academic year 2024-2025
welcome session & master presentation
mcv.uab.cat

Maria Vanrell

Welcome session

1. aim of the master
2. about computer vision
3. about the master
4. about the partners
   - UAB-CVC
   - UOC
   - UPC
   - UPF
   - UB
5. about the students

aim of the master

What?

To give to the students <u>updated knowledge about Computer Vision</u>

from basic techniques to state-of-art methods

Why?

<u>Computer Vision is an AI technology</u> whose development and applicability
is exponentially growing

new jobs, start-up opportunities, PHD studentships

How?

<u>Joining the expertise in the field of 5 universities</u> which are living in Barcelona

a big concentration of companies and research institutions

Welcome session

1. aim of the master
2. about computer vision
3. about the master
4. about the partners
   - UAB-CVC
   - UOC
   - UPC
   - UPF
   - UB
5. about the students

about computer vision

close to **50 years** of research in the field

| 1952 | 1962 | 1972 | 1982 | 1992 | 2002 | 2012 | 2022 |

CV raise in parallel with AI, 1950s …

From Wikipedia:
"[…] The Dartmouth Summer Research Project on Artificial Intelligence was a 1956 summer workshop widely considered [1][2][3] to be the founding event of artificial intelligence as a field.

The project lasted approximately six to eight weeks and was essentially an extended brainstorming session. Eleven mathematicians and scientists originally planned to attend; not all of them attended, but more than ten others came for short times. […]"

Published list of attendees
- *Ray Solomonoff*
- *Marvin Minsky*
- *John McCarthy*
- *Claude Shannon*
- *Trenchard More*
- *Nat Rochester*
- *Oliver Selfridge*
- *Julian Bigelow*
- *W. Ross Ashby*
- *W.S. McCulloch*
- *Abraham Robinson*
- *Tom Etter*
- *John Nash*
- *David Sayre*
- *Arthur Samuel*
- *Kenneth R. Shoulders*
- *Shoulders' friend*
- *Alex Bernstein*
- *Herbert Simon*
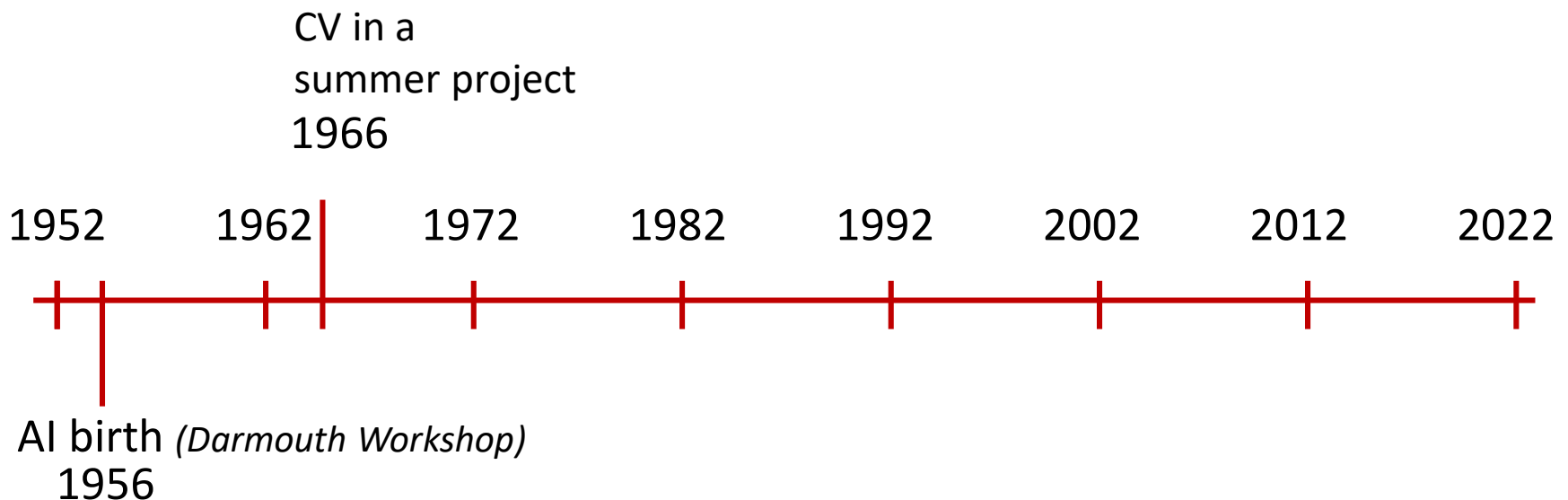- *Allen Newell*

AI birth *(Darmouth Workshop)*
1956

1952   1962   1972   1982   1992   2002   2012   2022
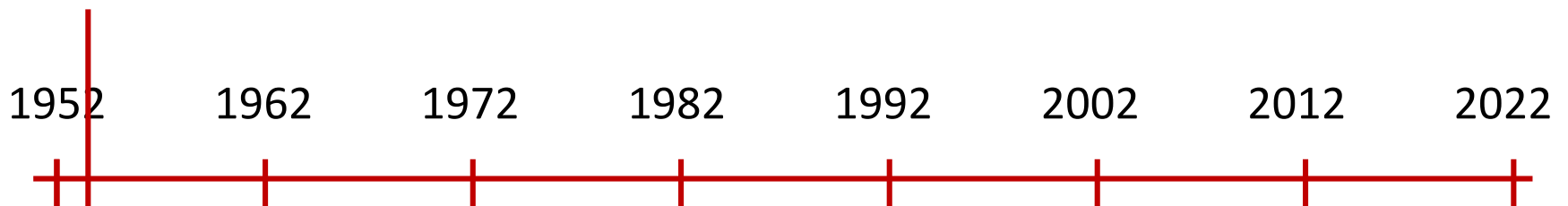
Vision as a Summer Project, 1966

from MIT AI Memos (1959-2004) we can find
Papert, Seymour (1966-07-01). "*The Summer Vision Project*"
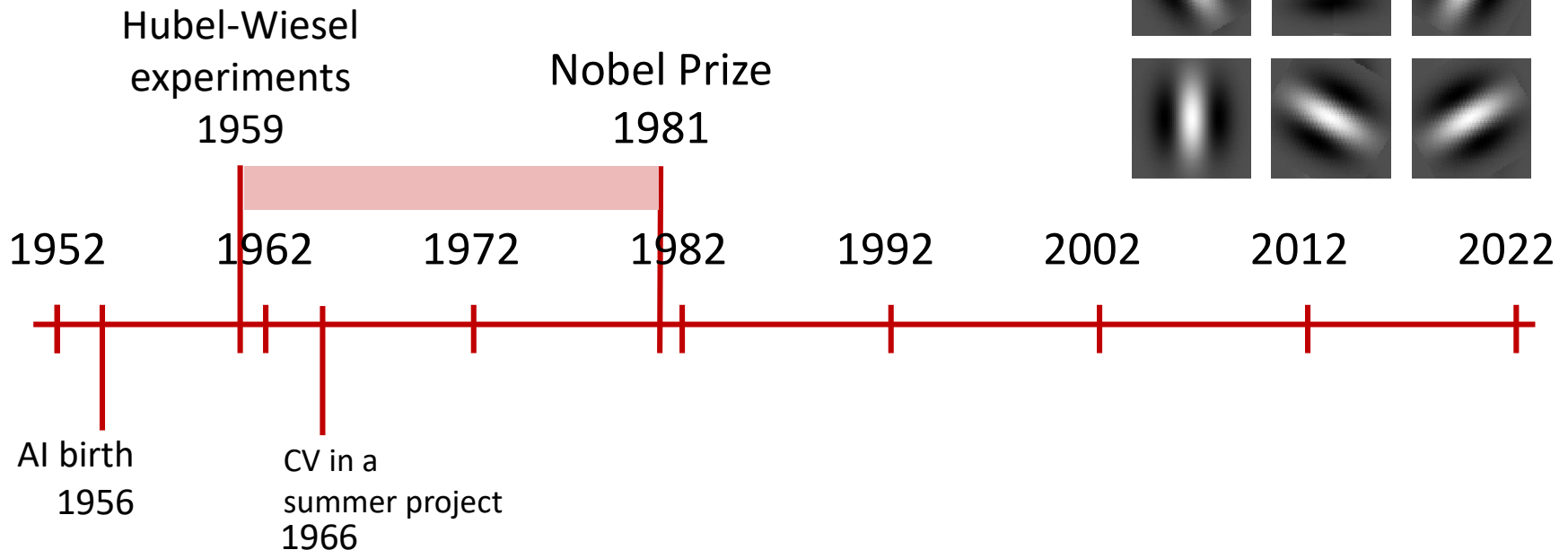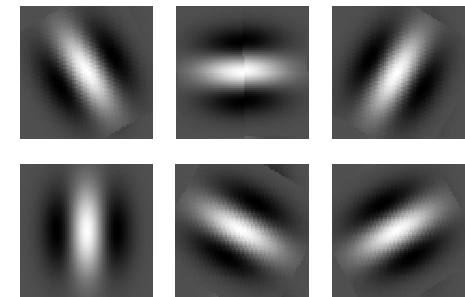
[...] The primary goal of the project is to construct a system of programs which will divide a vidisector picture into regions such as likely objects, likely background areas and chaos. We shall call this part of its operation **FIGURE-GROUND analysis**. It will be impossible to do this without considerable analysis of shape and surface properties, so FIGURE-GROUND analysis is really inseparable in practice from the second goal which is **REGION DESCRIPTION**. The final goal is **OBJECT IDENTIFICATION** which will actually name objects by matching them with a vocabulary of known objects.

CV in a
summer project
1966

| 1952 | 1962 | 1972 | 1982 | 1992 | 2002 | 2012 | 2022 |

AI birth *(Darmouth Workshop)*
1956

Important fidings in neurophysiology, 1959

From Wikipedia:

"[…] The Hubel and Wiesel experiments greatly expanded the scientific knowledge of sensory processing. In one experiment, done in 1959, they inserted a microelectrode into the primary visual cortex of an anesthetized cat. They then projected patterns of light and dark on a screen in front of the cat. They found that some neurons fired rapidly when presented with lines at one angle, while others responded best to another angle. They called these neurons "simple cells." Still other neurons, which they termed "complex cells," responded best to lines of a certain angle moving in one direction. These studies showed how the visual system builds an image from simple stimuli into more complex representations […]

Stimuli
Oriented Bars

Recording electrode
(electrical signal)

Brain Visual Area

Hubel-Wiesel experiments
1959

Nobel Prize
1981

1952   1962   1972   1982   1992   2002   2012   2022

AI birth
1956

CV in a summer project
1966
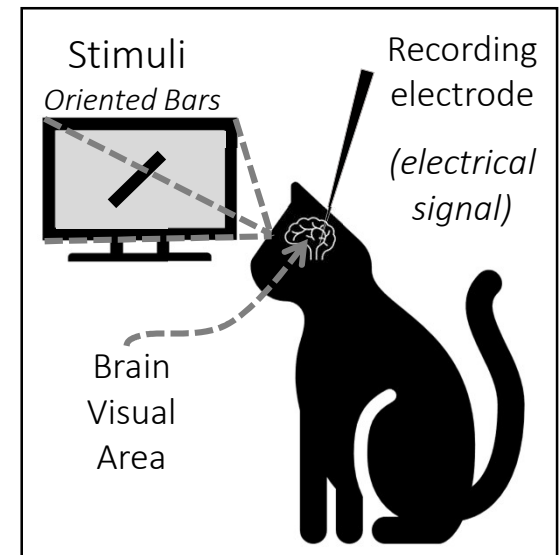
Marr's Theory, 1982

Vision must be considered as
an information processing system,
that is built at different stages

VISION

DAVID MARR

Input Image	→	Primal Sketch	→	2.5D Sketch	→	3D Model
		Edges Colour Blobs Dark&Light areas		Surface shape from Texture, Shading, disparity Cast Shadows		3D representation independently of the observer viewpoint

Marr's book
1982

1952   1962   1972   1982   1992   2002   2012   2022

AI birth   Hubel-Wiesel   CV as a Summer   Nobel Prize
            experiments   Project

