	UOC
M9	Master Dissertation	12	ALL

Total: 60



	Modules	ECTS	Univ.
M1	Introduction to human and CV	6	UPC
M2	Optimization and Inference techniques for CV	6	UPF
M3	Machine Learning techniques for CV	6	UAB
M4	3D Vision	6	UPF
M5	Visual Recognition	6	UAB
M6	Video Analysis	6	UPC

**Hybrid**  
(online-inperson)  
at UAB/UPC/UPF

	Modules	ECTS	Univ.
M7	Introduction to Research Dissemination	6	UOC
M8	Research and Technology Transfer Management	6	UOC

**On-line at**  
**UOC**

	Modules	ECTS	Univ.
M9	Master Dissertation	12	ALL

**Under**  
**supervision**



### Modules

ECTS

Univ.

M1	Introduction to human and CV	6	UPC
M2	Optimization and Inference techniques for CV	6	UPF
M3	Machine Learning techniques for CV	6	UAB

**Basic Techniques**  
(Hybrid: online-inperson)  
**Project-based**

M4 3D Vision

6

UPC

M5 Visual Recognition

6

UAB

M6 Video Analysis

6

UPF

**Vision Problems**  
(Hybrid: online-inperson)  
**Project-based**

### Modules

ECTS

Univ.

M7	Introduction to Research Dissemination	6	UOC
M8	Research and Technology Transfer Management	6	UOC

**Transversal skills**  
(online)

### Modules

ECTS

Univ.

M9	Master Dissertation	12	ALL
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**Final Project**  
(under supervision)  
Academic or  
at a Company



Modules

ECTS

Univ.

M1	Introduction to human and CV	6	UPC
M2	Optimization and Inference techniques for CV	6	UPF
M3	Machine Learning techniques for CV	6	UAB

**Basic Techniques**  
(Hybrid: online-inperson)  
**Project-based**

M4	3D Vision	6	UPC
M5	Visual Recognition	6	UAB
M6	Video Analysis	6	UPF

**Vision Problems**  
(Hybrid: online-inperson)  
**Project-based**

M7	Introduction to Research Dissemination	6	UOC
M8	Research and Technology Transfer Management	6	UOC

**Transversal skills**  
(online)

M9	Master Dissertation	12	ALL
----	---------------------	----	-----

**Final Project**  
(under supervision)  
Academic or at a Company



# FULL TIME option

October	November	December	February	March	April	May	July (September)
M1. Introduction to human and CV		M3. Machine Learning techniques for CV		M5. Visual Recognition			
M2. Optimization and Inference techniques for CV		M4. 3D Vision		M6. Video Analysis			
M7. Introduction to Research Dissemination				M8 Research and Technology Transfer Management			
						M9. Master Dissertation	



# PART TIME option

## 1<sup>st</sup> YEAR:

October	November	December	February	March	April	May	July (September)
M1. Introduction to human and CV		M3. Machine Learning techniques for CV		M5. Visual Recognition			
M7. Introduction to Research Dissemination				M8 Research and Technology Transfer Management			

## 2<sup>nd</sup> YEAR:

October	November	December	February	March	April	May	July (September)
M2. Optimization and Inference techniques for CV		M4. 3D Vision		M6. Video Analysis			
M9. Master Dissertation							

## SCHEDULE

Time	Monday	Tuesday	Wednesday	Thursday
16h-17h	M1 / 3 / 5	M2 / 4 / 6	M1 / 3 / 5	M2 / 4 / 6
17h-18h	M1 / 3 / 5	M2 / 4 / 6	M1 / 3 / 5	M2 / 4 / 6
18h-19h	Project M1/3/5			Project M2/4/6



# Changes for Academic Year 2023-2024



UAB  
*Campus Bellaterra*

UPC  
*Campus Nord*

UB  
*Central Campus*

UPF  
*Campus Poblenou*

UOC  
*Virtual Campus*

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Image © 2013 TerraMetrics



# NEW PROGRAM

## Part-Time 1st year

M1(6)	M3(6)	M5(9)
M7(9)		

## Part-Time 2nd year

M2(6)	M4(9)	M6(9)
M8(9)		

# Week Schedule

Week Schedule	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
4pm-5pm	Lecture	Lecture	Lecture	Lecture	
5pm-6pm	Lecture	Lecture	Lecture	Lecture	
6pm-7pm	Follow-up	Lecture	Lecture	Follow-up	
	IN-PERSON	ONLINE	ONLINE	IN-PERSON	

# Year Schedule

OCTOBER				NOVEMBER				DECEMBER				JANUARY				FEBRUARY				MARCH				APRIL				MAY				JUNE				JULY				AUG		SEPT.					
1	2	3	4	5	6	7	8	9	10				11	12	13	14	15	16	17	18	19	20	21	22	23		24	25	26	27	28	29	30	31	32	33	34	35	36		37	38					
M1								M3								M5																															
M2								M4								M6																															
M7																																															
																						Selection Period				M8																					

... but, we come back to this Year 2022-2023



# Module Coordinators:

**Module 1.** Introduction to Human & Computer Vision

**Philippe Salembier**

**Module 2.** Optimization and Inference techniques for CV

**Coloma Ballester**

**Module 3.** Machine Learning for CV

**Ramon Baldrich**

**Module 4.** 3D Vision

**Gloria Haro**

**Module 5.** Visual Recognition

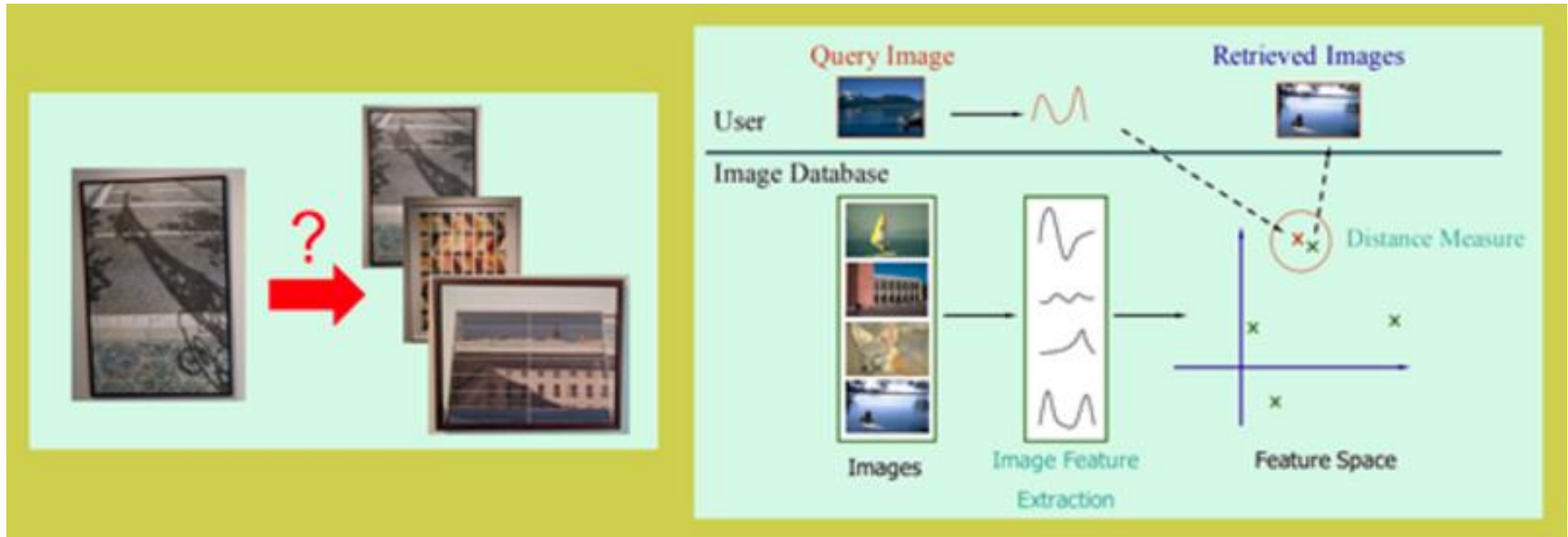
**Joan Serrat**

**Module 6.** Video Analysis

**Javier Ruiz**

**A project based-methodology ...**

# Project 1. Museum Painting Retrieval





## Project 2. Removing Objects in Natural and Urban Scenes



*Picture from: Komodakis and Tairitas, IEEE Trans Image Proc, 2007*

## Project 3. Image Classification





## Project 4. 3D recovery of urban scenes



The two central images are from Hiep et al. "Towards high-resolution large-scale multi-view stereo", CVPR 2009

