



Master in Computer Vision *Barcelona*



Academic year 2021-2022

Welcome Session & Master presentation

pazines.uab.cat/mcv

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

Image © 2013 Institut Cartogràfic de Catalunya
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

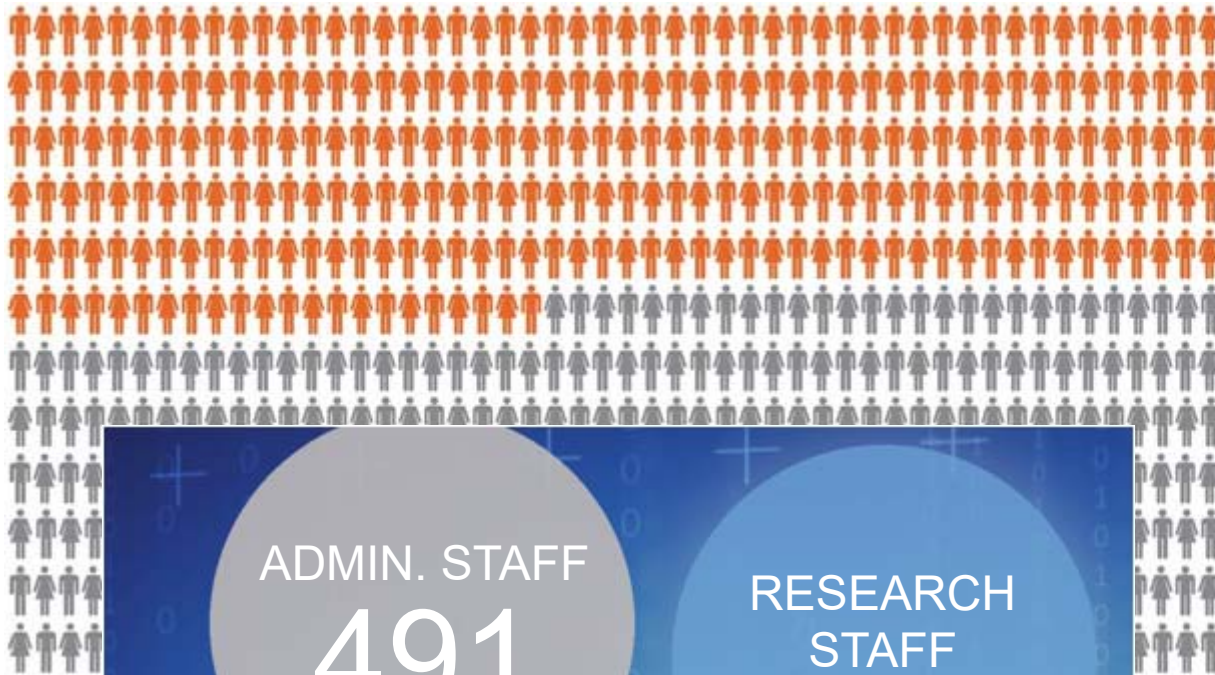


UOC
22@ Building



Google

A community of more than 60,000 students



41,784
graduates



60,096
students

UOC
Virtual Campus



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

Final Project
(under supervision)
Academic or
at a Company

Modules		ECTS	Univ.	
M1	Introduction to human and CV	6	UPC	Basic Techniques (Hybrid: online-inperson) Project-based
M2	Optimization and Inference techniques for CV	6	UPF	
M3	Machine Learning techniques for CV	6	UAB	
M4	3D Vision	6	UPC	Vision Problems (Hybrid: online-inperson) Project-based
M5	Visual Recognition	6	UAB	
M6	Video Analysis	6	UPF	
M7	Introduction to Research Dissemination	6	UOC	Transversal skills (online)
M8	Research and Technology Transfer Management	6	UOC	
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