1956   1959   1966   1981
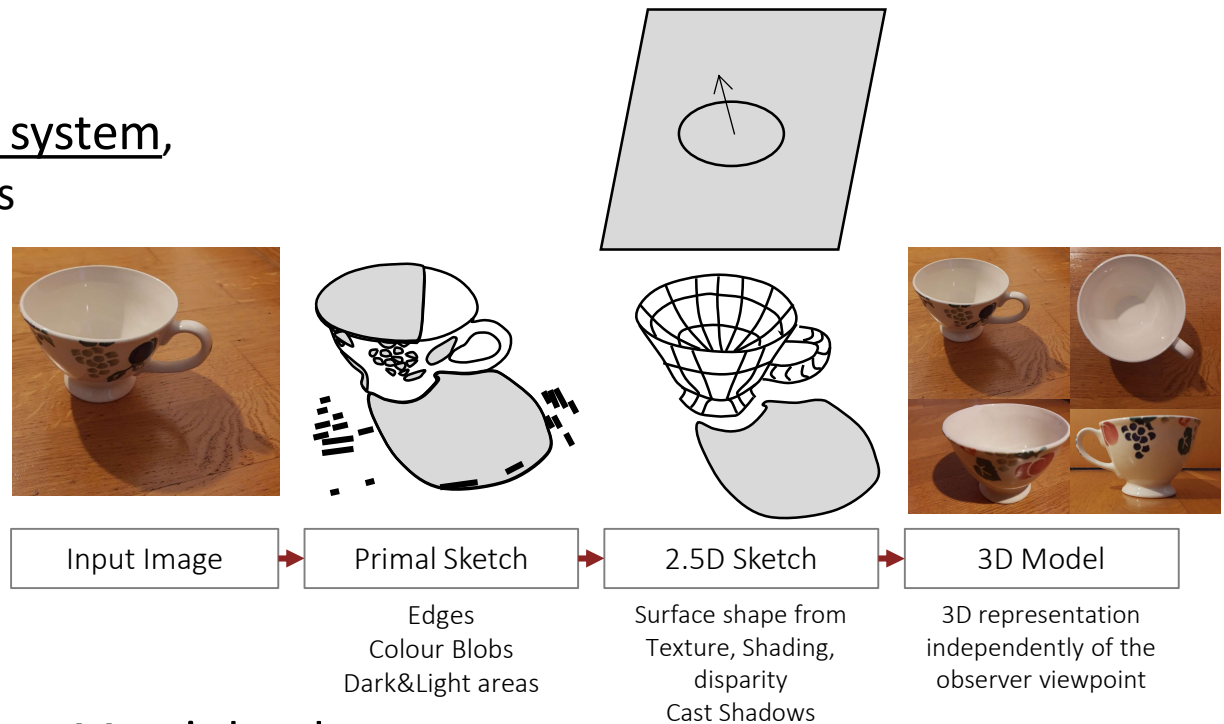
CV field explodes with multiple computational approaches

Different optimization method to extract important features that requires regularization methods to solve the ill-posed nature

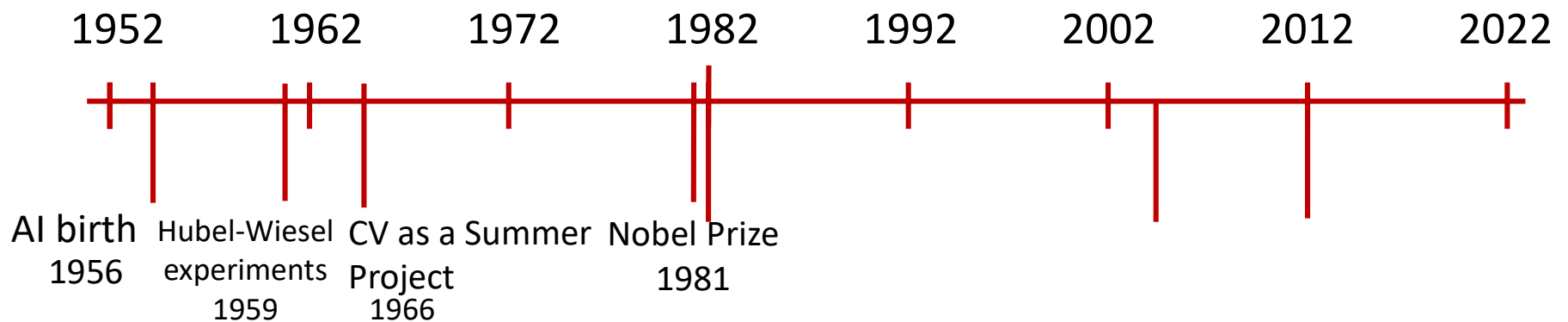Pros:

Application of a rich diversity of mathematical models … ✓

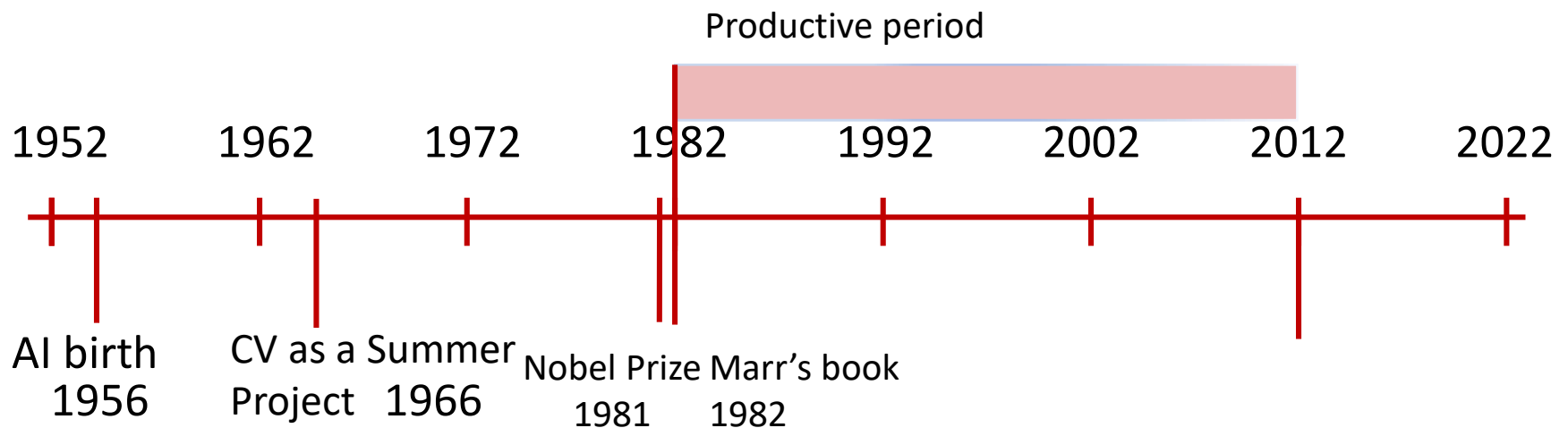*(Markov models, Wavelets, graphical models, neural networks…)*

Cons:

A lot of hand-crafted design and parameter setting …. ✗

Not a unified methodology to deal with visual information ✗

Productive period

1952　　1962　　1972　　1982　　1992　　2002　　2012　　2022

AI birth
1956

CV as a Summer
Project 1966

Nobel Prize
1981

Marr's book
1982

CV seriously start to work on Image annotation (2005)

The Pascal VOC Project (EU funded) provided a serious datasets for object class recognition [http://host.robots.ox.ac.uk/pascal/VOC/]

- *Standardized image datasets*
- *A common set of tools to access data*
- *Standardize evaluation and comparison of methods*
- *Ran challenges to evaluate methods (from 2005-2012)*

(b) Segmentation

(c) Action classification

(d) Person layout

(a) Classification and detection

Pascal VOC
2005

1952   1962   1972   1982   1992   2002   2012   2022

AI birth
1956

CV as a Summer
Project 1966

Nobel Prize
1981   Marr's book
1982
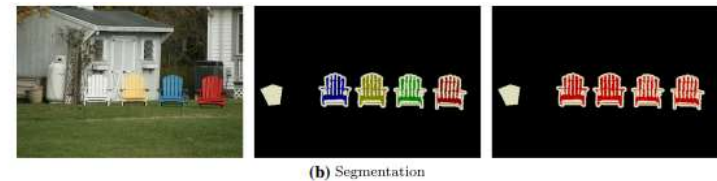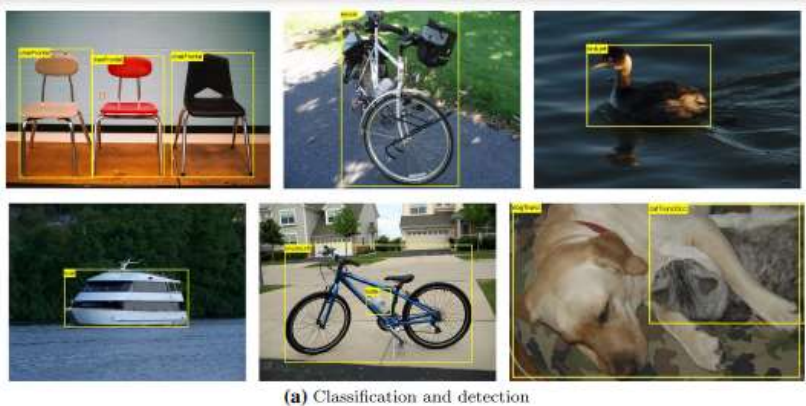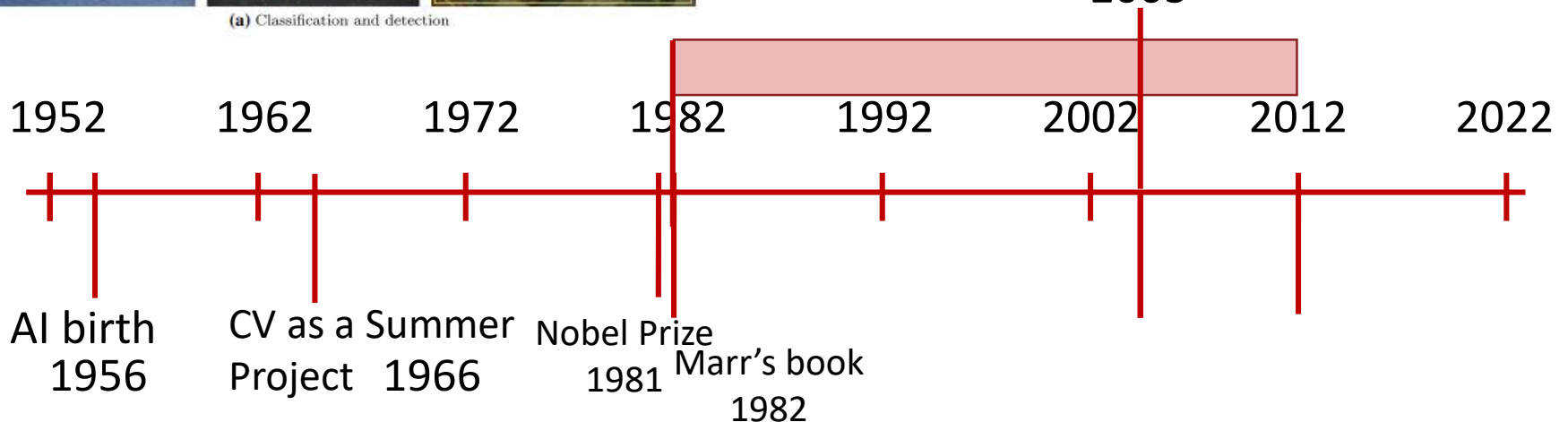
Deep Convolutional Networks (2012)

There is an important increase in performance accuracy in the Pascal Challenge

ImageNet Classification with Deep Convolutional Neural Networks
A. Krizhevsky, I. Sutskever and G.E. Hinton. NEURIPS 2012

From flat descriptors   to   hierarchical descriptors

Increase the power of representation of visual information

From hand-crafted   to   learned descriptors

CNN is trained with large datasets using graphical Cards and all parameter are all set in the training processs

Deep CNNs

1952   1962   1972   1982   1992   2002   2012   2022

AI birth
1956

CV as a Summer
Project   1966

Nobel Prize
1981   Marr's book
1982

Pascal VOC
2005
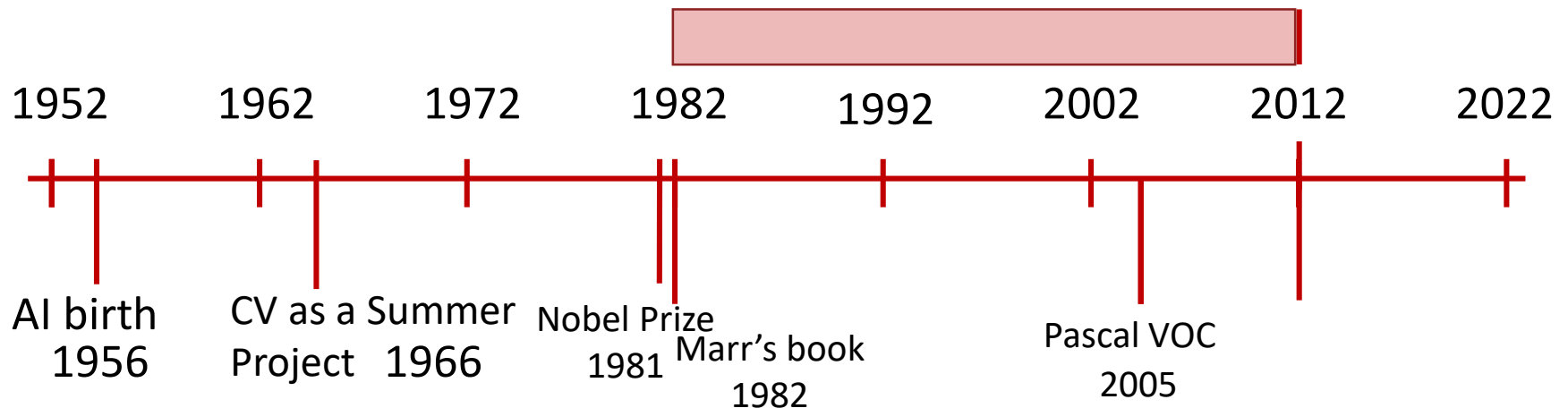
Since 2012 … CV field is installed in a permanent growing ….