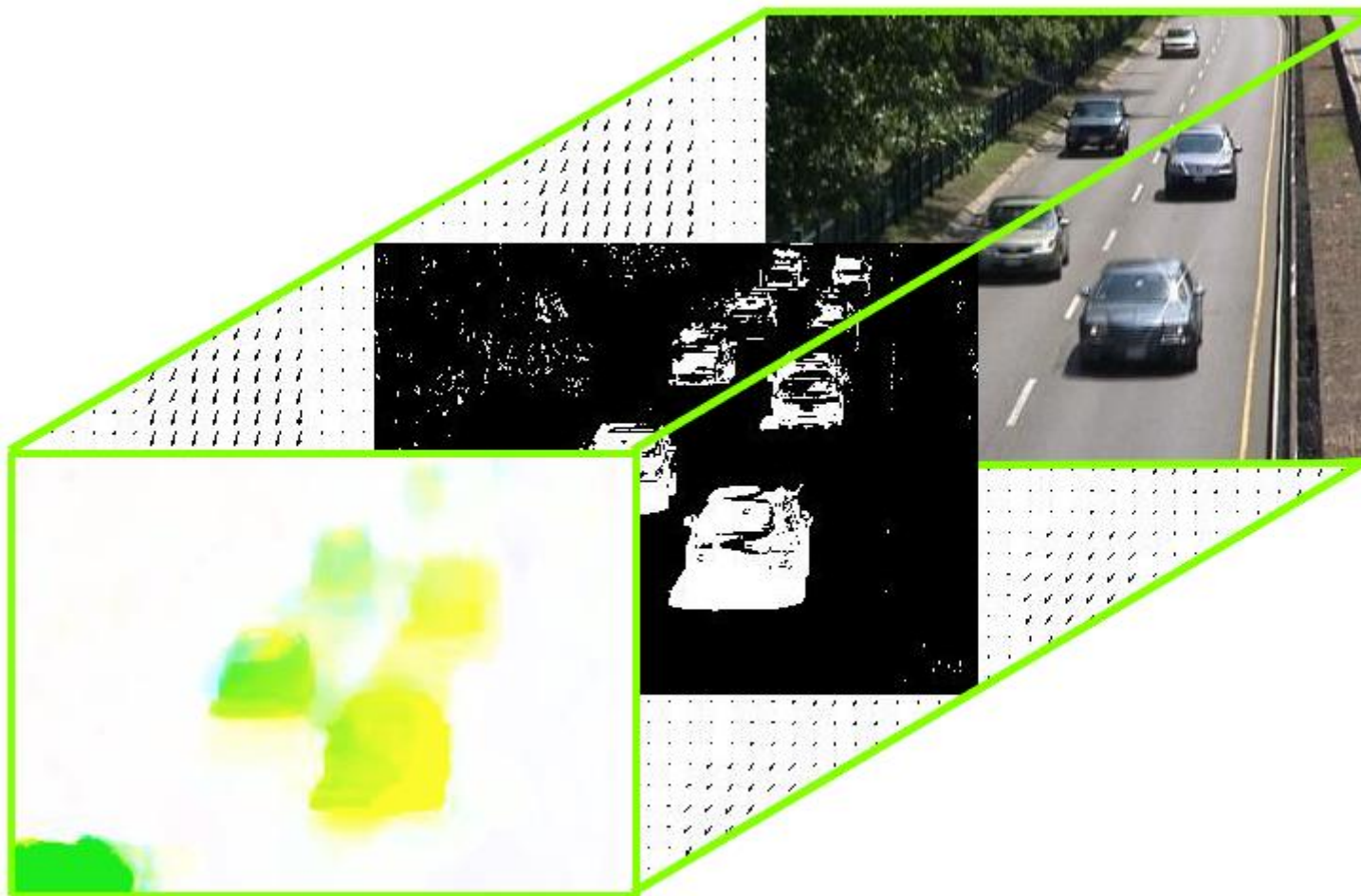


## Project 5. Deep Learning for Classification, Detection and Segmentation





## Project 6. Road Traffic Monitoring



# Project coordinators

**Project 1.** Museum Painting Retrieval

**Ramon Morros**

**Project 2.** Removing Objects in Natural Scenes

**Karim Lekadir**

**Project 3.** Image Classification

**Ramon Baldrich**

**Project 4.** 3D recovery of urban scenes

**Gloria Haro**

**Project 5.** Deep Learning for Classification, Detection and Segmentation

**Ernest Valveny**

**Project 6.** Road Traffic Monitoring

**Javier Ruiz**



# Teaching Methodology:

## Supervised Sessions on-site

- **Lecture Sessions**, where the lecturers will explain general contents about the topics. Some of them will be used to solve the problems.
- **Project follow-up Sessions**, where the problems and goals of the projects will be presented and discussed, students will interact with the project coordinator about problems and ideas on solving the project (approx. 1 hour/week)
- **Presentation Session**, where the students give an oral presentation about how they have solved the project and a demo of the results.
- **Exam Session**, where the students are evaluated individually. Knowledge achievements and problem-solving skills

**Homework**, student will work in **groups** to solve the problems of the projects with deliverables:

- Code
- Reports
- Oral presentations

# Evaluation:

The final marks for modules M1-M6 are computed with a formula, such as:

$$\text{Final Mark} = 0,4 \times \text{Exam} + 0,55 \times \text{Project} + 0,05 \times \text{Attendance}$$

**Exam:** is the mark obtained in the Module Exam (must be equal or greater than 3)

**Attendance:** is the mark derived from the control of attendance at lectures  
(must be at least 70%)

**Project:** is the mark provided by the project coordinator based on the weekly control of the project through the project sessions and deliverables accordingly with specific criteria of the projects, such as:

- Participation in discussion sessions and in team work (intra-group evaluations)
- Mandatory and optional exercises
- Code development (style, comments, etc.)
- Report (justification of the decisions in your project development)
- Presentation (Talk and demonstrations on your project.

**Special Exercises** can allow you to get extra points or increase the Exam Mark, but only if Exam Mark is greater than 3.



# Evaluation for modules M7 and M8

**Coordinator: David Merino** (dmerinoar@uoc.edu)

## M7 module mark is based on 5 different activities:

- Scientific text editing using LaTeX (20%)
- Oral presentations (40%).
- Writing style (20%)
- Ethics in Research (10%).
- Research dissemination tools (10%)

## M8 module mark is based on 6 different activities:

- Entrepreneurship (40%)
- Public funding (10%)
- Intellectual property (10%)
- Data analysis (20%)
- Project planning (10%)
- Review of the state-of-the-art (10%)
- Bibliographical review of own project (20%)

**Deliverables:**  
Reports and  
Videos of Oral  
presentations in  
M1 and M3

## M9 Coordinators:

(UAB) M. Vanrell & R. Baldrich

(UOC) X. Baró

(UPC) J.R.Casas

(UPF) Coloma Ballester

**Evaluation** of **M9** module, **Master's Dissertation**, is evaluated according to the following criteria:

- Research performed according to the initial hypothesis.
- Defense of the work in a viva with a **Committee of 3 members**
- **Report of the research work** (Article format, less than 30 pages)
- Reported Conclusions
- **Supervisor evaluation**



# Lecturers assessments

We will ask you for some help in improving the master

For each module we will ask you to fill an assessment about all the lecturers of the courses you attended.