1st 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			

2nd 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

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

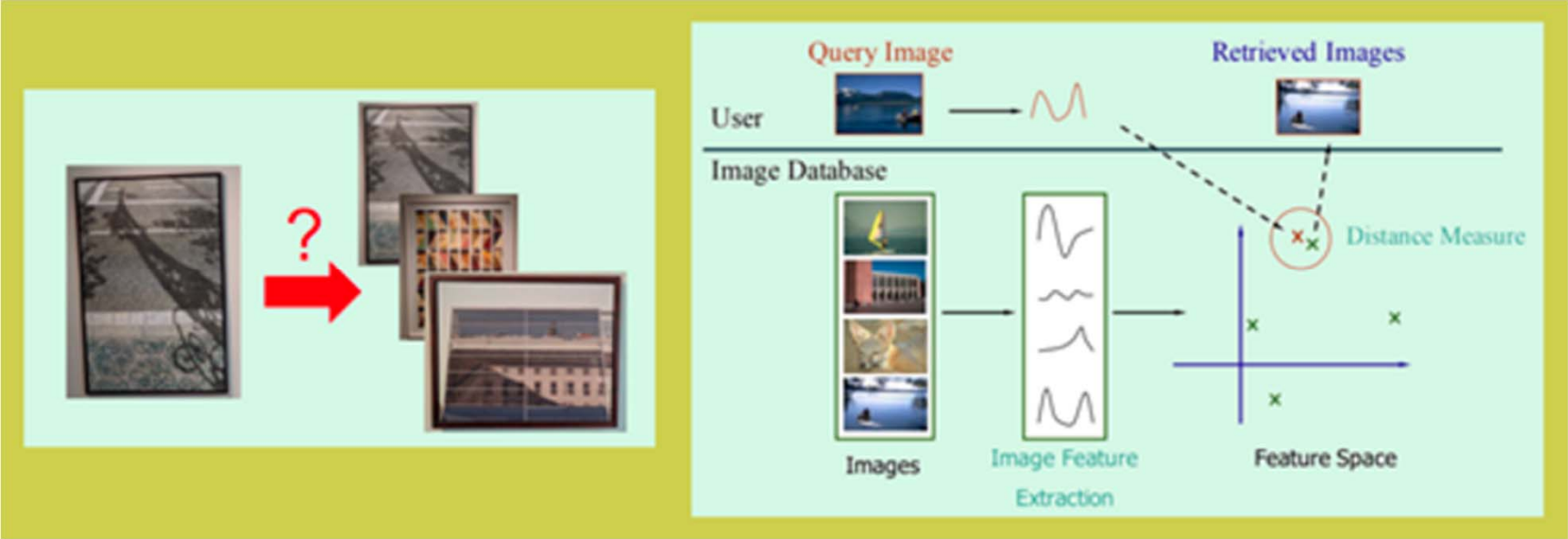
Module 5. Visual Recognition

Joan Serrat

Module 6. Video Analysis

Xavier Giró

Project 1. Museum Painting Retrieval

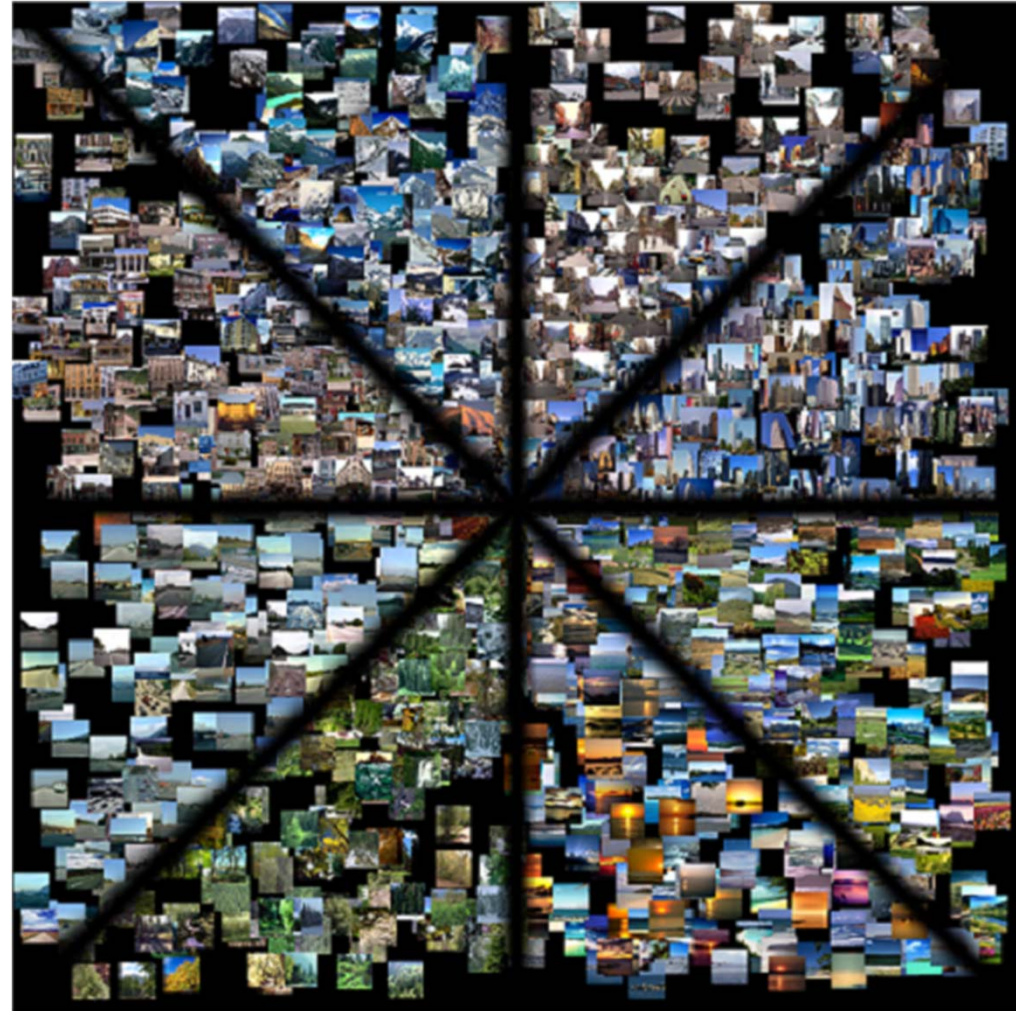


Project 2. Removing Objects in Natural and Urban Scenes

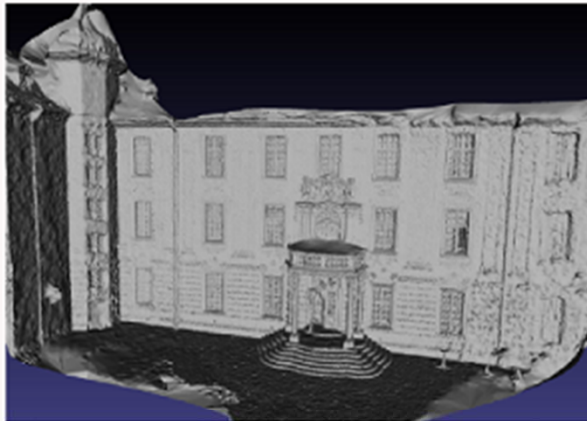


Picture from: Komodakis and Tziritis, *IEEE Trans Image Proc*, 2007

Project 3. Image Classification



Project 4. 3D recovery of urban scenes



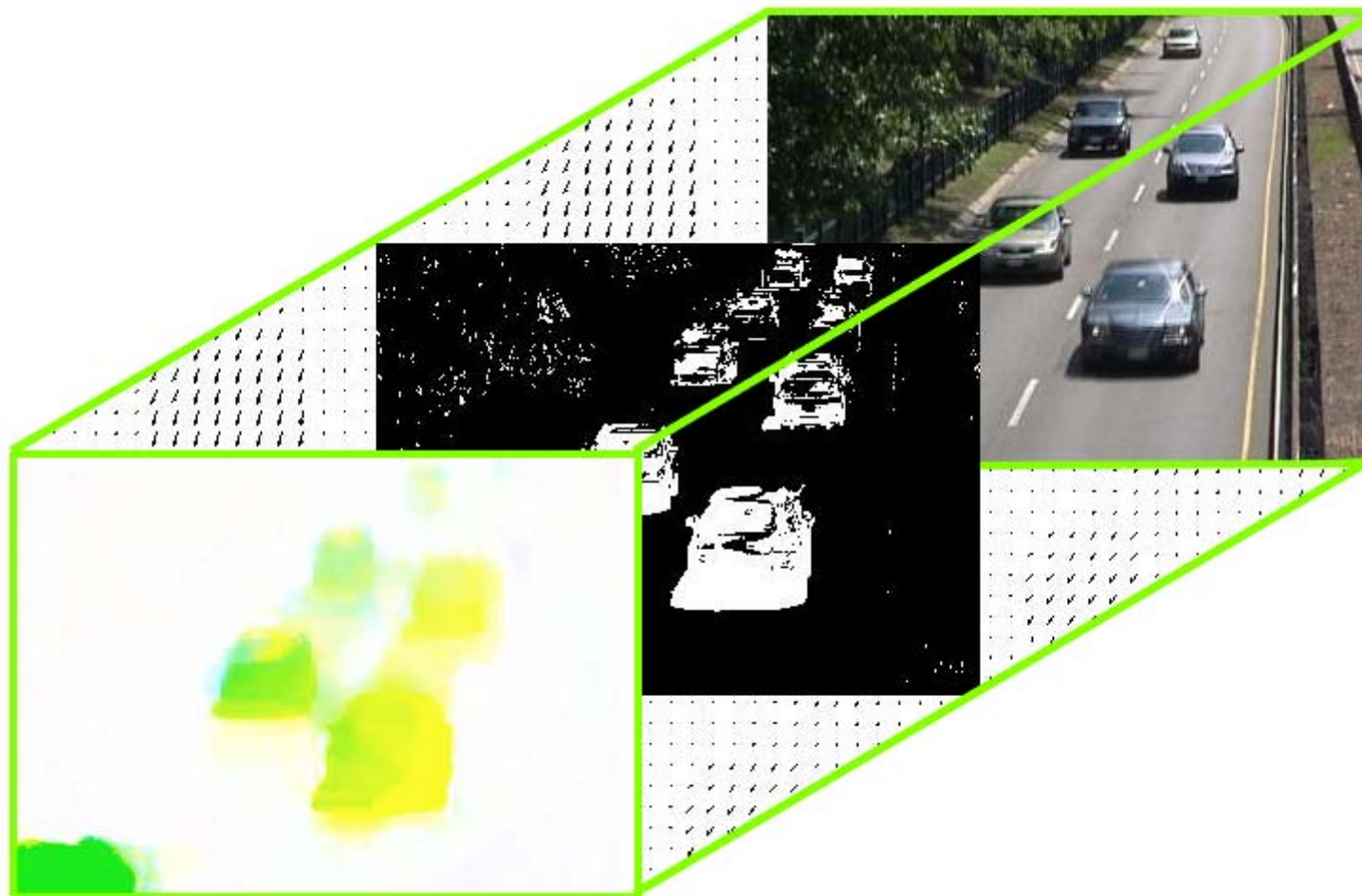
The two central images are from Hiep et al. "Towards high-resolution large-scale multi-view stereo", CVPR 2009



Project 5. Deep Learning for Classification, Detection and Segmentation