Image Classification performance is still improving results

SoA Image Classification (Imagenet Dataset)

30% of increase in the last 12 years!!!

Now …

1952   1962   1972   1982   1992   2002   2012   2022

AI birth 1956

CV as a Summer Project 1966

Nobel Prize 1981

Marr's book 1982

Pascal VOC 2005

Deep CNNs
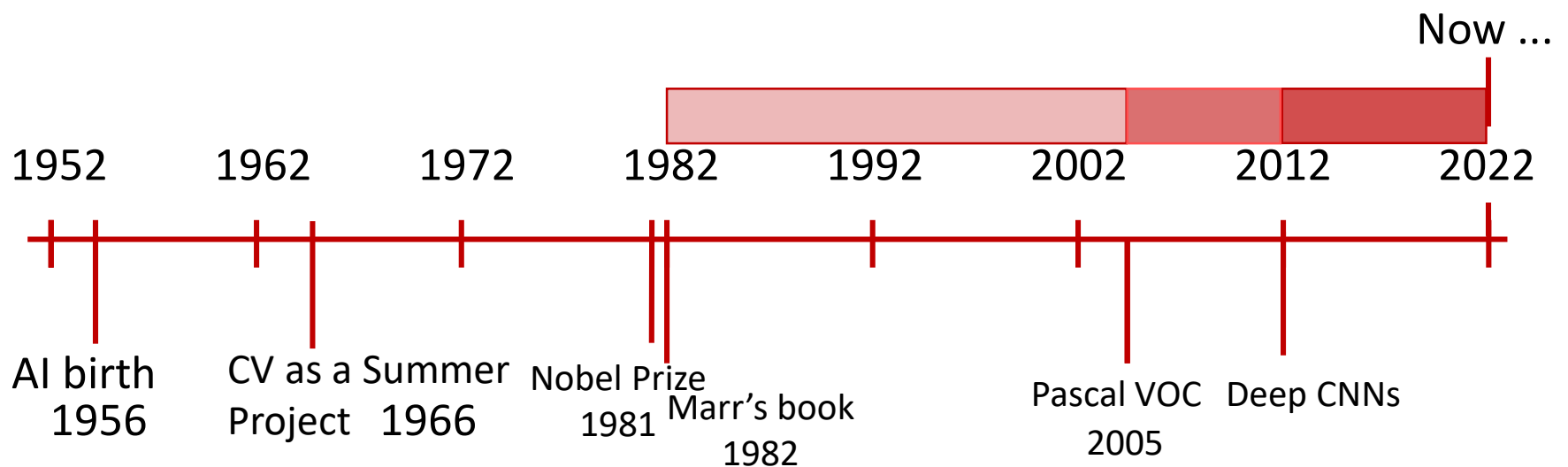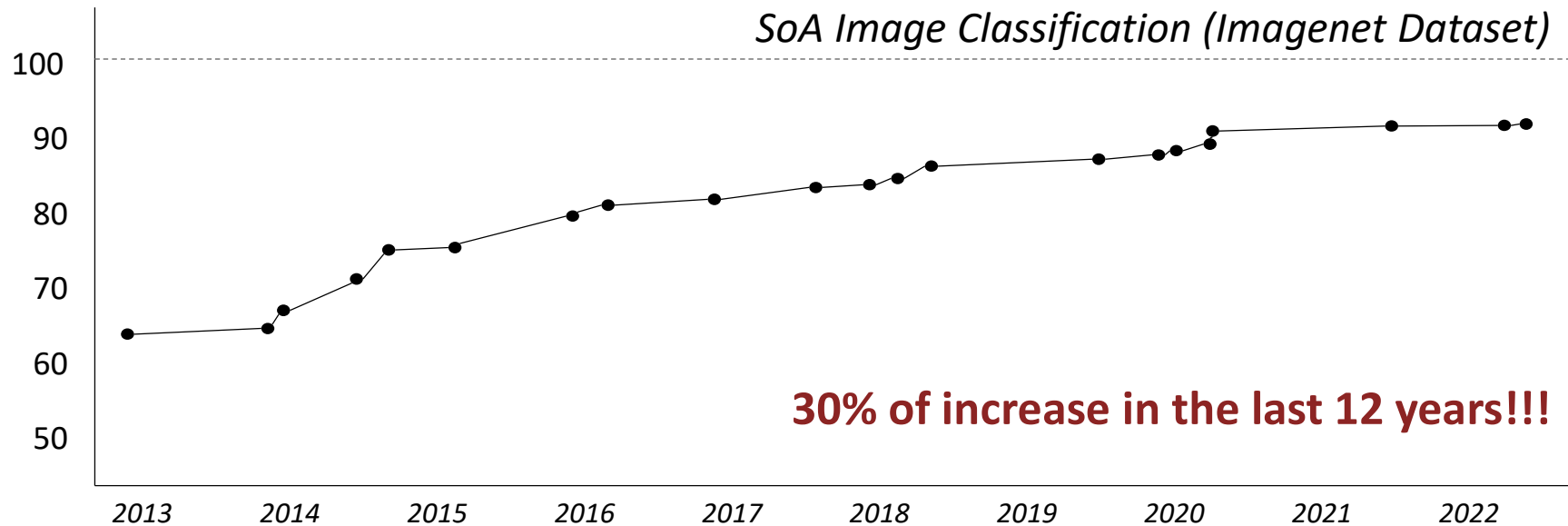
about computer vision

after 50 years we are **installed in the AI era**
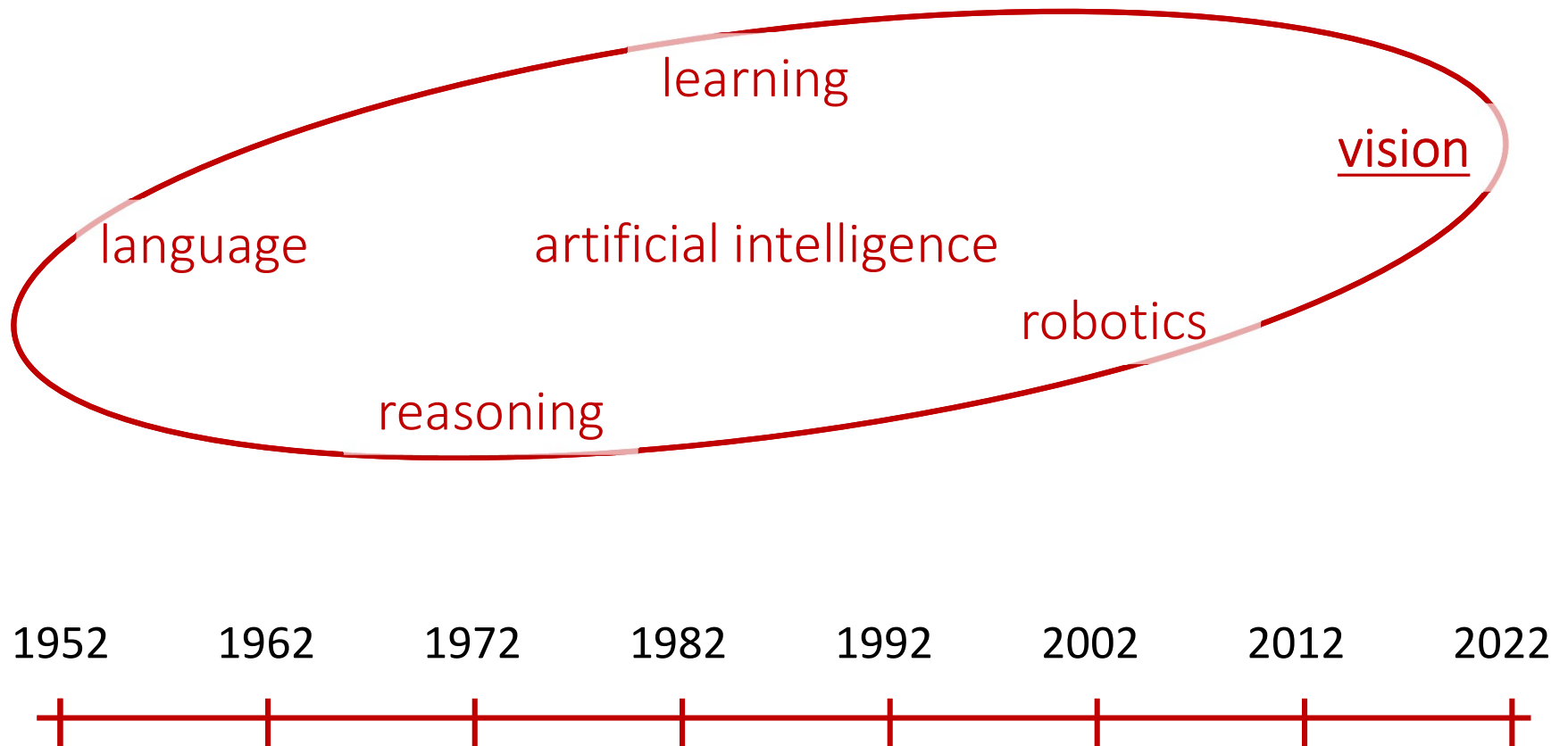
learning

vision

language   artificial intelligence

robotics

reasoning

| 1952 | 1962 | 1972 | 1982 | 1992 | 2002 | 2012 | 2022 |

Welcome session

1. aim of the master
2. about computer vision
3. about the master
4. about the partners
   - UAB-CVC
   - UOC
   - UPC
   - UPF
   - UB
5. about the students

UAB
Campus Bellaterra

UPC
Campus Nord

UB
Campus Edifici Històric

UPF
Campus Poblenou

UOC
Virtual Campus

Image © 2013 Institut Cartogràfic de Catalunya
Image © 2013 TerraMetrics

Google

2004

Imagery Date: 5/23/2011   41°24'53.89" N   2°06'52.12" E elev 364 m

UAB
Campus Bellaterra

Administration
Escola d'Enginyeria

Computer Vision Center

UPC
Campus Nord

C. SCR EULÀLIA D'ANZIZU

D5 module

A2 Building

UPF
Campus Poblenou

UOC
22@ Building

UB
Campus Edifici Històric

URL Facultat de Filosofia

Universitat de Barcelona

1 year program (60 ECTS: *European Credit Transfer System*)

	Courses	ECTS	Univ.	
C1	Introduction to human and CV	6	UPC	**6 ECTS**
C2	Optimization and Inference techniques for CV	6	UPF	
C3	Machine Learning techniques for CV	6	UAB	
C4	3D Vision	6	UPF	
C5	Visual Recognition	9	UAB-UB	**9 ECTS**
C6	Video Analysis	9	UPC-UB	
C7	Research Dissemination and Transfer	9	UOC	
C8	Master Dissertation	9	ALL	

Total: 60

1 ECTS = 25 Hours of student work

1 year program (2 Semesters)

	Courses	ECTS	Univ.	
C1	Introduction to human and CV	6	UPC	**1st Semester**
C2	Optimization and Inference techniques for CV	6	UPF	
C3	Machine Learning techniques for CV	6	UAB	
C4	3D Vision	6	UPF	
C5	Visual Recognition	9	UAB-UB	**2nd Semester**
C6	Video Analysis	9	UPC-UB	
C7	Research Dissemination and Transfer	9	UOC	**Annual**
C8	Master Dissertation	9	ALL	