# Practical Issues

# Schedule, News and Shared data:

mcv.uab.cat



News   Goals   Program   Schedule   Admission   Internships   Job offers & Phd Grants   Contact   Log In

## News

**Academic Year 2022-2023.** The **Welcome Session** for next October Intake will be on **September, the 30th** at Computer Vision Center (UAB Campus) at 4pm. **Courses will start on October, the 3rd**, they will take place at different Campus in Barcelona area depending on module coordination,

M1 and M4 (UPC) at [Campus Nord](#)

M2 and M6 (UPF) at [Campus Poblenou](#)

M3 and M5 (UAB) at [Campus Bellaterra](#)

M7 and M8 (UOC) are online through the [Virtual Campus of UOC](#)

A generic Year Calendar for 2022-2023 is [<here>](#), more details are given at each module page (*right-side menu*)

**Admission process for this master usually OPENS in December 202(X-1) for 202X October intake**, you can start your process at this [<link>](#). **The 1st Admission period, will usually end up around April 1st, 202X** (issuing the resolution around May 2<sup>nd</sup>, 202X). If there are free positions after the 1st period, we could have a 2<sup>nd</sup> period from around May 3<sup>rd</sup> to around June 23<sup>rd</sup> 202X (issuing the resolution around July 10<sup>th</sup>, 202X). We highly recommend you to apply in the 1st period even if you have not graduated yet.

**Academic Year 2021-22** started on **October 1st** with a **Welcome Session** that took place at CVC [Iphoto.pdf](#)

### Modules

- [M1. Introduction to human and CV](#)
- [M2. Optimization&Inference for CV](#)
- [M3. Machine Learning for CV](#)
- [M4. 3D Vision](#)
- [M5. Visual Recognition](#)
- [M6. Video Analysis](#)
- [M7. Research Dissemination](#)
- [M8. Research & Transfer Methods](#)
- [M9. Master Dissertation](#)

### See Project Proposals

- [Academic](#)
- [Company](#)
- [Student](#)

Practical Information  
about the  
modules:

Agenda, schedule,  
rooms



# Module Information



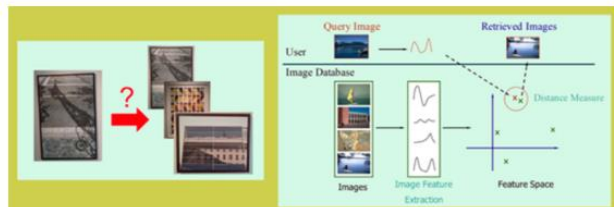
## Module Schedule Building and Room

News Goals Program Schedule Admission Internships Job offers & Phd Grants Contact Log In

### M1. Introduction to Human and Computer Vision

The aim of this module is introduce the students to computer vision including basics of human visual system and image perception, acquisition and processing. In terms of processing, the module deals with low-level pixel-based transforms, linear, nonlinear and morphological filtering, Fourier analysis, multiscale representations, extraction of simple features and image descriptions. Furthermore, elementary grouping, segmentation and classification strategies will be discussed as well as quality and assessment methodologies for image processing algorithms. To put into practice the algorithms and techniques, the students will work on a concrete project along the course. The aim is to provide an applied knowledge of a broad variety of Computer Vision techniques applied to solve a real-world vision problem. The project goal is to detect specific objects in images using basic CV techniques such as linear and non-linear filtering, segmentation, grouping, template matching, modeling, etc. The knowledge obtained can be used in a wide variety of applications, for instance, quality control, generic object detection, security applications, etc.

Project title: Museum Painting Retrieval



images. The resulting system can be applied to any small query-by-example problem

M1 Schedule – Academic Year 2022-2023 – Student Guide [<here>](#)

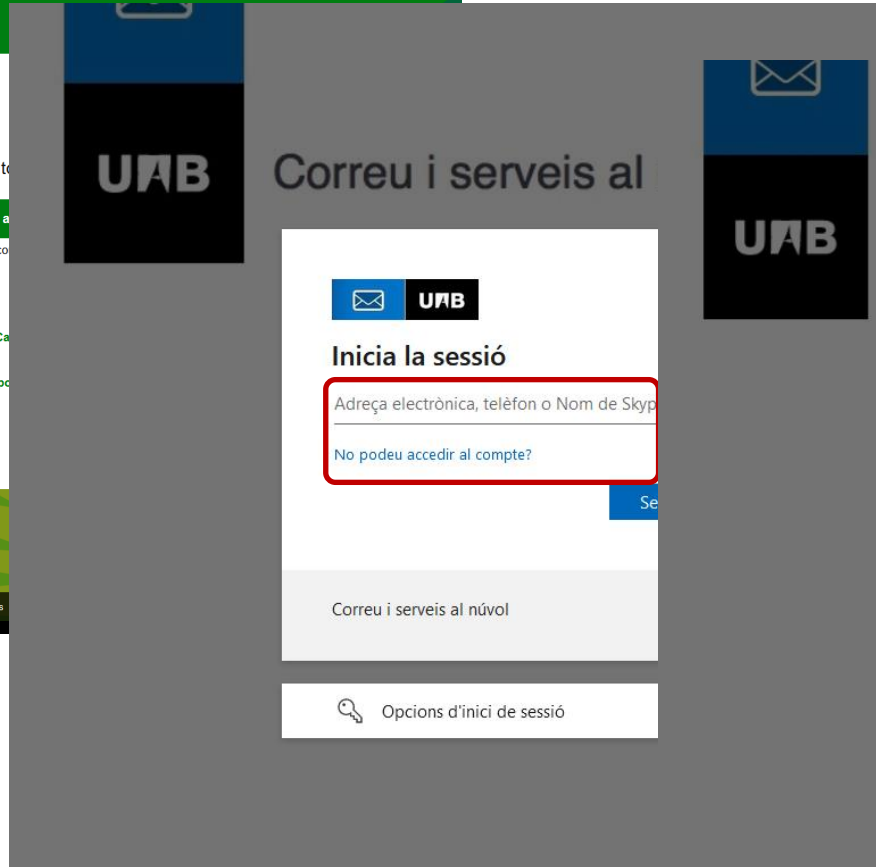
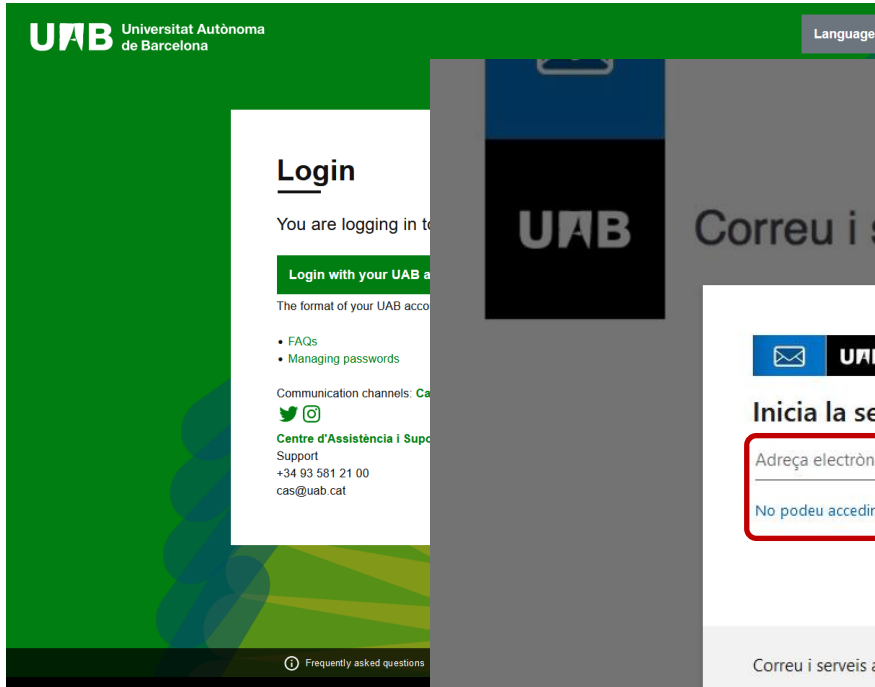
week	date	time	lecture	lecturer	university	room
1	Mon. Oct. 3rd	16:00 - 18:00	Image processing assessment and pixel-based processing	Philippe Salembier	UPC	A3-106
1	Mon. Oct. 3rd	18:00 - 19:00	Project Introduction	Ramón Morros	UPC	A3-106
1	Wed. Oct. 5th	16:00 - 18:00	Morphological and nonlinear filtering	Philippe Salembier	UPC	googlemeet
2	Mon. Oct. 10th	16:00 - 18:00	Space-frequency representation, Fourier transform and linear filtering (I)	Javier Ruiz	UPC	A3-106
2	Mon. Oct. 10th	18:00 - 19:00	Project follow-up	Ramón Morros	UPC	A3-106
2	Wed. Oct. 12th		HOLIDAY			
3	Mon. Oct. 17th	16:00 - 18:00	Space-frequency representation, Fourier transform and linear filtering (II)	Javier Ruiz	UPC	A3-106
3	Mon. Oct. 17th	18:00 - 19:00	Project follow-up	Ramón Morros	UPC	A3-106
3	Wed. Oct. 19th	16:00 - 18:00	Space-frequency representation, Fourier transform and linear filtering (III)	Javier Ruiz	UPC	googlemeet
4	Mon. Oct. 24th	16:00 - 18:00	Human Visual system and perception	Javier Vázquez	UAB	googlemeet
4	Mon. Oct. 24th	18:00 - 19:00	HOMEWORK			
4	Mon. Oct. 24th	18:00 - 19:00	Image formation and color representation	Javier Vázquez	UAB	googlemeet
5	Mon. Oct. 31st	16:00 - 18:00	Feature extraction	Verónica Vilaplana	UPC	A3-106
5	Mon. Oct. 31st	18:00 - 19:00	Project follow-up	Ramón Morros	UPC	A3-106
5	Wed. Nov. 2nd		HOMEWORK			
6	Mon. Nov. 7th	16:00 - 18:00	Grouping, segmentation and classification (I)	Ramón Morros	UPC	A3-106
6	Mon. Nov. 7th	18:00 - 19:00	Project follow-up	Ramón Morros	UPC	A3-106
6	Wed. Nov. 9th	16:00 - 18:00	Grouping, segmentation and classification (II)	Ramón Morros	UPC	googlemeet
7	MON. NOV. 14th	16:00 - 19:00	Project Presentations	Ramón Morros	UPC	A3-106
8	Mon. Nov. 21st		HOMEWORK			
8	Wed. Nov. 23rd		HOMEWORK			
9	MON. NOV. 28th	16:00 - 19:00	EXAM	Philippe Salembier	UPC	A6-002

