

DEEP LEARNING FOR COMPUTER VISION

Summer Seminar UPC TelecomBCN, 4 - 8 July 2016



Instructors



Xavier
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Kevin
McGuinness

Organizers



+ info: TelecomBCN.DeepLearning.Barcelona

Day 5
Closing



[Xavier Giró-i-Nieto](#)

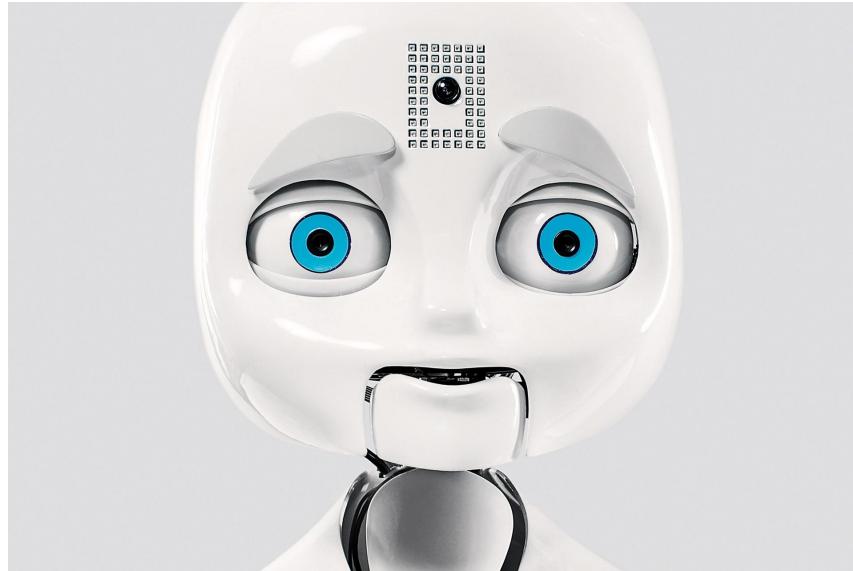


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BARCELONATECH

Department of Signal Theory
and Communications
Image Processing Group

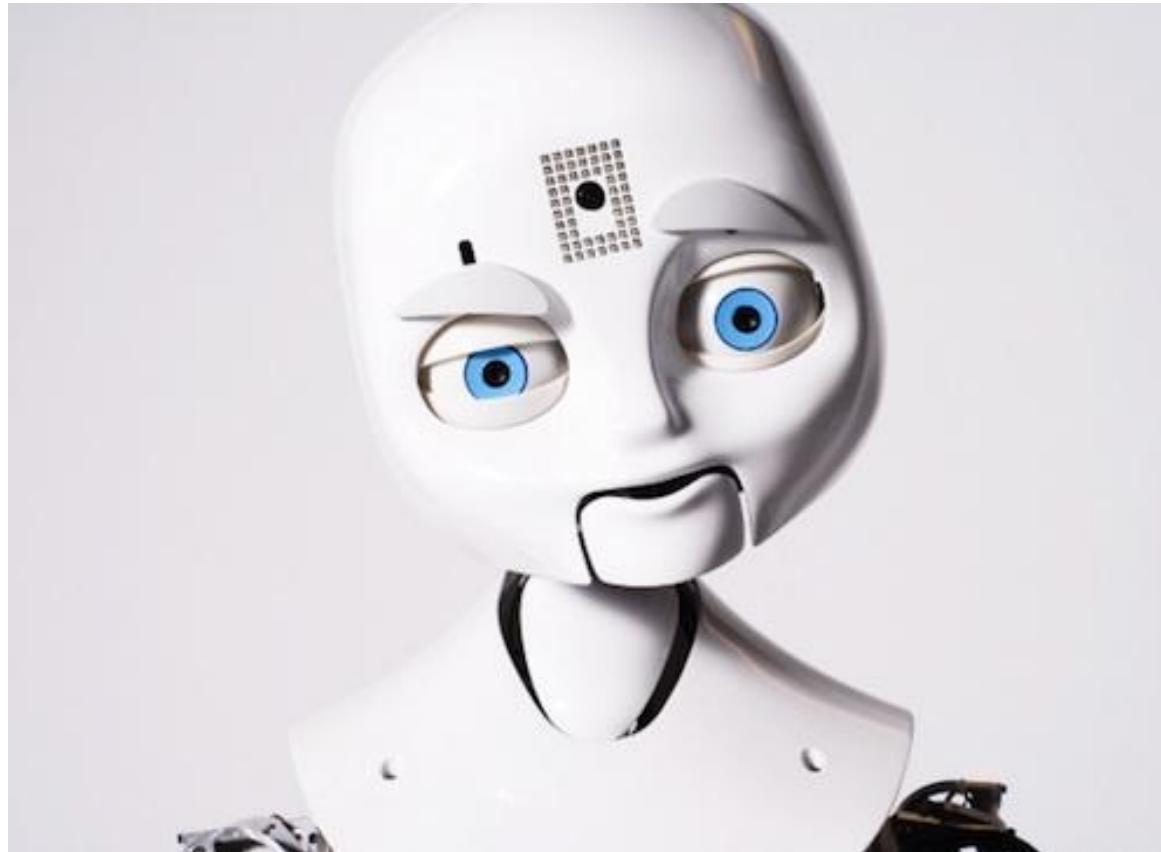
Learning only to see ?