Total: 60

1 year program (Contents)

	Courses	ECTS	Univ.	
C1	Introduction to human and CV	6	UPC	
C2	Optimization and Inference techniques for CV	6	UPF	Techniques
C3	Machine Learning techniques for CV	6	UAB	
C4	3D Vision	6	UPF	
C5	Visual Recognition	9	UAB-UB	Vision Problems
C6	Video Analysis	9	UPC-UB	
C7	Research Dissemination and Transfer	9	UOC	Transversal Skills
C8	Master Dissertation	9	ALL	Project

Total: 60

1 year program (Coordinators)

	Courses	ECTS	Univ.	
C1	Introduction to human and CV	6	UPC	*Philippe Salembier*
C2	Optimization and Inference techniques for CV	6	UPF	*Coloma Ballester*
C3	Machine Learning techniques for CV	6	UAB	*Ramon Baldrich*
C4	3D Vision	6	UPF	*Gloria Haro*
C5	Visual Recognition	9	UAB-UB	*Joan Serrat-Julio Silveira*
C6	Video Analysis	9	UPC-UB	*Javier Ruiz-Albert Clapès*
C7	Research Dissemination and Transfer	9	UOC	*Carles Ventura*
C8	Master Dissertation	9	ALL	

Total: 60

M. Vanrell & R. Baldrich (UAB)
J.R. Casas (UPC)
C. Ballester (UPF)
I. Benito (UOC)
X. Baró (UB)

1 year program (Methodology)

	Courses	ECTS	Univ.	
C1	Introduction to human and CV	6	UPC	
C2	Optimization and Inference techniques for CV	6	UPF	Project-based methodology
C3	Machine Learning techniques for CV	6	UAB	
C4	3D Vision	6	UPF	
C5	Visual Recognition	9	UAB-UB	
C6	Video Analysis	9	UPC-UB	
C7	Research Dissemination and Transfer	9	UOC	Online Activities
C8	Master Dissertation	9	ALL	Individual work

Total: 60

1 year program (Project Coordinators)

	Courses	ECTS	Univ.	
C1	Introduction to human and CV	6	UPC	*Ramon Morros*
C2	Optimization and Inference techniques for CV	6	UPF	*Adriano Pastore*
C3	Machine Learning techniques for CV	6	UAB	*Ramon Baldrich*
C4	3D Vision	6	UPF	*Gloria Haro*
C5	Visual Recognition	9	UAB-UB	*Ernest Valveny-Julio Silveira*
C6	Video Analysis	9	UPC-UB	*Javier Ruiz -Albert Clapés*
C7	Research Dissemination and Transfer	9	UOC	
C8	Master Dissertation	9	ALL	

Total: 60

Schedule:

Courses:	Monday C1-C3-C5	Tuesday C2-C4-C6	Wednesday C1-C3-C5	Thursday C2-C4-C6	Friday
4pm-5pm	Lecture	Lecture	Lecture	Lecture	
5pm-6pm	Lecture	Lecture	Lecture	Lecture	
6pm-7pm	*[Lecture]*	*[Lecture]*	*[Lecture]*	*[Lecture]*	
7pm-8pm	Project Follow-up			Project Follow-up	
	3 or 4 hours	*2 or 3 hours*	*2 or 3 hours*	*3 or 4 hours*	
	Number of hours per day depends on the Lecture Topic *Total amount Hours/Course = 6 per week*				

6 hours/week (1 follow-up, 5 theoretical) within the schedule
but can change a bit depending on the course and the contents

Master in Computer Vision

| Barcelona

UAB Universitat Autònoma de Barcelona
UNIVERSITAT DE BARCELONA
UOC Universitat Oberta de Catalunya
UPC UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH
upf. Universitat Pompeu Fabra Barcelona

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

News

The **pre-registration period** for the master's degree in Computer Vision Computer Vision will close on **April 3rd, 2023.** Publication and notification will be from **May 2nd, 2023.** An extra periode in case of vacancies will be from May 3rd to June 23th, 2023 and publication and notification will be from July 10th, 2023. **The courses will start on October 2nd, 2023.**

Changes for the Academic Year 2023-2024. This master will be improved by incorporating a new partner, Universitat de Barcelona (*Campus Edifici històric*) updating contents, <New Program>, and schedule, <New Schedule>.

Congratulations to 2022 Graduated Students. Two Master Dissertations of our students, *Marcos V. Conde and Juan A. Rodriguez*, have been accepted for publication at WACV'23:

Modules

C1. Introduction to human and CV

C2. Optimization&Inference for CV

C3. Machine Learning for CV

C4. 3D Vision

C5. Visual Recognition

C6. Video Analysis

C7. Research Dissemination and Transfer

C8. Master Dissertation

C1. Introduction to human and computer vision

DATE	TIME	Lecture	Lecturer	Univ.	Room
Mon. Sept. 30th	16:00-17:00	Image processing assessment and pixel-based processing	Philippe Salembier	UPC	A1-203
	17:00-18:00			UPC	
	18:00-19:00	Project Introduction	R. Morros & J. Ruiz	UPC	
Wed. Oct. 2nd	16:00-17:00	Morphological and nonlinear filtering	Philippe Salembier	UPC	A1-203 Hybrid
	17:00-18:00			UPC	
Mon. Oct. 7th	16:00-17:00	Human Visual system and perception	Javier Vázquez	UPC	A1-203
	17:00-18:00			UPC	
	18:00-19:00	Project Introduction	R. Morros & J. Ruiz	UPC	
Wed. Oct. 9th	16:00-17:00	Human Visual system and perception	Javier Vázquez	UPC	A1-203 Hybrid
	17:00-18:00			UPC	
Mon. Oct. 14th	16:00-17:00	Space-frequency representation, Fourier transform and linear filtering	Javier Ruiz	UPC	A1-203
	17:00-18:00			UPC	
	18:00-19:00	Project Introduction	R. Morros & J. Ruiz	UPC	
Wed. Oct. 16th	16:00-17:00	Space-frequency representation, Fourier transform and linear filtering	Javier Ruiz	UPC	A1-203 Hybrid
	17:00-18:00			UPC	
Mon. Oct. 21st	16:00-17:00	Space-frequency representation, Fourier transform and linear filtering	Javier Ruiz	UPC	A1-203 Hybrid
	17:00-18:00			UPC	
Wed. Oct. 23rd		HOMEWORK			
Mon. Oct. 28th	16:00-17:00	Feature extraction	Ramon Morros	UPC	A1-203
	17:00-18:00			UPC	
	18:00-19:00	Project Introduction	R. Morros & J. Ruiz	UPC	
Wed. Oct. 30th	16:00-17:00	Grouping, segmentation and classification	Ramon Morros	UPC	A1-203 Hybrid
	17:00-18:00			UPC	
Mon. Nov. 4th	16:00-17:00	Grouping, segmentation and classification	Ramon Morros	UPC	A1-203
	17:00-18:00			UPC	
Wed. Nov. 6th		HOMEWORK			
Mon. Nov. 11th	16:00-19:00	Project Presentations	R. Morros & J. Ruiz	UPC	A1-203
Mon. Nov. 18th		HOMEWORK			
Wed. Nov. 20th		HOMEWORK			
Mon. Nov. 25th	16:00 -19:00	EXAM	Philippe Salembier	UPC	A6-002

We have:

- 4 Theory hours/week
- 1   Follow-up session

No free days in the middle

Master in Computer Vision | Barcelona

UAB
Universitat Autònoma de Barcelona

UNIVERSITAT DE BARCELONA

UOC Universitat Oberta de Catalunya

UPC UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

upf. Universitat Pompeu Fabra Barcelona

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

News

The **pre-registration period** for the master's degree in Computer Vision Computer Vision will close on **April 3rd, 2023**. Publication and notification will be from **May 2nd, 2023**. An extra periode in case of vacancies will be from May 3rd to June 23th, 2023 and publication and notification will be from July 10th, 2023. **The courses will start on October 2nd, 2023.**

Changes for the Academic Year 2023-2024. This master will be improved by incorporating a new partner, Universitat de Barcelona (*Campus Edifici històric*) updating contents, <New Program>, and schedule, <New Schedule>.

Congratulations to 2022 Graduated Students. Two Master Dissertations of our students, *Marcos V. Conde and Juan A. Rodriguez*, have been accepted for publication at WACV'23:

Modules

C1. Introduction to human and CV

C2. Optimization&Inference for CV

C3. Machine Learning for CV

C4. 3D Vision

C5. Visual Recognition

C6. Video Analysis

C7. Research Dissemination and Transfer

C8. Master Dissertation

C2. Optimization for Introduction to Human and Computer Vision

DATE	TIME	Lecture	Lecturer	Univ.	Room & Building
Tue. Oct. 1st	16:00-17:00	Introduction to optimization problems and energy minimization methods. Examples and overview of a variational formulation.	Coloma Ballester	UPF	Room 52.223 Hybrid (zoom) Roc Boronat Bldg.
	17:00-18:00	Numerical techniques for variational problems (I): Gateaux derivative, Euler-Lagrange equation and Gradient methods.			
Thu. Oct. 3rd	16:00-17:00	Numerical techniques for variational problems (II): Gateaux derivative, Euler-Lagrange equation and Gradient methods.	Coloma Ballester	UPF	Room 52.223 Roc Boronat Bldg.
	17:00-18:00	Numerical techniques for variational problems (III): Gradient methods. Applications: denoising, image inpainting and Poisson editing.		UPF	
	18:00-19:00	Project Introduction	Adriano Pastore	UPF	
Tue. Oct. 8th	16:00-17:00	Review and complements of numerical linear algebra (I): least squares methods, singular value decomposition and applications.	Pablo Arias	UPF	Room 52.223 Hybrid (zoom) Roc Boronat Bldg.
	17:00-18:00	Review and complements of numerical linear algebra (II): least squares methods, singular value decomposition and applications.		UPF	
Thu. Oct. 10th	16:00-17:00	The Backpropagation strategy for gradient computation. Gradient descent optimization algorithms useful for deep learning strategies (I)	Pablo Arias	UPF	Room 52.223 Roc Boronat Bldg.
	17:00-18:00	The Backpropagation strategy for gradient computation. Gradient descent optimization algorithms useful for deep learning strategies (II)		UPF	
	18:00-19:00	Convex optimization (I). Convex sets and convex functions. Convex optimization.		UPF	
	19:00-20:00	Project Follow-up	Adriano Pastore	UPF	
Tue. Oct. 15th	16:00-17:00	Convex optimization (II). Constrained optimization. Karush-Kuhn-Tucker optimality conditions.	Pablo Arias	UPF	Room 52.223 Hybrid (zoom) Roc Boronat Bldg.
	17:00-18:00	Convex optimization (III). Constrained optimization. Karush-Kuhn-Tucker optimality conditions.		UPF	
Thu. Oct. 17th	16:00-17:00	Convex optimization (IV): Duality principles and methods. Subgradient methods. Interior point methods. Non-convex problems and convex relaxation.	Coloma Ballester	UPF	Room 52.223 Roc Boronat Bldg.
	17:00-18:00	Convex optimization (V): Duality principles and methods. Subgradient methods. Interior point methods. Non-convex problems and convex relaxation. Applications.		UPF	
	18:00-19:00	Segmentation with variational models. The Mumford and Shah Functional and the Level sets framework.	Adriano Pastore	UPF	
	19:00-20:00	Project Follow-up	Adriano Pastore	UPF	
Tue. Oct. 22nd		HOMEWORK			
Thu. Oct. 24th		HOMEWORK			
Tue. Oct. 29th	16:00-17:00	Bayesian networks and MRFs (I): Inference problems. Main Inference algorithms. Message passing. Exercise: inference for segmentation.	Oriol Ramos	UAB	Room 52.223 Hybrid (zoom) Roc Boronat Bldg.
	17:00-18:00	Bayesian networks and MRFs (II): Inference problems. Main Inference algorithms. Message passing. Exercise: inference for segmentation.		UAB	
Thu. Oct. 31st	16:00-17:00	Belief propagation (I): message passing, loopy belief propagation. Applications in the context of some deep learning strategies.	Oriol Ramos	UAB	Room 52.223 Roc Boronat Bldg.
	17:00-18:00	Belief propagation (II): message passing, loopy belief propagation. Applications in the context of some deep learning strategies.		UAB	
Tue. Nov. 5th		HOMEWORK			