M1 Schedule – Academic Year 2022-2023 – Student Guide [<here>](#)

week	date	time	lecture	lecturer	university	room
1	Mon. Oct. 3rd	16:00 - 18:00	Image processing assessment and pixel-based processing	Philippe Salembier	UPC	A3-106
1	Mon. Oct. 3rd	18:00 - 19:00	Project Introduction	Ramón Morros	UPC	A3-106
1	Wed. Oct. 5th	16:00 - 18:00	Morphological and nonlinear filtering	Philippe Salembier	UPC	googlemeet
2	Mon. Oct. 10th	16:00 - 18:00	Space-frequency representation, Fourier transform and linear filtering (I)	Javier Ruiz	UPC	A3-106
2	Mon. Oct. 10th	18:00 - 19:00	Project follow-up	Ramón Morros	UPC	A3-106
2	Wed. Oct. 12th		HOLIDAY			
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4	Mon. Oct. 24th	16:00 - 18:00	Human Visual system and perception	Javier Vázquez	UAB	googlemeet
4	Mon. Oct. 24th	18:00 - 19:00	HOMEWORK			
4	Mon. Oct. 24th	18:00 - 19:00	Image formation and color representation	Javier Vázquez	UAB	googlemeet
5	Mon. Oct. 31st	16:00 - 18:00	Feature extraction	Verónica Vilaplana	UPC	A3-106
5	Mon. Oct. 31st	18:00 - 19:00	Project follow-up	Ramón Morros	UPC	A3-106
5	Wed. Nov. 2nd		HOMEWORK			
6	Mon. Nov. 7th	16:00 - 18:00	Grouping, segmentation and classification (I)	Ramón Morros	UPC	A3-106
6	Mon. Nov. 7th	18:00 - 19:00	Project follow-up	Ramón Morros	UPC	A3-106
6	Wed. Nov. 9th	16:00 - 18:00	Grouping, segmentation and classification (II)	Ramón Morros	UPC	googlemeet
7	MON. NOV. 14th	16:00 - 19:00	Project Presentations	Ramón Morros	UPC	A3-106
8	Mon. Nov. 21st		HOMEWORK			
8	Wed. Nov. 23rd		HOMEWORK			
9	MON. NOV. 28th	16:00 - 19:00	EXAM	Philippe Salembier	UPC	A6-002

Link to Virtual Room

# Moodle Rooms for M1-M6 and M9 at UAB Campus Virtual: `cv.uab.cat`



[NIU@uab.cat](mailto:NIU@uab.cat)  
Password



Verification code



# Campus Virtual UAB

## Benvinguda al Campus Virtual

### Manteniment i aturada del Campus Virtual

Per tasques de manteniment, el proper dimarts **4 d'octubre** de **7:30 a 8:00** hi ha programada una aturada del Campus Virtual.

### Sou docent i a l'aula només veieu una part de l'alumnat matriculat a l'assignatura?

Si veieu més estudiants a Sigma, molt probablement us manqui assignar algun codi de matrícula a l'aula. Consulteu la següent [informació](#).

## Your subjects

Preferences 𐄂

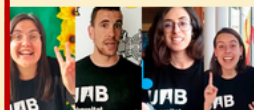
✉ Messaging (moodle) →

M1. Introduction to Human and Computer Vision [MO56725] (22-23) →

M2. Optimisation and Inference for Computer Vision [MO56727] (22-23) →

## Latest news

### On Campus



## Utilities

⚙ Moodle classroom management

🔗 Moodle: Help for teachers

📊 Virtual Campus in figures

# Your subjects



# Moodle Rooms for M1, M2, ... M6 and M9

The screenshot shows the 'Campus Virtual de la UAB' website. The header includes the UAB logo, navigation links (Inici, Ajuda professorat, Ajuda alumnat), and a 'Sortida' button. The main content area displays a list of courses. The first course, 'M1. Introduction to Human and Computer Vision MO22047 (18-19)', is highlighted with a red box. Below the course title, there are links for 'Esdeveniments propers' (0 nous), 'Material i activitats' (0 nous), and 'Avisos i notícies' (0 nous). A 'Bibliografia M1. Introduction to Human and Computer Vision (43085)' link is also present. The second course, 'M2. Optimisation and Inference for Computer Vision MO22048 (18-19)', is also visible below it. The interface includes filters for 'Totes', 'Docent', and 'Estudiant', and a 'Vista' section with 'Completa' and 'Simplificada' options.

## M1. Introduction to Human and Computer Vision [MO14296]

News and Forum

### CONTACTS

Coordinators and Lecturers

### LECTURES

Materials

### PROJECT

### EVALUATION

IMPORTANT

## About UAB e-mail address

You can access your account at: [correu.uab.cat](mailto:correu.uab.cat)  
with the UAB NIU and password

Once logged in, you should

- At the top of the page, select **Settings > View all Outlook settings**.
- Select **Mail > Forwarding**.
- Select **Enable forwarding**, enter the forwarding email address

If you have technical problems with your account or  
Campus Virtual you can contact to [cas@uab.cat](mailto:cas@uab.cat)

# UOC Virtual Campus for M7 and M8

You Will receive your login information from UOC at your contact e-mail given to UAB

They are different from the UAB NIU/password!!!

The image shows a screenshot of the UOC Virtual Campus login page. A red circle highlights the 'User' input field, and another red circle highlights the 'Campus' dropdown menu. A red arrow points from the 'Campus' dropdown to the 'UOC' link in the browser's address bar. The browser's address bar shows 'www.uoc.edu/portal/campus/index.html'. The page header includes the UOC logo and navigation links: 'Recerca i innovació', 'Coneixement obert', 'Sobre la UOC', and 'Campus'. The main content area features a large blue banner with the text '«L'e-learning resoldria molts dels problemes que tenim per la dispersió de la població»' and a photo of a man. At the bottom, there is a cookie consent banner with the text 'Utilitzem galetes pròpies i de tercers. L'anàlisi de les dades que recopilem ens permet millorar el web i oferir una informació i uns serveis més personalitzats. Si continues navegant, considerem que n'acceptes l'ús. Per a més informació, consulta la política de galetes.' and a 'Tanca' button.