Project 6. Road Traffic Monitoring



Project coordinators

Project 1. Museum Painting Retrieval

Ramon Morros / Verónica Vilaplana

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 / Xavier Giró

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

Coordinators: David Merino and Carles Ventura

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 & E. Sayrol
(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:

pazines.uab.cat/mcv

Master in Computer Vision
Barcelona

UAB | UOC | UPC | upf.

News | Goals of the Master | Program | Schedule | Admission | Grants | Open positions | Contact | Login

News

--- **Master** (Intake October 2019) starts on **September 27th** with a **Welcome Session** that will take place at CVC at 4pm

Courses start on September 30th, they take place at different Campuses within the Barcelona area depending on module coordination:

M1 and M6 (UPC) at Campus Nord

M2 and M4 (UPF) at Campus Poblenou

M3 and M5 (UAB) at Campus Bellaterra

M7 and M8 (UOC) online through the Virtual Campus of UOC

--- **Student Projects in companies**, if your company is interested in offering internship projects for our students you can insert your proposal [\[here\]](#).

--- **Important!!!! This Master has been awarded** with 1 **Grant of Catalunya-La Pedrera Foundation** - deadline for applications is July, 16th 2019 [\[more information\]](#)

--- A **new pre-registration period** for this Master (2019 October Intake) will open from July 1th o **September 6th**, 2019 (issuing the resolution on September 13th). Resolution for the first pre-registration was issued on past May 31st.