We have:

5 Theory hours/week
1 Follow-up session
(4 hours in person, 2 hybrid)

We have **some free days** in the middle

Teaching Methodology:

Supervised Sessions

- **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

C7. Research Dissemination and Transfer

	Courses	ECTS	Univ.
C1	Introduction to human and CV	6	UPC
C2	Optimization and Inference techniques for CV	6	UPF
C3	Machine Learning techniques for CV	6	UAB
C4	3D Vision	6	UPF
C5	Visual Recognition	9	UAB-UB
C6	Video Analysis	9	UPC-UB
C7	Research Dissemination and Transfer	9	UOC
C8	Master Dissertation	9	ALL
	Total:	60	

Important note: Starts on October 16th

Contents

Project Planification and Development

Project Planning

Data Analysis

Ethics in Research: Debate

Writing Scientific texts in Latex

Introduction to Latex: edition of basic text

Advanced Latex: Standard text edition

Writing scientific texts: simplifying a scientific document

Writing Scientific Texts: introduction to computer vision (C1)

Writing of Scientific Texts: machine learning techniques for computer vision (C3 or C4)

Literature review and composition of the state-of-the-art

Oral presentation

Oral Presentation: "Introduce yourself"

Oral Presentation: "Machine learning for computer vision"

Research management and dissemination

Publishing Research Results: quiz test

Entrepreneurship

Public Funding of Research Projects

Intellectual property, patents, copyright and trademarks

C7. Research dissemination and Transfer (UOC)

Methodology: Online Asynchronous.
Access to Materials and Agenda of Activities with Deliveries

FULL TIME option

October	November	December	February	May	June	July or September

C1. Introduction to human and CV

C3. Machine Learning techniques for CV

C5. Visual Recognition

C2. Optimization and Inference techniques for CV

C4. 3D Vision

C6. Video Analysis

C7. Research Dissemination and Transfer

C8. Master Dissertation

PART TIME option

1st YEAR:

October	November	December	February	May	June	July or September

C1. Introduction to human and CV

C3. Machine Learning techniques for CV

C5. Visual Recognition

C7. Research Dissemination and Transfer

2nd YEAR:

October	November	December	February	May	June	July or September

C2. Optimization and Inference techniques for CV

C4. 3D Vision

C6. Video Analysis

C8. Master Dissertation

C8. Master Dissertation

	Courses	ECTS	Univ.
C1	Introduction to human and CV	6	UPC
C2	Optimization and Inference techniques for CV	6	UPF
C3	Machine Learning techniques for CV	6	UAB
C4	3D Vision	6	UPF
C5	Visual Recognition	9	UAB-UB
C6	Video Analysis	9	UPC-UB
C7	Research Dissemination and Transfer	9	UOC
C8	Master Dissertation	9	ALL

Total: 60

C8. Master Dissertation

January-March, **Project proposals are made available,** they can be seen at:

- *Academic: https://mcv.uab.cat/show_academic_proposals/*
- *Company: https://mcv.uab.cat/show_company_proposals/*

April, Selection period is open

      Students should discuss with academic supervisors and companies and select a project.

End of April, Project assignment

      Students take a decision

May-September (or July) - Master project development

      Project carries 225 hours of work and should be completed between May and September.

Defence of the thesis (July or September)

      Call 1: July 1st   /   Call2: September 1st

      Step 1. Informing M9 coordinators about your intention of defending your MSc thesis

      Step 2. Submitting your dissertation (pdf report)

      Step 3. Oral presentation

Evaluation

	Courses	ECTS	Univ.
C1	Introduction to human and CV	6	UPC
C2	Optimization and Inference techniques for CV	6	UPF
C3	Machine Learning techniques for CV	6	UAB
C4	3D Vision	6	UPF
C5	Visual Recognition	9	UAB-UB
C6	Video Analysis	9	UPC-UB
C7	Research Dissemination and Transfer	9	UOC
C8	Master Dissertation	9	ALL

Total: 60

Evaluation C1-C6

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 (<u>must be equal or greater than 3</u>)

Attendance: is the mark derived from the control of attendance at lectures

(<u>must be at least 70%</u>)

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 ot increase the Exam Mark, but only if Exam Mark is greater than 3.

Evaluation

	Courses	ECTS	Univ.
C1	Introduction to human and CV	6	UPC
C2	Optimization and Inference techniques for CV	6	UPF
C3	Machine Learning techniques for CV	6	UAB
C4	3D Vision	6	UPF
C5	Visual Recognition	9	UAB-UB
C6	Video Analysis	9	UPC-UB
C7	Research Dissemination and Transfer	9	UOC
C8	Master Dissertation	9	ALL

Total: 60

Evaluation C7

The final Mark in this course will be computed by the following weighted formula on the whole evaluation activities:

Project Planification and Development (10%)

Project Planning (3%)
Data Analysis (3%)
Ethics in Research: Debate (4%)

Writing Scientific texts in Latex (30%)

Introduction to Latex: edition of basic text
Advanced Latex: Standard text edition
Writing scientific texts: simplifying a scientific document
Writing Scientific Texts: introduction to computer vision (C1)
Writing of Scientific Texts: machine learning techniques for computer vision (C3 or C4)
Literature review and composition of the state-of-the-art

Oral presentation (30%)

Oral Presentation: "Introduce yourself" (10%)
Oral Presentation: "Machine learning for computer vision" (20%)

Research management and dissemination (30%)

Publishing Research Results: quiz test (2%)
Entrepreneurship (20%)
Public Funding of Research Projects (6%)
Intellectual property, patents, copyright and trademarks (2%)

Evaluation

	Courses	ECTS	Univ.
C1	Introduction to human and CV	6	UPC
C2	Optimization and Inference techniques for CV	6	UPF
C3	Machine Learning techniques for CV	6	UAB
C4	3D Vision	6	UPF
C5	Visual Recognition	9	UAB-UB
C6	Video Analysis	9	UPC-UB
C7	Research Dissemination and Transfer	9	UOC
C8	Master Dissertation	9	ALL

Total: 60

Evaluation C8

The final Mark of the dissertation is computed by the following weighted formula:

Final Mark = 0,25 x Supervisor Evaluation + 0,75 x Committee Evaluation

Supervisor Evaluation Criteria:
- Technical Competences
- Attitude
- Innovation and Research capabilities

Committee Evaluation Criteria:
- Written report
- Work carried out
- Oral presentation

Plagiarism and irregularities:

Notwithstanding other disciplinary measures deemed appropriate,
and in accordance with the academic regulations in force,
assessment activities will receive a zero whenever a student commits academic irregularities
that may alter such assessment.

Assessment activities graded in this way and by this procedure **will not be re-assessable**.
If passing the assessment activity or activities in question is required to pass the subject, the
awarding of a zero for disciplinary measures will also entail a direct fail for the subject,
with no opportunity to re-assess this in the same academic year.

Irregularities contemplated in this procedure include, among others:

- the **total or partial copying** of a practical exercise, report, or any other evaluation activity,
- **allowing others to copy**,
- **unauthorized and/or non-cited use of AI tools** *(such as, Copilot, ChatGPT or equivalent)* to solve
exercises or projects or any assessed activity,
- **presenting teamwork** that has **not been entirely done by the members of the team**,
- **presenting any materials prepared by a third party as one's own work**, even if these materials are
translations or adaptations, including work that is not original or exclusively that of the student,
- **having communication devices** *(such as mobile phones, smart watches, etc.)* accessible during
theoretical-practical assessment tests (individual exams).

Communication

Courses

C1	Introduction to human and CV
C2	Optimization and Inference techniques for CV
C3	Machine Learning techniques for CV
C4	3D Vision
C5	Visual Recognition
C6	Video Analysis
C7	Research Dissemination and Transfer
C8	Master Dissertation

Moodle rooms at
UAB Virtual Campus at
`cv.uab.cat`

cv.uab.cat
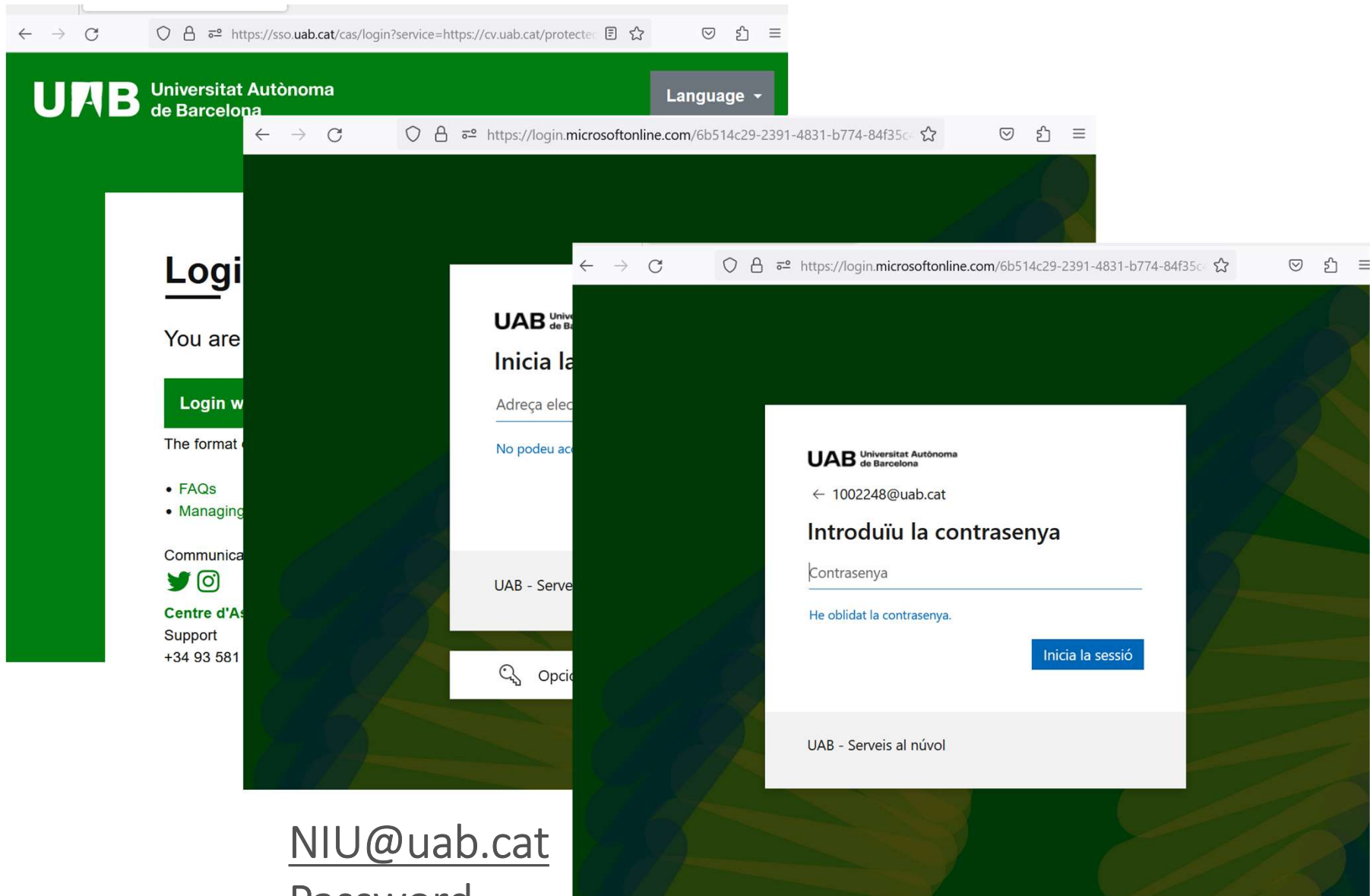
NIU@uab.cat
Password

Verification code

✖

˅ General

News and Forum

˅ Contacts

Coordinators and Lecturers

˅ Lectures

Calendar 2023

Virtual Room for Lectures Se…

Materials

˅ Project

Project Materials

QS Test 1 - W5 🔒

˅ Evaluation

Evaluation Criteria

C1. Introduction to Human and Computer Vision [MO64870]

Course   Settings   Participants   Grades   Reports   More ˅

˅ General

Collapse all

FORUM
News and Forum

˅ Contacts

PAGE
Coordinators and Lecturers

˅ Lectures

FILE
Calendar 2023

About UAB e-mail address

You can access your account at: `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`

Communication

Courses

C1	Introduction to human and CV
C2	Optimization and Inference techniques for CV
C3	Machine Learning techniques for CV
C4	3D Vision
C5	Visual Recognition
C6	Video Analysis
C7	Research Dissemination and Transfer
C8	Master Dissertation