**Important: M7 course starts on October 21st**



# UOC Moodle rooms for M7 and M8

The screenshot shows the UOC Moodle interface. The browser address bar displays the URL: `cv.uoc.edu/cgi-bin/uocapp?s=9d72248938b68b56c8e8b489a55a61687232373017457e023544df0b1fc1e137ae25ecaf8f52af99311...`. The UOC logo and name 'Universitat Oberta de Catalunya' are visible. The user is logged in as 'David Masip Rodo' with the role 'GCUOC-Professor-IT, Multimedia and Telecommunications'. The top navigation bar includes links for 'Help service', 'Mailbox', 'Agenda', 'My profile', 'Work groups', and a 'Search' button. A row of icons represents various services: My UOC, Community, Classrooms (highlighted), Tutor Support, Counsellors, Library, Secretary's Office, Intrauoc, and News. The 'Classrooms' dropdown menu is open, showing a list of rooms, with 'Introduction to Research Dissemination aula 1 - Fernando Vilariño Freire, Claudia Bullion' selected. On the left, the 'Students Room' sidebar lists years from 20091 to 20122. The main content area shows the course 'M0.200 Introduction to Research Dissemination aula 1' with tabs for 'COURSE' and 'CLASSROOM MANAGEMENT'. Below the course title, there is a 'START' button and a 'LEARNING GUIDE' button.

Additionally, **you can use a desk** for your homework **at CVC**



In the basement ...

To prepare your Access to CVC

Please, contact Mrs. Mireia Martin ([mmartin@cvc.uab.cat](mailto:mmartin@cvc.uab.cat))

# M9 . Master's Dissertation

Guideline for the students at the website page M9

Companies and institutions that hosted our students in the past:





# Welcome session

1. About the Master
2. About the Partners
  - The UAB-CVC
  - The UOC
  - The UPC
  - The UPF
3. About the Students

# UAB / CVC

Created in 1968

University campus with 263ha with all necessary services for living



## International Rankings



170 (2) →



201-300 (2)



178 (1)



44 (1)



(1)

Rank	Scientific fields and subjects
1-50	Geography (34), Veterinary Sciences (5)
51-75	Agricultural Sciences
76-100	Biotechnology, Ecology, Economics
101-150	Atmospherical Sciences, Instrumental Sciences and Technology, Mathematics, Materials Science, Nanoscience and Nanotechnology, Oceanography, Physics, Biological Sciences, Chemistry, Energy Science and Engineering, Environment Science and Engineering, Hospitality and Tourism Management, Human Biological Sciences, Medical Technology, Nursing, Pharmacy, Political Science, Public Administration, Sociology
151-200	Biomedical Engineering, Clinical Medicine, Earth Sciences, Education, Food Science and Technology, Psychology, Telecommunications Engineering
201-300	



# Degrees

**112** Bachelor's degrees  
**140** Official Master's degrees  
**129** Master's Degrees  
**293** Lifelong learning programmes

**56** MOOC offered at Coursera  
**221,562** MOOC students  
**89%** Bachelor's degree performance rate  
**93%** Employment rate

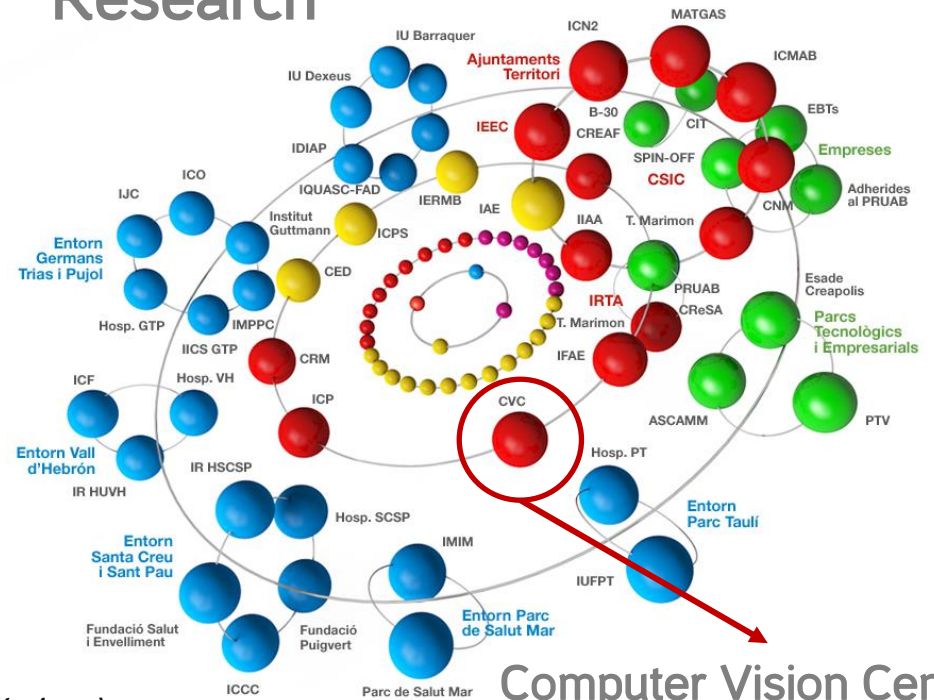
# Students

**27,203** Undergraduate students (*25,537 full-time*)  
**2,987** Official Master's students  
**2,046** UAB master's degree students  
**3,789** Lifelong learning programmes students

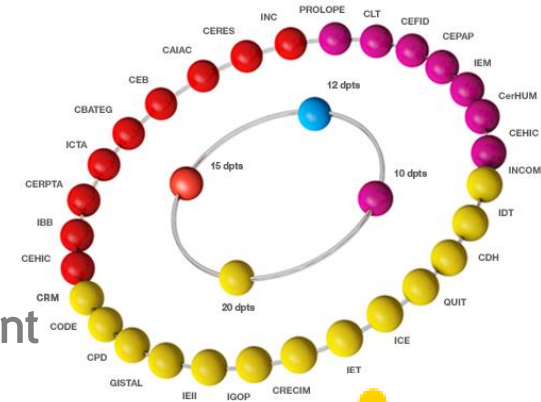
# Staff

**57** Departments → Computer Science Department  
**15** Centers → Engineering School  
**4,020** Teaching and Research Staff

# Research



# Computer Vision Center



- Social
- Humanities
- Science (Tech & Exp)
- Health
- Others

# Computer Vision Center, since 1995

 **26**  
YEARS

 **+130**  
STAFF

 **2,8 M**  
€/YEAR INCOME

 **+50**  
PUBLICATIONS/YEAR

 **+50**  
ONGOING PHD THESIS



 **Generalitat  
de Catalunya**

**UAB**  
Universitat Autònoma  
de Barcelona



**TECH  
TRANSFER**

**40** active projects with a total budget of 2.342.200 €

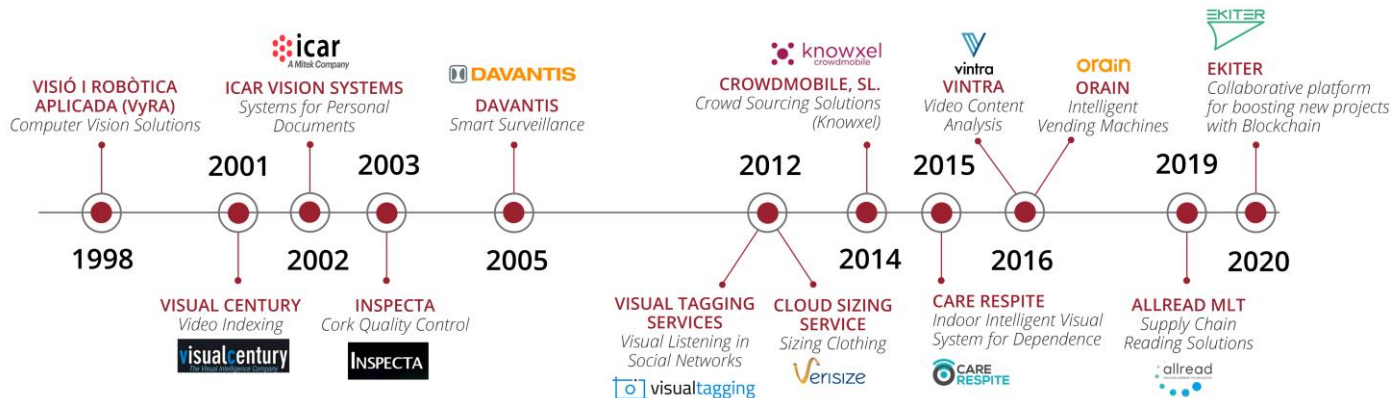
**18** new projects with a total budget of 1.188.372 €