--- The **Pre-registration period** for the **Master in Computer Vision (2019 October intake)** is **from January 11th to May 10th, 2019** (issuing the resolution on May 31st, 2019). Students interested in enrolling the master who have not yet finished their degree, must also go through this pre-registration period and if finally admitted, they will then receive an admission conditioned to them passing the degree in due time. Another pre-registration period could be open further on if vacancies, will open **from July 1st to**

Modules

- M1. IHCV
- M2. OICV
- M3. MLCV
- M4. 3DV
- M5. VR
- M6. VA
- M7. RD
- M8. RTTM
- M9. MD

Practical Information
about the
modules:

Agenda, schedule,
rooms

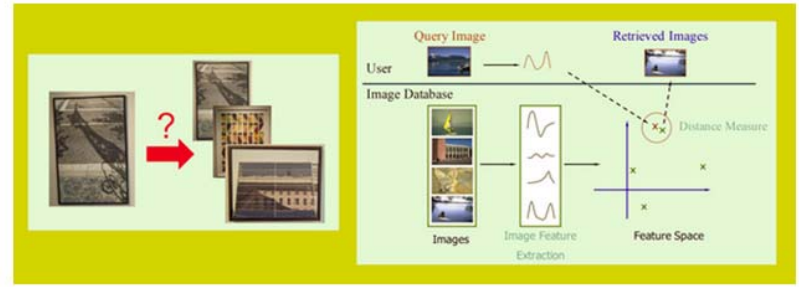
Module Information



M1. Introduction to human and computer vision

The aim of this module is to 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, in our case traffic signals, 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



The goal of this project is to apply the basic concepts and techniques to build a system for content-based image retrieval (CBIR). CBIR systems analyze the contents of the image (color, texture, shape, etc.) to search digital images in large databases. The CBIR will be based on a Query-By-Example (QBE) methodology, where the search is performed using an example image provided by the user. The result images are similar (share common elements) with the example. CBIR represents a typical problem where Computer Vision techniques can be successfully applied to obtain automatic results in a real-world problem. The learning objectives for the students are the use of local image features, such as color, contours, etc. to implement a system able to solve the proposed problem. In this way, the students can experience the problems of designing and evaluating the performance of a

- M1. IHCV
- M2. OICV
- M3. MLCV
- M4. 3DVCV
- M5. VR
- M6. VA
- M7. RD
- M8. RTTM
- M9. MD

Module Schedule Building and Room

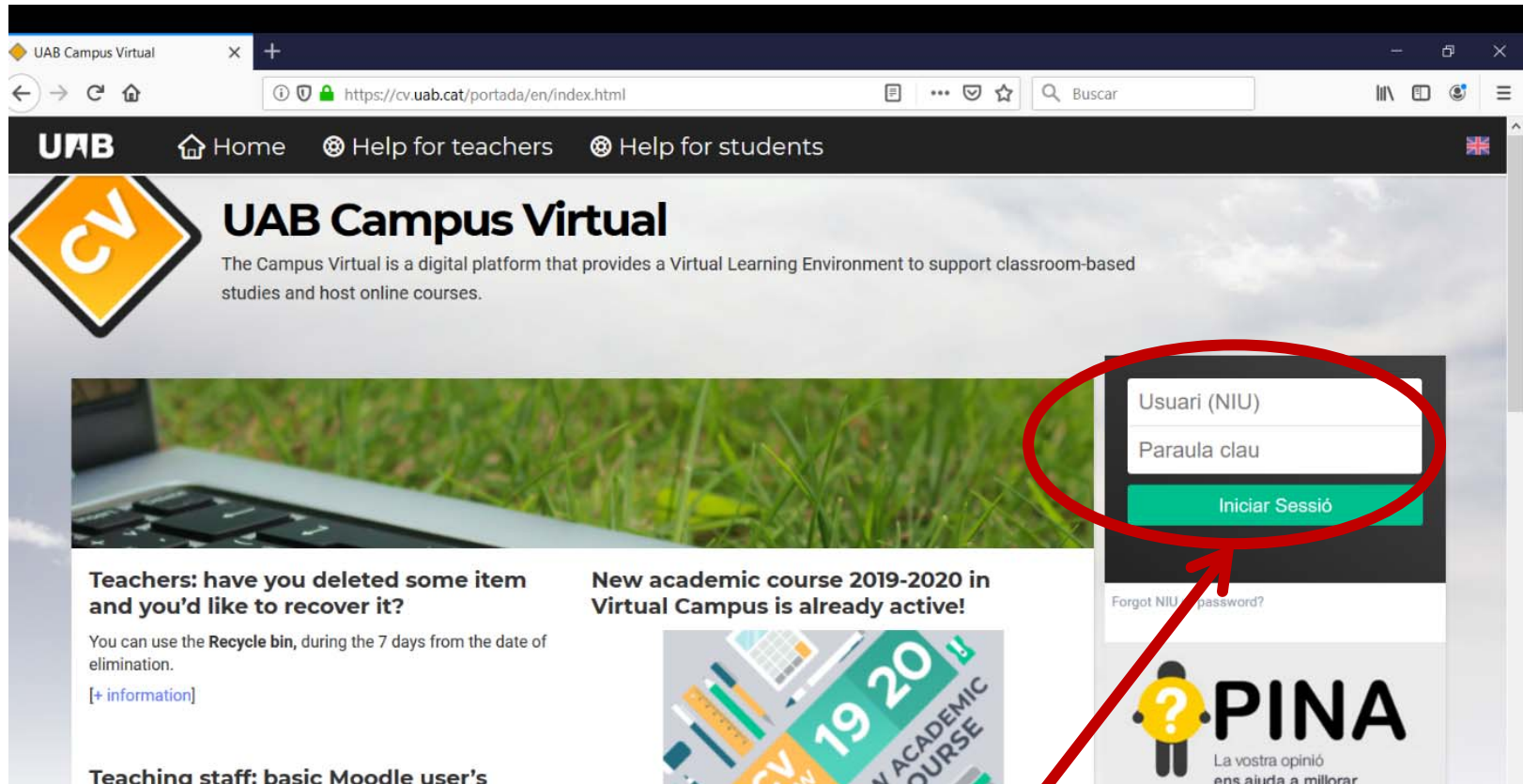
Module lectures:

Academic year 2021-2022/ M1 Student Guide [here](#)

Week	Date	Time	Lecture	Lecturer	University
1	Mon.Oct.4th	16h-18h	Human Visual system and perception	Javier Vázquez	UPC-Campus: A2-104
1	Mon.Oct.4th	18h-19h	Project Introduction	R.Morros/V.Vilaplana	UPC-Campus: A2-104
1	Wed.Oct.6th	16h-18h	Image formation and color representation	Javier Vázquez	https://meet.google.com/xiv-rxcp-jiv
2	Mon.Oct.11th	16h-18h	Image processing assessment and pixel-based processing	Philippe Salembier	UPC-Campus: A2-104
2	Mon.Oct.11th	18h-19h	Project follow-up	R.Morros/V.Vilaplana	UPC-Campus: A2-104
2	Wed.Oct.13rd	16h-18h	Morphological and nonlinear filtering	Philippe Salembier	https://meet.google.com/xiv-rxcp-jiv
3	Mon.Oct.18th	16h-18h	HOMEWORK		
3	Mon.Oct.18th		HOMEWORK		
3	Wed.Oct.20th	16h-18h	Space-frequency representation, Fourier transform and linear filtering (I)	Javier Ruiz	https://meet.google.com/xiv-rxcp-jiv
4	Mon.Oct.25th	16h-18h	Space-frequency representation, Fourier transform and linear filtering (II)	Javier Ruiz	UPC-Campus: A2-104
4	Mon.Oct.25th	18h-19h	Project follow-up	R.Morros/V.Vilaplana	UPC-Campus: A2-104
4	Wed.Oct.27th		Space-frequency representation, Fourier	Javier Ruiz	https://meet.google.com/xiv-rxcp-jiv

Link to Virtual Room

Moodle Rooms for M1, M2, ... M6 and M9 at UAB Campus Virtual: **cv.uab.cat**



The screenshot shows the UAB Campus Virtual website. The main header includes the UAB logo and navigation links for Home, Help for teachers, and Help for students. The main content area features the UAB Campus Virtual logo and a description: "The Campus Virtual is a digital platform that provides a Virtual Learning Environment to support classroom-based studies and host online courses." Below this, there are several news items and a login form. The login form is highlighted with a red circle and contains the following fields:

- Usuari (NIU)
- Paraula clau
- Iniciar Sessió

Below the login form, there is a link for "Forgot NIU password?" and a section for "PINA" (La vostra opinió ens ajuda a millorar).

NIU / Password

IMPORTANT

About UAB e-mail address

You can access your account at:

<https://e-campus.uab.cat/>

with the UAB NIU and password

Once logged in, you should

- go to the top right of the icon **"gear"**
- click on **"settings"**
- Select **"Forwarding and POP / IMAP"**
- you must activate the option **"Forward"**
- add the [address where you want to receive the UAB emails](#)

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

Campus Virtual de la UAB - Ad X
https://cv.uab.cat/protected/index.jsp

UAB Inici Ajuda professorat Ajuda alumnat Sortida

CV Campus Virtual de la UAB
Benvingut/da, Maria Vanrell Martorell

Filtra Totes Docent Estudiant Vista Completa Simplificada

Missatgeria (moodle)
Tens 0 missatges nous.