Computer vision is large scale deployed...



...is because they have learned to see.

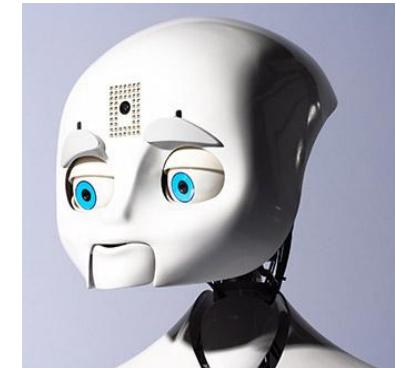
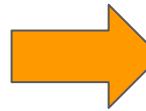
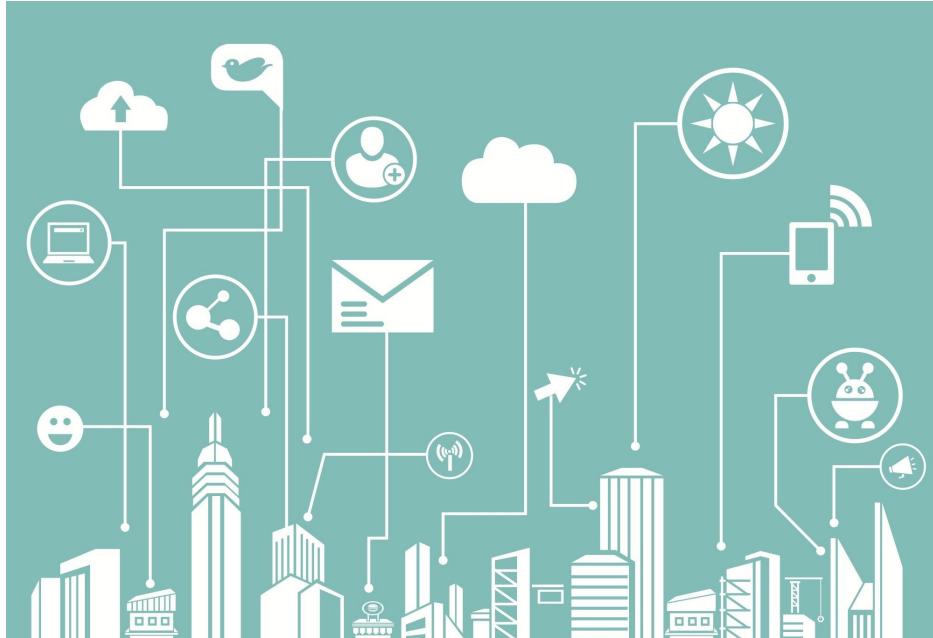
Learning only to see ?



[Nexi](#), del MIT Media Lab (Foto: Spencer Lowel)

Learning only to see ?

Internet of things - IoT



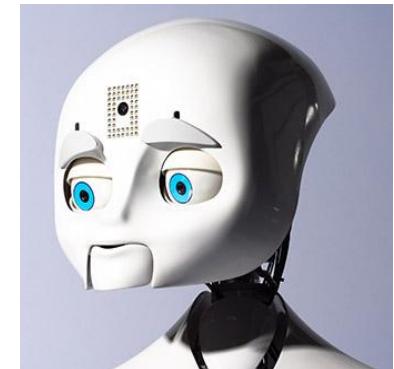
Big data

Learning only to see ?

Personal data



Big data



Learning only to see ?

Robust manipulation and motion



Atlas, de Boston Dynamics

Learning only to see ?