**2** Transferred Licenses

**+150** companies among our customers and contacts



## CVC SPIN-OFFS



# Research Lines



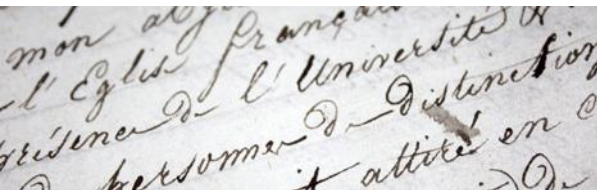
## Health and well-being

Computer assisted diagnosis, intervention and planning;  
Augmented modelling;  
Well-being and ambient assisted living.



## Mobility and transport

Advanced driving systems and autonomous driving;  
Virtual worlds for ADAS;  
Unmanned Aerial Vehicles.



## Culture & Experience-based technologies

Cultural heritage (AR/VR)  
Reading Systems – Document analysis  
Surveillance



## Industry 4.0

Quality control  
AR/VR technologies for industry 4.0  
Robotic Vision

UOC



# The world's first online university

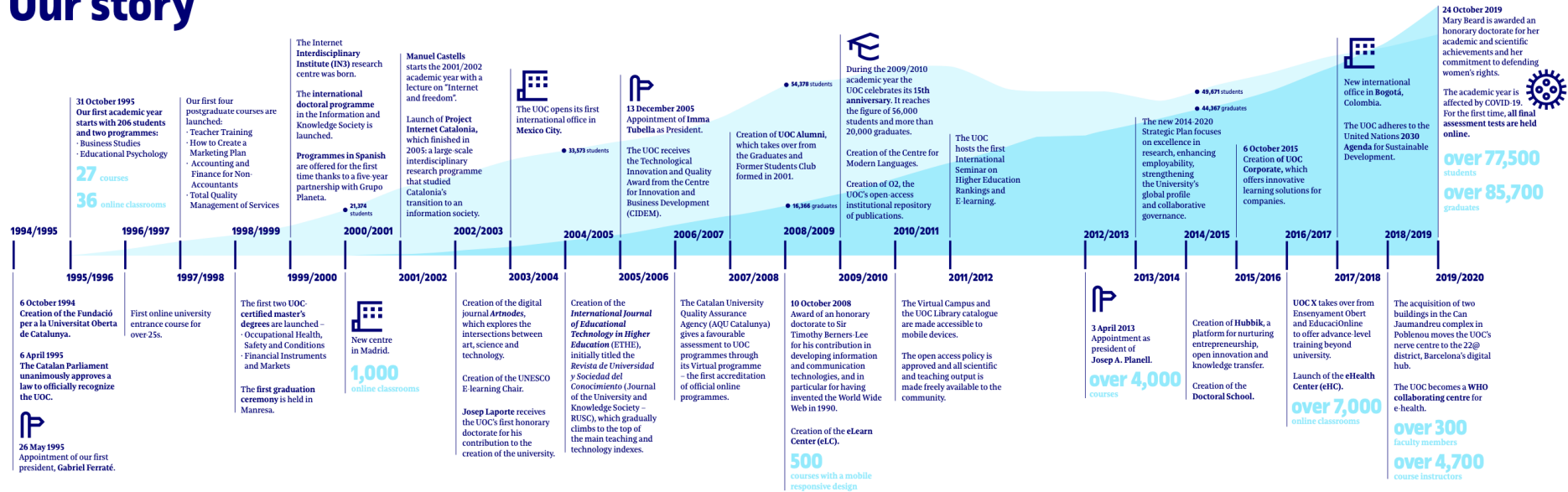


"We wanted to break down the barriers of space and time"

Gabriel Ferraté, the UOC's founding president

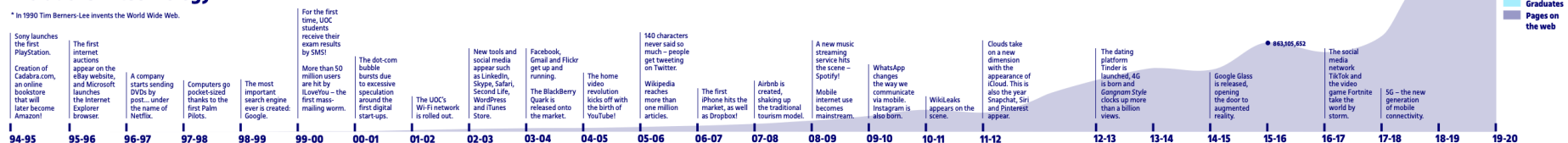
The idea behind founding the UOC back in 1995 was not to create a distance university, but to take advantage of the incipient World Wide Web to create the first-ever *distanceless* university

## Our story



## Evolutions in technology

\* In 1990 Tim Berners-Lee invents the World Wide Web.



# Leaders in quality e-learning

The UOC has students in 141 countries



Student data for 2020/2021. These figures do not include UOC Corporate students.

They come from **many** places and social backgrounds.

They are between **25** and **40 years old**, and more than **57%** are women.

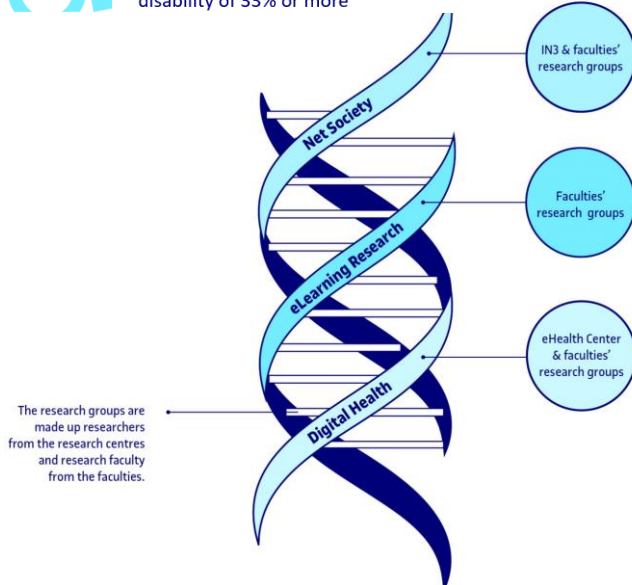
They study, **work** and have **family obligations**.

They have previous training and **professional experience**: almost **67%** **work** in the private sector and **61%** are studying to **increase their knowledge**.

They have **little time** and **balance their studies with their work**.