M1. Introduction to Human and Computer Vision MO22047 (18-19) Vés-hi >

Esdeveniments propers 0 nous
Material i activitats 0 nous
Avisos i notícies 0 nous

Bibliografia M1. Introduction to Human and Computer Vision (43085)

M2. Optimisation and Inference for Computer Vision MO22048 (18-19) Vés-hi >

Esdeveniments propers 0 nous
Material i activitats 6 nous
Avisos i notícies 0 nous

Bibliografia M2. Optimisation and Inference for Computer Vision (43086)

ACCÉS DIRECTE

- Tauler
- Gestió c
- Curs ac
- Curs ac
- Correu
- Enquest
- Calenda
- Catàleg
- Serveis
- Serveis
- Propiet
- Treballs

Su
Email: ca
Telèfon: S
Horari: la
divendres

M1. Introduction to Human and Computer [MO14296]

News and Forum

CONTACTS

Coordinators and Lecturers

LECTURES

Materials

PROJECT

EVALUATION

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. The browser address bar shows the URL www.uoc.edu/portal/ca/index.html, which is circled in red. A red arrow points from this URL to the UOC logo in the header. Another red arrow points from the 'Campus' dropdown menu in the header to the 'Virtual Campus' login form. The login form has two input fields: 'User' and a password field (masked with dots), and an 'Enter' button. The header also includes the text 'Universitat Oberta de Catalunya' and navigation links: 'Recerca i innovació', 'Coneixement obert', and 'Sobre la UOC'. A 'Campus' dropdown menu is visible, with a red circle around it. Below the header, there is a banner with the text: «L'e-learning resoldria molts dels problemes que tenim per la dispersió de la població». At the bottom, there is a cookie consent notice: '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 20th

UOC Moodle rooms for M7 and M8

The screenshot shows a web browser window with the URL `cv.uoc.edu/cgi-bin/uocapp?s=9d72248938b68b56c8e8b489a55a61687232373017457e023544df0b1fc1e137ae25ecaf8f52af99311...`. The page header includes the UOC logo and name, 'Universitat Oberta de Catalunya', and user information for 'David Masip Rodo' with the role 'GCUOC-Professor-IT, Multimedia and Telecommunications'. Navigation links include 'Accessibility', 'Settings', 'Help service', 'Mailbox', 'Agenda', 'My profile', 'Work groups', and 'Search'. A menu bar contains icons for 'My UOC', 'Community', 'Classrooms', 'Tutor Support', 'Counsellors', 'Library', 'Secretary's Office', 'Intrauoc', and 'News'. The 'Classrooms' menu is open, showing a dropdown for 'M0.200 Introduction to Research Dissemination' with a sub-menu for 'Aules' containing 'Introduction to Research Dissemination aula 1 - Fernando Vilariño Freire, Claudia Bullion'. On the left, a 'Students Room' sidebar lists course numbers from 20091 to 20122. The main content area has tabs for 'COURSE' and 'CLASSROOM MANAGEMENT', with a 'Change course' dropdown. A large orange banner displays 'M0.200 Introduction to Research Dissemination aula 1' and the name 'David M...'. Below this, a 'START' section features a 'LEARNING GUIDE' button.

TO be more linked...

We will ask you to join us at social/professional networks



Become a Fan
Publications related to MCV



As a MCV data base

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)

M9 . Master's Dissertation

Guideline for the students at the website page M9

Companies and institutions that hosted our students in the past:



United Technologies

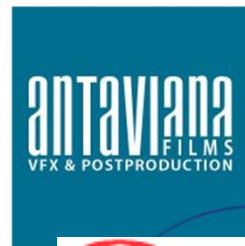


Université de Montréal



CAR
Centre d'Alt Rendiment Esportiu

catchoom®



ctrl
env
wrkshp



Sant Pau

visualtagging



McGill eurecat
Centre Tecnològic de Catalunya



Ansur
innovation in communication



UAB

UOC

UPC

upf.



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Welcome session

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