Playing with other computers

DeepMind



Learning only to see ?

Playing with humans



AlphaGo (Google DeepMind)

Learning only to see ?

Autonomous Driving



Google Self-driving car

Learning only to see ?

Visual arts



Only open their eyes ?

Visual arts



Learning only to see ?

Visual arts

Click on the image painted by a human!

You will be shown 10 pairs of pictures. In each pair, one is painted by a human and another one is generated by artificial intelligence based on a photo and a style of a painter. Click on a picture painted by a human.



 Follow @deepart_io

by deepart.io

<http://turing.deepart.io/>

Learning only to see ?

Music composition

Lea Oxlee [1:07] ([music sheet](#)) - my favorite!



Cookie policy

maraoz
Lea Oxlee

SOUND CLOUD

Share

0:09 1:07

▶ 535

X: :2
T:Lea Oxlee
% Nottingham Music Database
S:Kevin Briggs, via EF
M:4/4
L:1/4
K:D
P:A
A/2G/2 | "D" F/2A/2F/2A/2 FA| "G" Bd/2c/2 B/2d/2B/2d/2 | \
"A" c3c/2B/2 |
"D" Af f/2e/2f | "Em" e/2d/2c/2B/2 "A7" c/2=c/2B/2A/2 | "D" G/2A/2G/2F/2 "Em" E/2F/2D/2E/2
"F#" df fe/2f/2 | "E7" gf z"A7" A/2B/2d/2^c/2 | \
"A" ce "E7" e/2d/2c/2B/2 | "A" AA A: |
P:B
e/2f/2 | "A" ea ee/2f/2 | "D" gf "A" ec | "D" dd/2f/2 "A" ec | "D" #m d3/2e/2 dA | "A7" GE E2 | "D" FD

Learning only to see ?

Poetry



A bunch of planes are flying in the sky.

I have no time for the first time
in the morning when I stand
and say, "You should have re-
membered your father."

The stars are still a moment. The
signs are the same.

The last walls are closed and the
windows do not look at me.

They look at me with their shad-
ows. I cannot see them,

I must not be there. I must be
saved at last.

And I cannot think of it. I don't
know where they were.

I was the conventional subject of
the things I was doing.

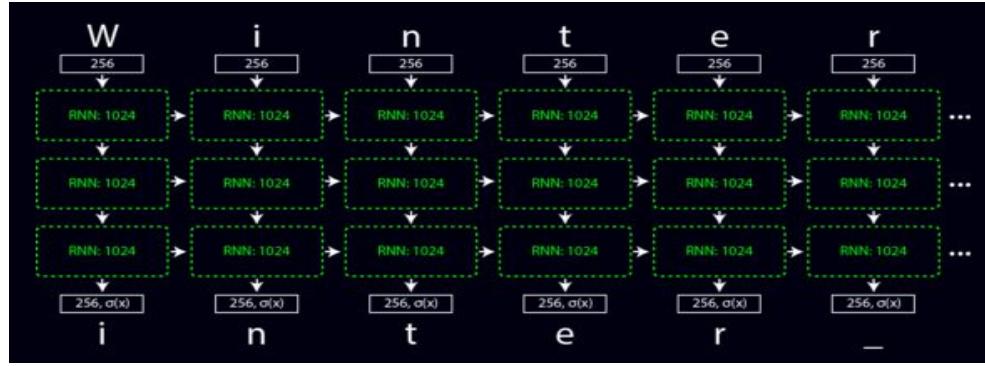
A bunch of planes are flying in
the sky.

I don't want to hear my father
and I ever see him again.

The cold house where I lived, I
took the strange change.

Learning only to see ?

“Scripts” (!?)



JOHN

He leaned close and onions, barefoot from his shoulder. "I am not a purple girl," he said as he stood over him. "The sight of you sell your father with you a little choice."

"I say to swear up his sea or a boy of stone and heart, down," Lord Tywin said. "I love your word or her to me."

Learning only to see ?

“Scripts” (!?)



Learning only to see ?

Public Health



Learning only to see ?