**1,944**  
students have a certified  
disability of 33% or more



**95,000**  
graduates

**6,500**  
course instructors  
and tutors

**15,500**  
virtual  
classrooms

*Times Higher Education*  
**World University Rankings**

Global  
**Top 175**  
among young universities

Ibero-America  
**1st**  
online university

Spain  
**4th**  
university created less than 50 years ago



## Research centres

### Internet Interdisciplinary Institute (IN3)

The institute specializes in the **internet and technology's effects on human behaviour**

### eHealth Center (eHC)

The centre conducts research into digital health to bring about a **paradigm shift in health** and transform the system

### eLearning Innovation Center (eLinC)

The centre **innovates in learning** to bring our educational model to the next level

### Doctoral School

It organizes and coordinates doctoral courses and acts as a frame of reference for the various **doctoral programmes** offered by the University

Social  
sciences



Arts and  
humanities



Information and  
knowledge  
society



Health  
sciences



Information and  
communication  
technologies

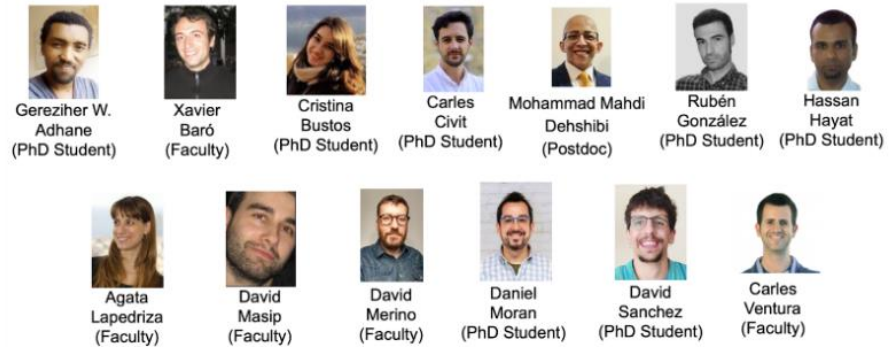


E-learning



### Our mission

*Advancing AI research and creating trustworthy AI technologies to promote and improve the human well-being.*



### Computer Vision

Creating computational models to analyze and understand high level information in digital images and videos. Special focus on:

- Person-centric Perception
- Scene Context Analysis
- Medical Image Analysis

### Natural Language Processing

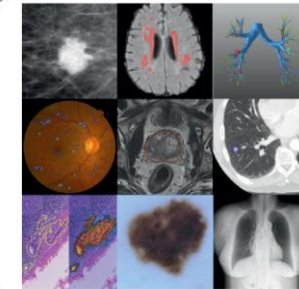
Creating computational models to analyze and synthesize written and spoken language.

### Explainable AI

Creating AI systems that can provide explanations on their results that are understandable by humans.

### Fairness in AI

Creating techniques to make sure the AI systems are not biased and work well for any data group.

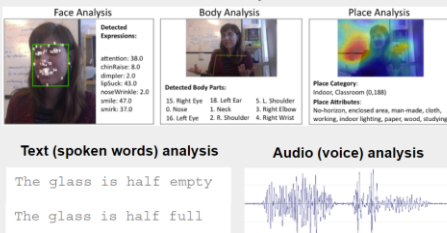


Collage of some medical imaging applications in which deep learning has achieved state-of-the-art results.

From top-left to bottom-right:

1. mammographic mass classification
2. segmentation of lesions in the brain,
3. leak detection in airway tree segmentation,
4. diabetic retinopathy classification
5. prostate segmentation,
6. nodule classification,
7. breast cancer metastases detection,
8. skin lesion classification
9. bone suppression

### Visual analysis



- Emotion Perception
- Behaviour Analysis
- Personality trait inference
- Human Motion Prediction



### Jibo Station



- **Goal:** reduce anxiety before surgery in pediatric patients (3-10 years old)
- **Hypothesis:** through distraction, we can reduce stress and take vital signs at the same time.

UPC



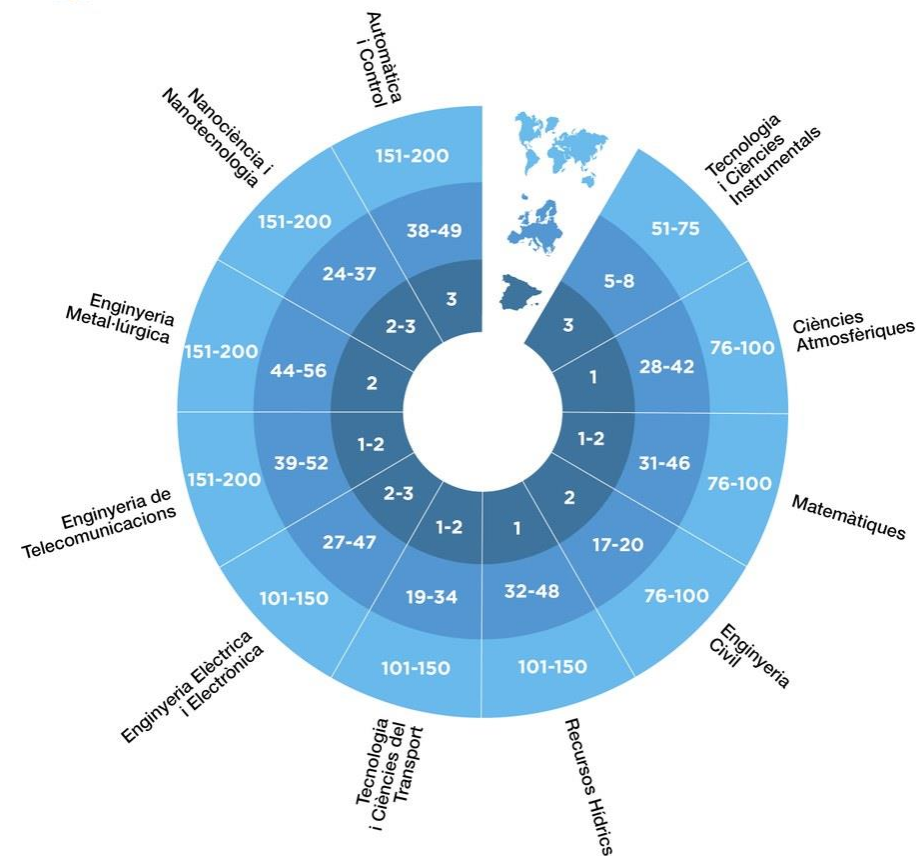


# Universitat Politècnica de Catalunya BarcelonaTech

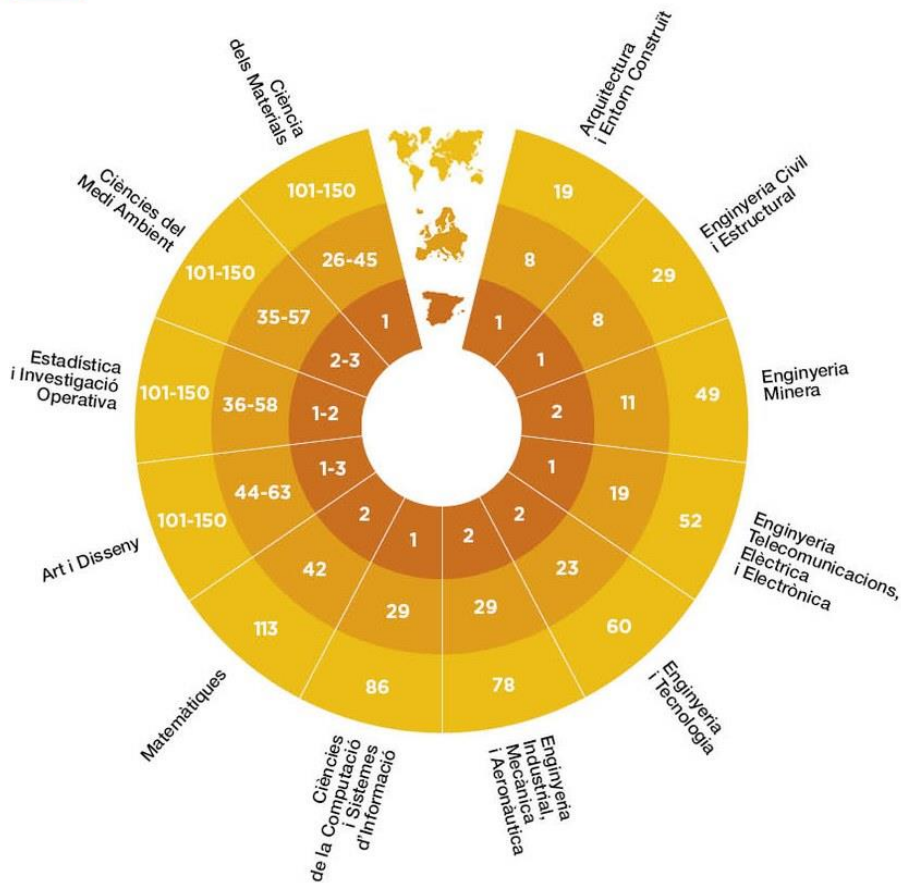
La **UPC** és una institució **pública** de **recerca** i d'**educació superior** en els àmbits de l'**enginyeria**, l'**arquitectura**, les **ciències** i la **tecnologia**, i és una de les universitats politècniques líders d'Europa.