UOC Virtual Campus for C7
`aula.uoc.edu`

UOC Virtual Campus for C7

www.uoc.edu

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

They are different from the UAB NIU/password!!!
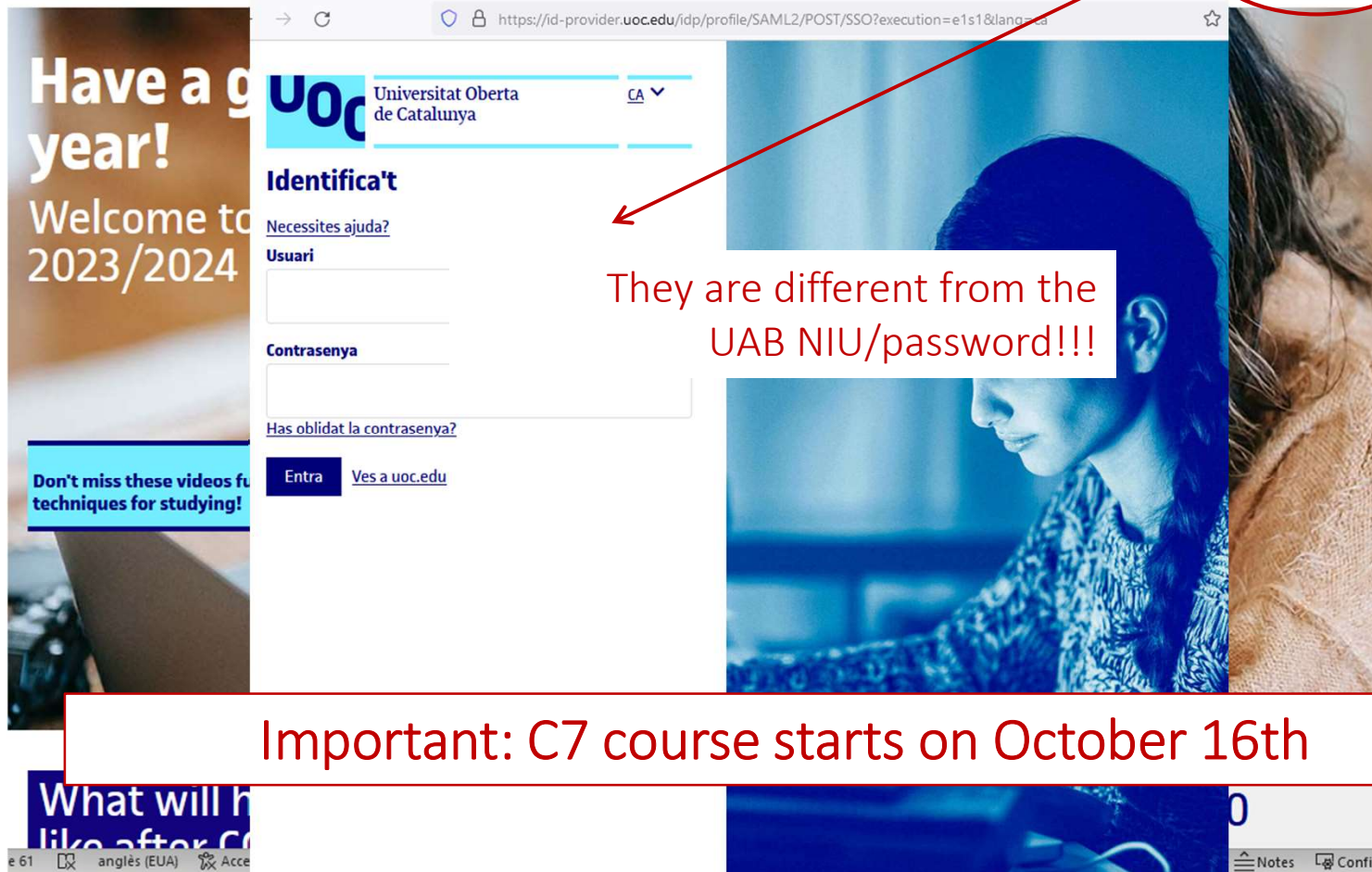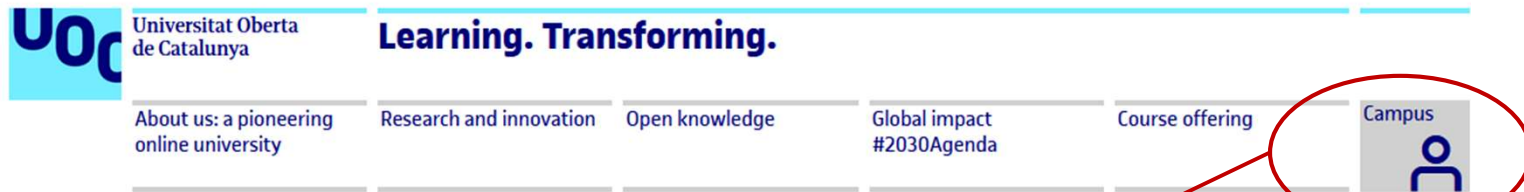
Important: C7 course starts on October 16th

Welcome session

1. aim of the master
2. about computer vision
3. about the master
4. about the partners
   - UAB-CVC
   - UOC
   - UPC
   - UPF
   - UB
5. about the students

UAB / CVC

UAB

Created in 1968

University campus with 263ha with all necessary services for living

International Ranquings

 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,
151-200	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
201-300	Biomedical Engineering, Clinical Medicine, Earth Sciences, Education, Food Science and Technology, Psychology, Telecomunications Engineering

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
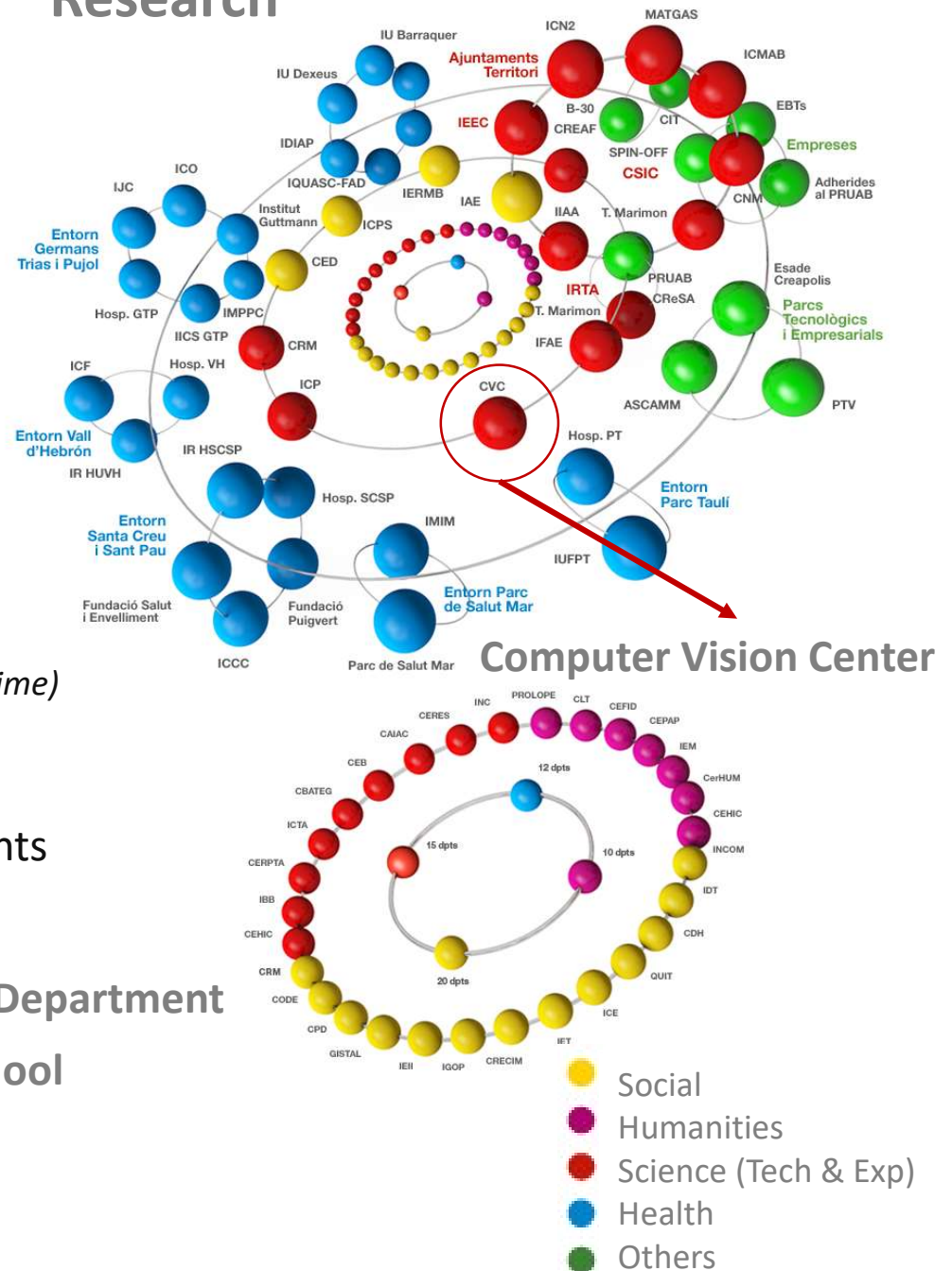
Computer Vision Center, since 1995

26 YEARS

+130 STAFF

2,8 M €/YEAR INCOME

+50 PUBLICATIONS/YEAR

+50 ONGOING PHD THESIS

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

VISIÓ I ROBÒTICA APLICADA (VyRA)
Computer Vision Solutions
1998

icar *A Mitek Company*
ICAR VISION SYSTEMS
Systems for Personal Documents
2001

VISUAL CENTURY
Video Indexing
visualcentury *The Visual Intelligence Company*
2002

INSPECTA
Cork Quality Control
INSPECTA
2003

DAVANTIS
DAVANTIS
Smart Surveillance
2005

knowxel *crowdmobile*
CROWDMOBILE, SL.
Crowd Sourcing Solutions (Knowxel)
2012

VISUAL TAGGING SERVICES
Visual Listening in Social Networks
visualtagging

CLOUD SIZING SERVICE
Sizing Clothing
Verisize
2014

vintra VINTRA
Video Content Analysis
2015

CARE RESPITE
Indoor Intelligent Visual System for Dependence
CARE RESPITE
2016

orain ORAIN
Intelligent Vending Machines

ALLREAD MLT
Supply Chain Reading Solutions
allread
2019

EKITER
EKITER
Collaborative platform for boosting new projects with Blockchain
2020

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

UOC Universitat Oberta de Catalunya

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

31 October 1995
Our first academic year starts with 206 students and two programmes:
· Business Studies
· Educational Psychology
27 courses
36 online classrooms

Our first four postgraduate courses are launched:
· Teacher Training
· How to Create a Marketing Plan
· Accounting and Finance for Non-Accountants
· Total Quality Management of Services

The Internet Interdisciplinary Institute (IN3) research centre was born.

The international doctoral programme in the Information and Knowledge Society is launched.

Programmes in Spanish are offered for the first time thanks to a five-year partnership with Grupo Planeta.
21,174 students

Manuel Castells starts the 2001/2002 academic year with a lecture on "Internet and freedom".

Launch of Project Internet Catalonia, which finished in 2005; a large-scale interdisciplinary research programme that studied Catalonia's transition to an information society.
33,573 students

The UOC opens its first international office in Mexico City.

13 December 2005 Appointment of Imma Tubella as President.

The UOC receives the Technological Innovation and Quality Award from the Centre for Innovation and Business Development (CIDEM).
16,366 graduates

54,378 students

Creation of UOC Alumni, which takes over from the Graduates and Former Students Club formed in 2001.

Creation of O2, the UOC's open-access institutional repository of publications.

During the 2009/2010 academic year the UOC celebrates its 15th anniversary. It reaches the figure of 56,000 students and more than 20,000 graduates.

Creation of the Centre for Modern Languages.

The UOC hosts the first International Seminar on Higher Education Rankings and E-learning.

The new 2014-2020 Strategic Plan focuses on excellence in research, enhancing employability, strengthening the University's global profile and collaborative governance.

49,671 students
44,367 graduates

6 October 2015 Creation of UOC Corporate, which offers innovative learning solutions for companies.

New international office in Bogotá, Colombia.

The UOC adheres to the United Nations 2030 Agenda for Sustainable Development.