Public health

Nacho Hernandez, [“Why artificial intelligence will democratize healthcare”](#)
(TEDx Talk, 2014)



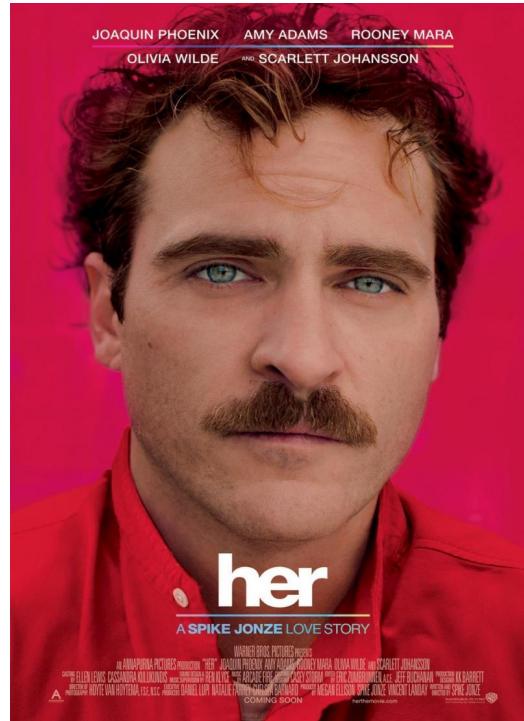
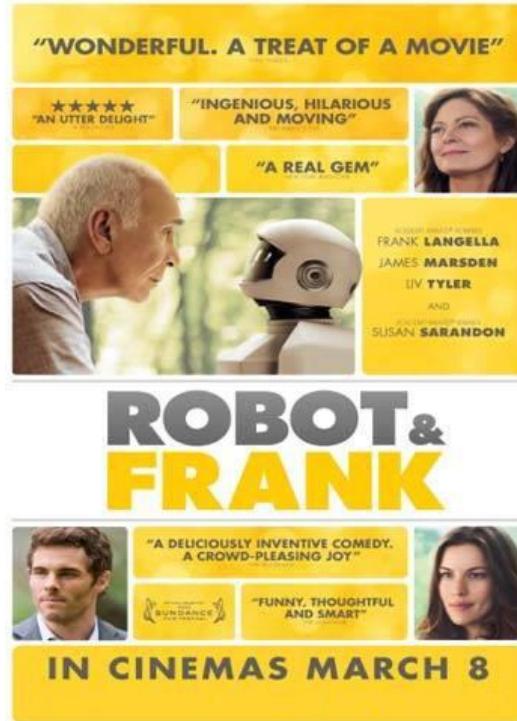
Learning only to see ?

Mental health

Nancy Lublin, ["The heartbreaking text that inspired a crisis helpline"](#) (TED Talk 2015)



Learning only to see ?



Psychological support and counseling ?

Learning only to see ?

Affective computing

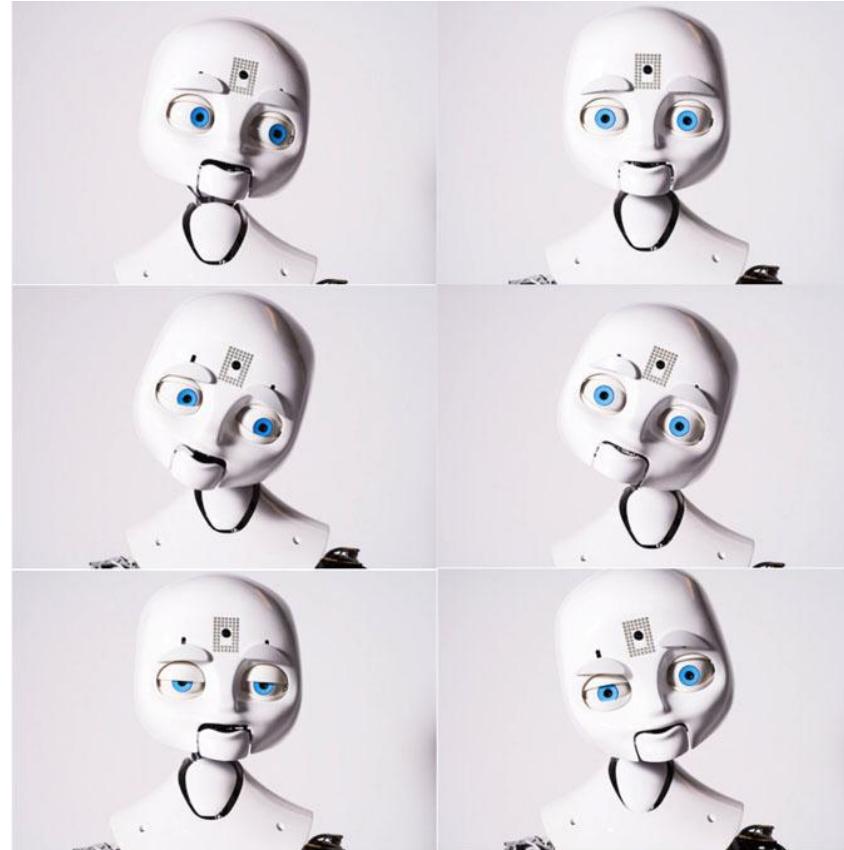
Rana el Kalioubi, ["This app know how you feel, from the look on your face"](#),
TEDTalks 2015.