Shanghai Global Ranking  
of Academic Subjects, 2022



QS World University Rankings  
by Subject, 2022





# Universitat Politècnica de Catalunya BarcelonaTech



La UPC és una universitat amb una extensa implantació en el territori, amb **9 campus** distribuïts en **7 ciutats de Catalunya**: Barcelona, Castelldefels, Manresa, Sant Adrià de Besòs, Sant Cugat del Vallès, Terrassa i Vilanova i la Geltrú.

29.812  
estudiants

3.523  
PDI

2.074  
PAS

65  
graus

84  
màsters

45  
programes de doctorat

18  
centres docents

275  
programes de formació permanent

19  
patents el darrer any

317 M  
pressupost 2022

72,7 M  
ingressos per R+D+I (2021)

70.151  
Alumni



# GPI – Image Processing Group

## Signal Theory and Communications Department



### GPI – Image Processing Group

Signal theory and communications Department

- 10 faculty members
- 25 PhD and master students
- <https://imatge.upc.edu>
- Consolidated Research Group since 1999
- GPI is part of IDEAI



### IDEAI - Intelligent Data Science and Artificial Intelligence

- UPC Research Center
- 60 researchers / 150 Phd and Master students
- <https://ideai.upc.edu>

### GPI Experience:

- >30 years in image processing and computer vision
- Pioneered adoption of Deep Learning (DL) since 2015
  - Introduced DL in master and bachelor programs
- Long experience in European and national projects

### GPI Current research lines:

- Medical imaging applications (neuroimaging, histopathology, dermoscopic,...)
- CV solutions for micro mobility vehicles
- CV for agri-food industry
- Image processing for plasma facing components protection
- Remote sensing applications (super-resolution, semantic segmentation,...)
- Human computer interfaces
- Audio-visual production, archives, search and retrieval

**UPF**



# UPF An urban **public** university in the heart of Barcelona



## **Ciutadella campus:**

Social Sciences and Humanities

(+Inf. Tech.: Centre for Brain

& Cognition - CBC)



## **Mar campus:**

Health and Life Sciences



## **Poblenou campus:**

Communication, Translation and  
**Information Technologies**

## UPF in the rankings



**1st. Spanish, 69th. European**  
**156th. Worldwide (2022)**  
**15th. Worldwide Young University (<50Y)**



**1st. Spanish in Engineering studies**  
**82nd. European in Engineering studies**  
**240th. Worldwide in Engineering studies**

**5th. Worldwide** in sector of gender & equality



**4th. European**



**1st. Of two Spanish ICT Department** granted with research excellence seal **Maria de Maeztu** by the Spanish Ministry

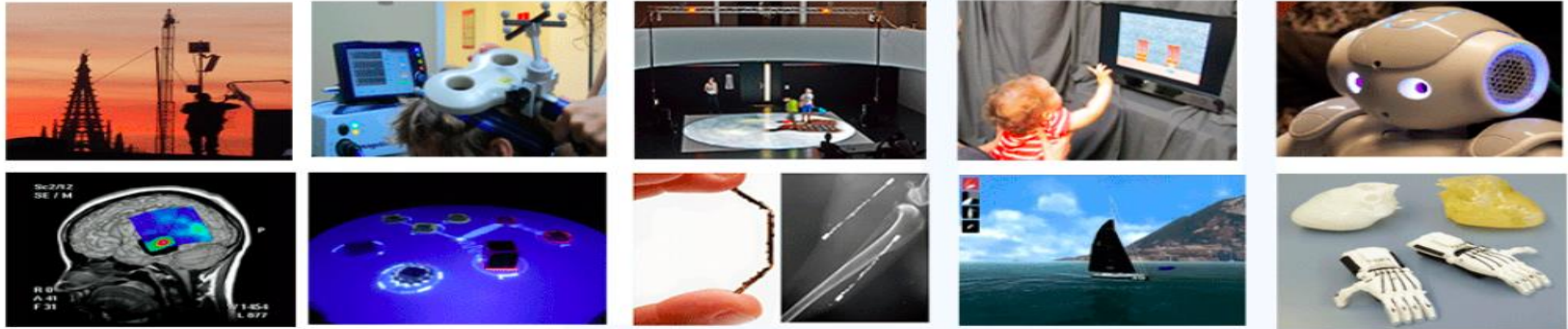


**3rd. Spanish university** in terms of absolute H2020 funding [source: Horizon dashboard]  
**21** cumulative ERC grants @DTIC up to date



# School of Engineering

## Department of Information and Communication Technologies (DTIC)



**1.020**  
Under-graduate students

**138**  
Master students

**180**  
PhD students

**46**  
Faculty members

**86**  
Tenure Track / PostDocs

**95 + 68**  
Research Support + part-time teaching

**Total**  
**1.630**  
Community members

**46** Faculty members: **16** Full Professors  
+ **20** Associate Professors  
+ **10** ICREA Research Professors  
(Catalan Institution for Research and Advanced Studies)

# 23 Research Groups: 5 Research Areas

- Image Processing
- Sound & Music computing
- 3D Graphics, AR, Computer Vision
- HCI, Educational Technologies

- Foundations of Computer Science
- Artificial intelligence (planning, natural language processing, CV, ML, robotics...)
- Ubiquitous computing
- Web science & social computing

- Computational Neuroscience
- Speech acquisition & perception; Language cognition
- Theoretical & Cognitive neuroscience
- Multisensory;
- Infant Reasoning, Cognition

Multimedia Technologies  
(4 groups)

Networks & Communications  
(4 groups)

Computation & Intelligent Systems  
(5 groups)

Computational Biology & Biomedical Systems  
(5 groups)

Brain & Cognition  
(5 groups)

- Wireless Networks
- Information Theory and Coding
- Cybersecurity
- Network Technologies policy aspects and Strategies
- Internet of Things

- Medical Imaging & modelling of biomedical systems
- Analysis of biomedical data
- Instrumentation & biomedical electronics
- Computational simulation & biomechanics
- Nonlinear signal analysis in biological systems



# Research at Intelligent Multimodal Vision Analysis (IMVA) group

PIs: Coloma Ballester, Gloria Haro, Federico Sukno

Our overall goal is to investigate the automatic analysis and understanding of visual content and to address real-world problems and applications, often involving also modalities beyond vision, such as audio, natural language, ultrasound or magnetic resonance. We develop model-based and data-driven (deep learning) approaches, algorithms and innovative digital technologies, together with their theoretical analysis. The applications include: accessibility of people with visual, hearing or reading impairment to multimedia content and may contribute to the development of more accessible devices; the analysis of the human face both in terms of its morphology and its dynamics (e.g. expressions and emotions) with enormous potential for disciplines such as psychology, linguistics, neuroscience, health or developmental biology; the separation of the different audio sources that make up the audio mixture of a particular video; the understanding and the exploitation of the correlations and complementations among different modalities; etc



Automatic  
Lip-Reading





# Welcome session

1. About the Master
2. About the Partners
  - The UAB-CVC
  - The UOC
  - The UPC
  - The UPF
3. About the Students

# About the new students

Origin	#	#	%
Catalonia	20	20	62.5
UAB	9		
UPC	6		
UB	3		
UPF	2		
France	1	8	25
India	2		
Mexico	1		
Romania	2		
South-Africa	1		
Ukraine	1		
Spain-Valencia	1	4	13
Spain-Basque Country	1		
Spain-Oviedo	1		
Spain-Galicia	1		

Full-time	23
Part-time	8
Erasmus	1

Now, time for the students  
to introduce themselves

# Welcome session

1. About the Master
2. About the Partners
  - The UAB-CVC
  - The UOC
  - The UPC
  - The UPF
3. About the Students

Time for a drink at the garden ....