24 October 2019 Mary Beard is awarded an honorary doctorate for her academic and scientific achievements and her commitment to defending women's rights.

The academic year is affected by COVID-19. For the first time, all final assessment tests are held online.
over 77,500 students
over 85,700 graduates

Timeline (top): 1994/1995 | 1996/1997 | 1998/1999 | 2000/2001 | 2002/2003 | 2004/2005 | 2006/2007 | 2008/2009 | 2010/2011 | 2012/2013 | 2014/2015 | 2016/2017 | 2018/2019

6 October 1994 Creation of the Fundació per a la Universitat Oberta de Catalunya.

6 April 1995 The Catalan Parliament unanimously approves a law to officially recognize the UOC.

26 May 1995 Appointment of our first president, Gabriel Ferraté.

First online university entrance course for over-25s.

The first two UOC-certified master's degrees are launched –
· Occupational Health, Safety and Conditions
· Financial Instruments and Markets

The first graduation ceremony is held in Manresa.

New centre in Madrid.
1,000 online classrooms

Creation of the digital journal *Artnodes*, which explores the intersections between art, science and technology.

Creation of the UNESCO E-learning Chair.

Josep Laporte receives the UOC's first honorary doctorate for his contribution to the creation of the university.
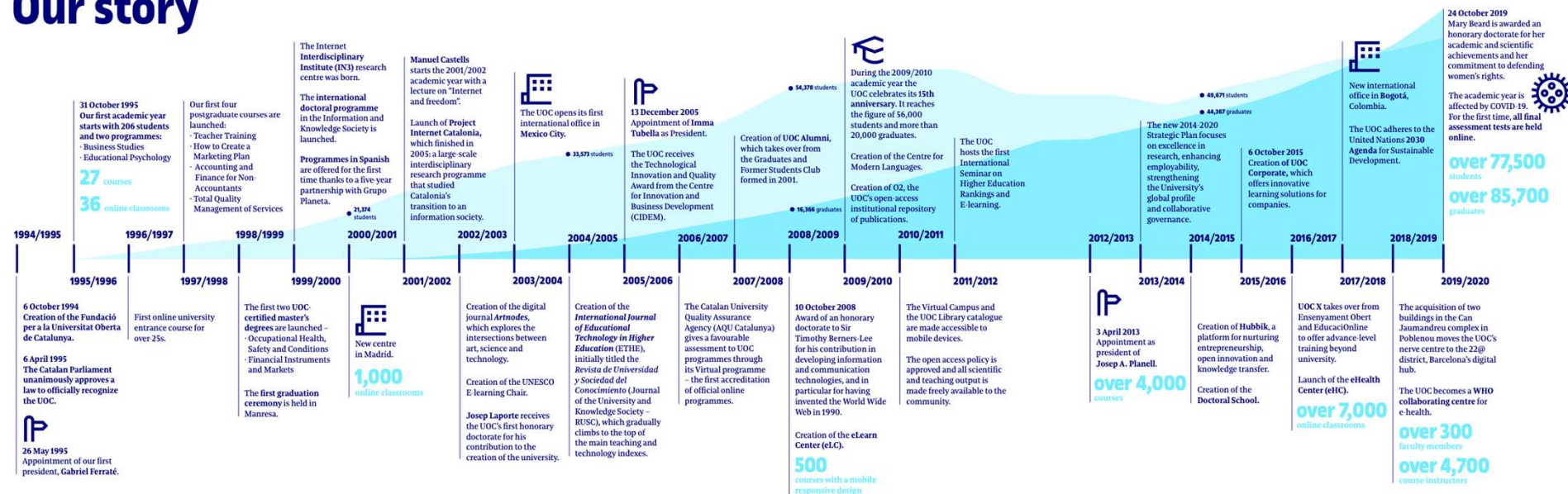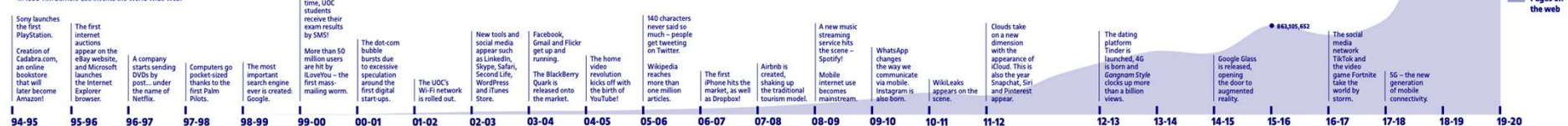
Creation of the *International Journal of Educational Technology in Higher Education* (ETHE), initially titled the *Revista de Universidad y Sociedad del Conocimiento* (Journal of the University and Knowledge Society – RUSC), which gradually climbs to the top of the main teaching and technology indexes.

The Catalan University Quality Assurance Agency (AQU Catalunya) gives a favourable assessment to UOC programmes through its Virtual programme – the first accreditation of official online programmes.

10 October 2008 Award of an honorary doctorate to Sir Timothy Berners-Lee for his contribution in developing information and communication technologies, and in particular for having invented the World Wide Web in 1990.

Creation of the eLearn Center (eLC).
500 courses with a mobile responsive design

The Virtual Campus and the UOC Library catalogue are made accessible to mobile devices.

The open access policy is approved and all scientific and teaching output is made freely available to the community.

3 April 2013 Appointment as president of Josep A. Planell.
over 4,000 courses

Creation of Hubbik, a platform for nurturing entrepreneurship, open innovation and knowledge transfer.

Creation of the Doctoral School.
over 7,000 online classrooms

UOC X takes over from Ensenyament Obert and EducaciOnline to offer advance-level training beyond university.

Launch of the eHealth Center (eHC).
over 300 faculty members
over 4,700 course instructors

The acquisition of two buildings in the Can Jaumandreu complex in Poblenou moves the UOC's nerve centre to the 22@ district, Barcelona's digital hub.

The UOC becomes a WHO collaborating centre for e-health.

Timeline (bottom): 1995/1996 | 1997/1998 | 1999/2000 | 2001/2002 | 2003/2004 | 2005/2006 | 2007/2008 | 2009/2010 | 2011/2012 | 2013/2014 | 2015/2016 | 2017/2018 | 2019/2020

Evolutions in technology

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

Sony launches the first PlayStation.
Creation of Cadabra.com, an online bookstore that will later become Amazon!

The first internet auctions appear on the eBay website, and Microsoft launches the Internet Explorer browser.

A company starts sending DVDs by post... under the name of Netflix.

Computers go pocket-sized thanks to the first Palm Pilots.

The most important search engine ever is created: Google.

More than 50 million users are hit by ILoveYou – the first mass-mailing worm.

The dot-com bubble bursts due to excessive speculation around the first digital start-ups.

The UOC's Wi-Fi network is rolled out.

New tools and social media appear such as LinkedIn, Skype, Safari, Second Life, WordPress and iTunes Store.

Facebook, Gmail and Flickr get up and running.

The BlackBerry Quark is released onto the market.

The home video revolution kicks off with the birth of YouTube!

Wikipedia reaches more than one million articles.

The first iPhone hits the market, as well as Dropbox!

Airbnb is created, shaking up the traditional tourism model.

140 characters never said so much – people get tweeting on Twitter.

A new music streaming service hits the scene – Spotify!

WhatsApp changes the way we communicate via mobile. Instagram is also born.

Mobile internet use becomes mainstream.

For the first time, UOC students receive their exam results by SMS!

WikiLeaks appears on the scene.

Clouds take on a new dimension with the appearance of iCloud. This is also the year Snapchat, Siri and Pinterest appear.

The dating platform Tinder is launched, 4G is born and Gangnam Style clocks up more than a billion views.

Google Glass is released, opening the door to augmented reality.

The social media network TikTok and the video game Fortnite take the world by storm.

5G – the new generation of mobile connectivity.

1,766,926,608
863,105,652

Legend: Students | Graduates | Pages on the web

Timeline: 94-95 | 95-96 | 96-97 | 97-98 | 98-99 | 99-00 | 00-01 | 01-02 | 02-03 | 03-04 | 04-05 | 05-06 | 06-07 | 07-08 | 08-09 | 09-10 | 10-11 | 11-12 | 12-13 | 13-14 | 14-15 | 15-16 | 16-17 | 17-18 | 18-19 | 19-20

Leaders in quality e-learning

UOC Universitat Oberta de Catalunya

The UOC has students in 141 countries

> 51,400 in Catalonia

> 28,500 in Spain (excluding Catalonia)

> 6,600 in the rest of the world

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

Research DNA

- Net Society — IN3 & faculties' research groups
- eLearning Research — Faculties' research groups
- Digital Health — eHealth Center & faculties' research groups

The research groups are made up researchers from the research centres and research faculty from the faculties.

95,000 graduates

6,500 course instructors and tutors

15,500 virtual classrooms

87,500 students

800 programmes taught

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

UOC Universitat Oberta de Catalunya
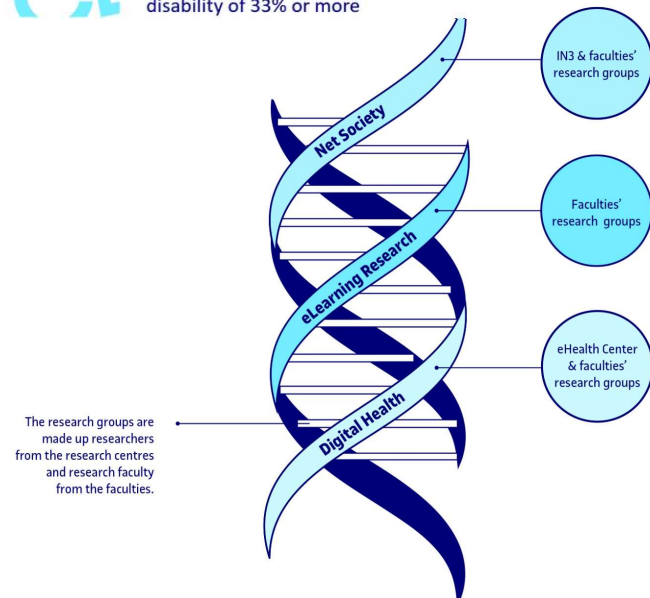
AIWELL Lab – Artifial Intelligence for Human Well-being Lab

AI well

https://aiwell.uoc.edu

Our mission
Advancing AI research and creating trustworthy AI technologies to promote and improve the human well-being

Computer Vision	Natural Language Processing
Explanaible Artificial Intelligence	Fairness in Artificial Intelligence

PDI:

Agata Lapedriza   Carles Ventura   David Masip   David Merino

Ismael Benito   Agnès Pérez   Joan M. Nunez   Xavi Baró

PhD Candidates:
Marcelo Teran, Mona Ashtari, Mujeeb Ur, Rubén González, Cristina Bustos, Josep López, Elena Ortega and Josep Cabacas.

Master Students:
Cristian Gutierrez, Rubés Ostos and Andres Santos.

UPC

UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

Campus d'Excel·lència Internacional

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

- Automàtica i Control — 151-200 / 38-49 / 3 / 2-3
- Nanociència i Nanotecnologia — 151-200 / 24-37
- Enginyeria Metal·lúrgica — 151-200 / 44-56 / 2
- Enginyeria de Telecomunicacions — 151-200 / 39-52 / 1-2 / 2-3
- Enginyeria Elèctrica i Electrònica — 101-150 / 27-47 / 1-2 / 19-34
- Tecnologia i Ciències del Transport — 101-150 / 32-48
- Recursos Hídrics — 101-150 / 1
- Enginyeria Civil — 76-100 / 17-20 / 2
- Matemàtiques — 76-100 / 31-46 / 1-2
- Ciències Atmosfèriques — 76-100 / 28-42 / 1
- Tecnologia i Ciències Instrumentals — 51-75 / 5-8 / 3

QS World University Rankings by Subject, 2022

- Ciència dels Materials — 101-150 / 26-45 / 1
- Ciències del Medi Ambient — 101-150 / 35-57 / 2-3
- Estadística i Investigació Operativa — 101-150 / 36-58 / 1-2
- Art i Disseny — 101-150 / 44-63 / 1-3 / 2
- Matemàtiques — 113 / 42 / 2 / 1
- Ciències de la Computació i Sistemes d'Informació — 86 / 29 / 2
- Enginyeria Industrial, Mecànica i Aeronàutica — 78 / 29 / 2 / 29
- Enginyeria i Tecnologia — 60 / 23 / 1 / 19
- Enginyeria Telecomunicacions, Elèctrica i Electrònica — 52 / 11 / 2
- Enginyeria Minera — 49 / 8 / 1
- Enginyeria Civil i Estructural — 29 / 8 / 1
- Arquitectura i Entorn Construït — 19 / 8 / 1

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.

Manresa
Terrassa
St. Cugat del Vallès
Sant Adrià de Besòs
Barcelona
Castelldefels
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

- 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

3 spheres campus

Social Sciences & Humanities

Communication

Biomedicine

Ciutadella campus:
Social Sciences and Humanities
(*+Inf. Tech.:*
Centre for Brain
& Cognition - CBC)

Mar campus:
Health and Life Sciences

Poblenou campus:
Communication, Translation and **Engineering**

upf. 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 Engineering
(previously, of Information and Communication Technologies DTIC)

1.020
Under-
graduate
students

138
Master
students

180
PhD
students

**Total
1.630**
Community
members

46
Faculty
members

86
Tenure
Track /
PostDocs

95 + 68
Research
Support +
part-time
teaching

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

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

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

Multimedia Technologies (4 groups)

Networks & Communications (4 groups)

Computation & Intelligent Systems (5 groups)

Computational Biology & Biomedical Systems (5 groups)

Brain & Cognition (5 groups)

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

- 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
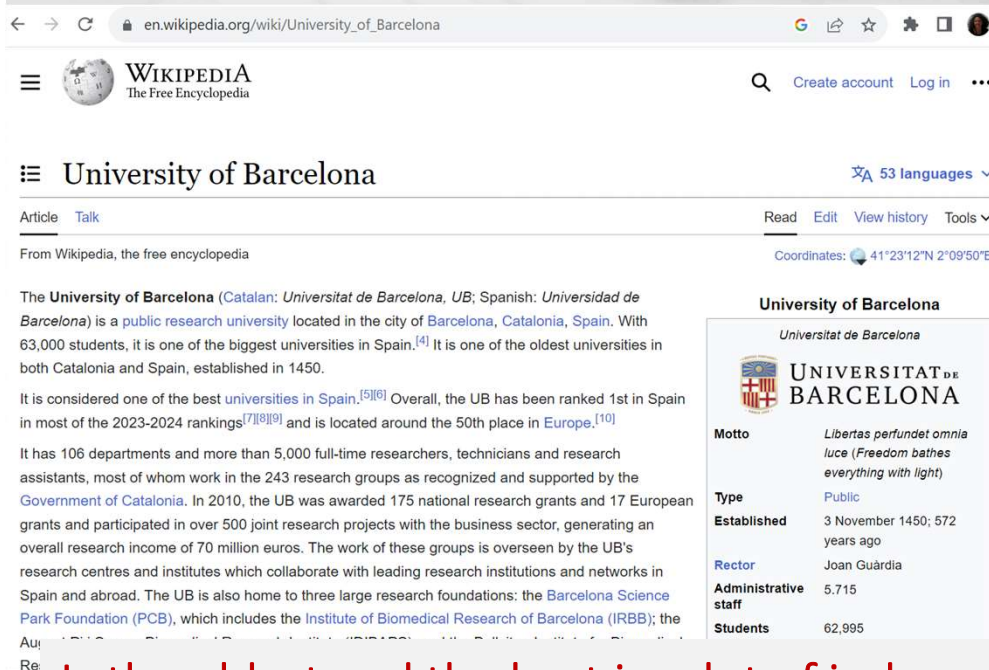
Our overall goal is to investigate the automatic analysis and understanding of visual content and to address real-world problems and applications, often involving also modalities beyond vision, such as audio, natural language, ultrasound or magnetic resonance. We develop model-based and data-driven (deep 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
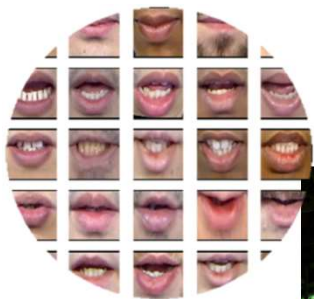
Automatic Lip-Reading

UB

Is the oldest and the best in a lot of indexes

1401 - General Study of Medicine and Arts
1450 - General Study of Barcelona
Suppressed in 1717, with the the lost of Catalan independence.
1842 – Created again as University of Barcelona
1863 – Building of the current venue, courses started in 1871.

https://en.wikipedia.org/wiki/University_of_Barcelona

PhD Students

Tenure Lecturers

3 ICREA

71 Permanent Members

Post-Doctoral Fellows

Assistant Lecturers

Temporary Visitors

3 Office staff (1 Research staff)

Algebra, Geometry, Logic and Topology

Analysis and Probability

Applied Mathematics (and Statistics)

Computer Science
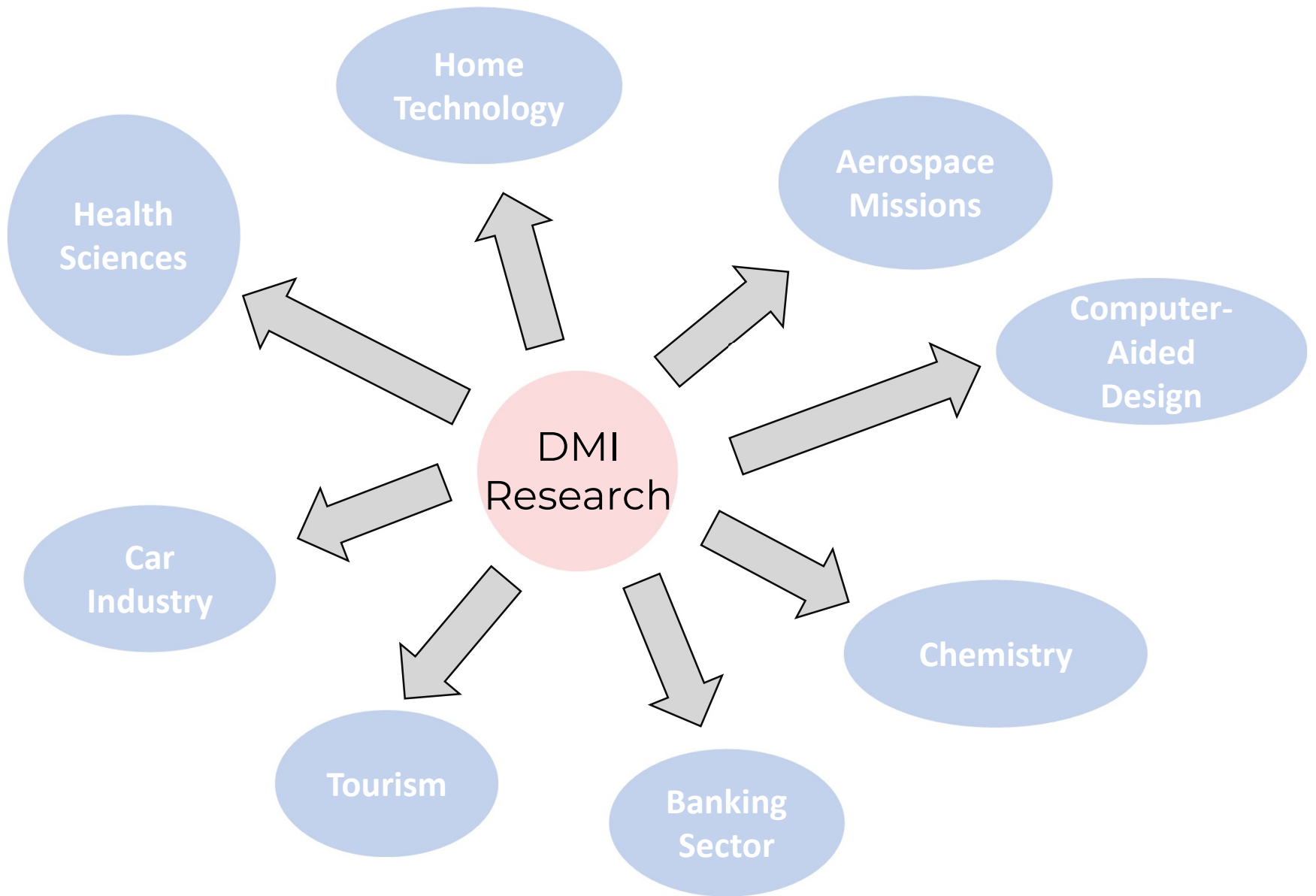
Research lines
Human Behavior Understanding

FACE ANALYSIS
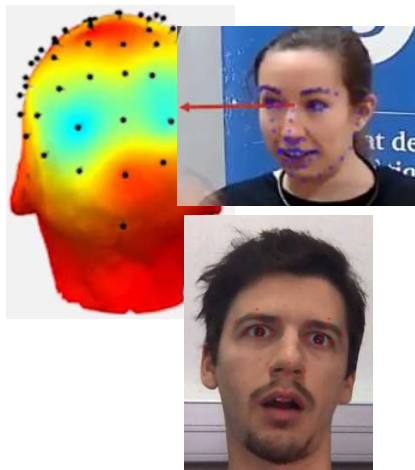
VISUAL (AND MULTIMODAL) MODELING OF HUMANS

CAUCASIAN AGE 30

NEUTRAL FACE ♀

AUDIO SIGNAL

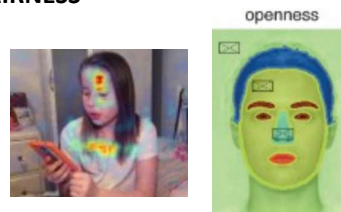**3D (& 4D) POSE, SHAPE, TEXTURE (IN 3D AND FROM 2D)**
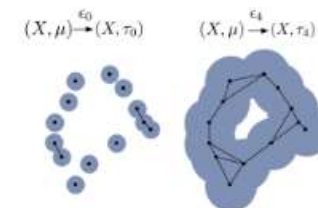
BEHAVIOR ANALYSIS
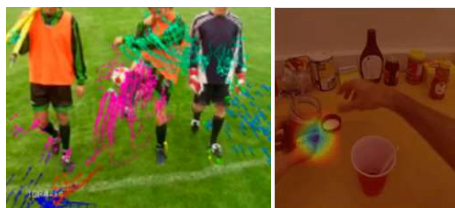
UNDERSTANDING AND EXPLAINING HUMAN BEHAVIOR (Affective & Personality Computing)
-INTERPRETABILITY & EXPLAINABILITY
-FAIRNESS

openness

BIAS ANALYSIS VISUALIZATION

$(X, \mu) \xrightarrow{\epsilon_0} (X, \tau_0)$ $(X, \mu) \xrightarrow{\epsilon_4} (X, \tau_4)$

INTERPRETING AND EXPLAINING LEARNING

Research lines:

- Spatio-temporal and multi-modal deep Learning
- Domain Adaptation
- Bias and fairness
- Explainability and interpretability

Research fields

- Computer Vision
- Machine Learning
- Social Signal Processing
- Affective Computing
- Personality Computing

Application domains:

- eHealth and welfare
- Security
- Connected city / home
- Leisure

Welcome session

1. aim of the master
2. about computer vision
3. about the master
4. about the partners
   - UAB-CVC
   - UOC
   - UPC
   - UPF
   - UB
5. about the students

About the students

Genre	#	%
Female	14	43.75
Male	18	56.25

		Enrolment	#
News	32	Full-time	26
		Part-time	5
		Others	1
Old	9	PT2	7
		Others	2

University of Graduation	%
International	28.1
FACHHOCHSCHULE KÖLN	Germany
LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN	
RADBOUD UNIVERSITEIT NIJMEGEN	Netherlands
UNIVERZITET U NOVOM SADU	Croatia
YEREVAN STATE UNIVERSITY	Armenia
Ain Shams University	Egypt
HO CHI MIHN CITY UNIVERSITY OF TECHNOLOGY AND EDUCATION	Vietnam
Universidad Nacional de Córdoba	Argentina
Universidad de la República (URUGUAI)	Uruguai
Spain	9.4
Universidad de Sevilla	Spain
Universidad de Zaragoza	
Universidad del País Vasco	
Catalonia	62.5
Universitat Autònoma de Barcelona (UAB)	9
Universitat Politècnica de Catalunya (UPC)	5
Universitat Pompeu Fabra (UPF)	4
Universitat de Barcelona (UB)	1
Universitat de Lleida (UdL)	1
	100

Now, time for the students
to introduce themselves

Welcome session

1. aim of the master
2. about computer vision
3. about the master
4. about the partners
   - UAB-CVC
   - UOC
   - UPC
   - UPF
   - UB
5. about the students

Time to go to the garden (photo + drinks) …