Learning only to see ?

Affective computing

[Nexi](#) Project,
from MIT Media Lab
(Photos: Spencer Lowel)



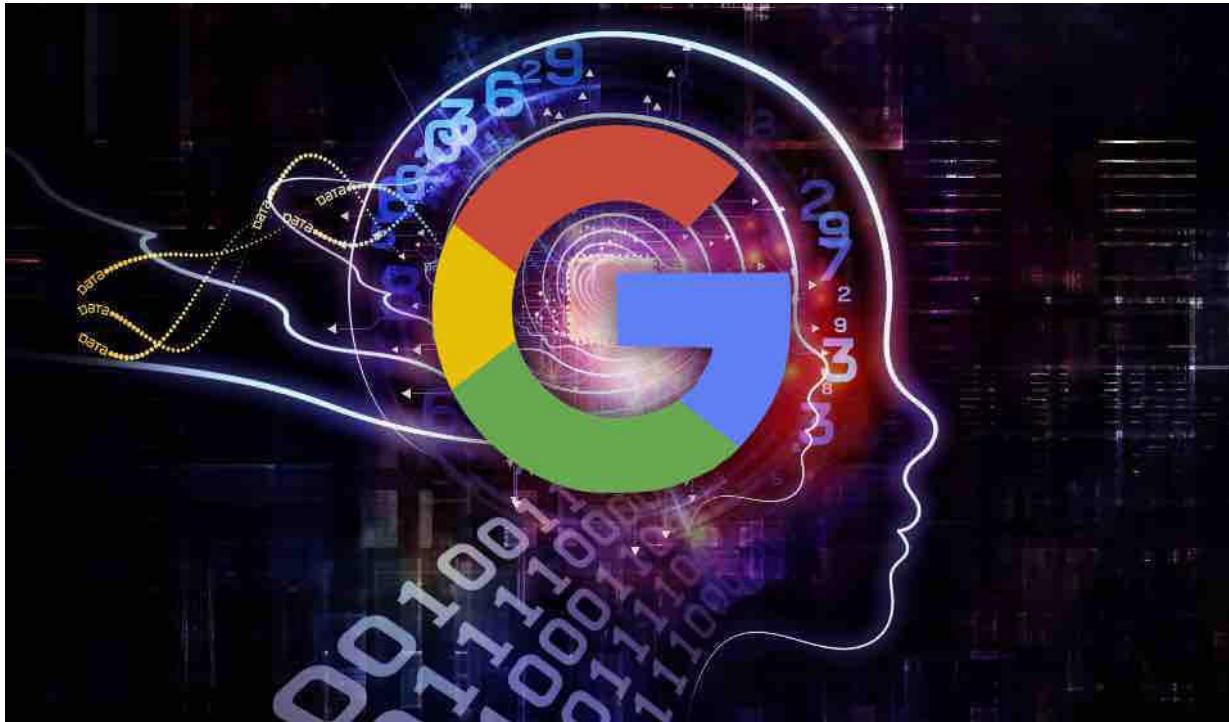
Artificial intelligence

"Google's chairman (Eric Schmidth) thinks artificial intelligence will let scientists solve some of the world's "hard problems," like **population growth, climate change, human development, and education.**"
(Bloomberg Business, 11/01/2016)



Artificial intelligence

Google's CEO Sundar Pichai: ["Era Of Computers Will End Very Soon, AI Will Rule"](#) (Fossbytes, 03/05/2016)



Artificial intelligence

Jeremy Howard, ["The wonderful and terrifying implications of computers that can learn"](#), TEDTalks 2014.



Artificial intelligence

Stephen Hawking, ["Artificial intelligence could spell out the human race."](#)
(2014)



Artificial intelligence



Andrew Ng

31 març a les 13:52 ·

With automation taking over jobs, we have an ethical responsibility to help people whose jobs are displaced. We should make sure people have opportunities, and are paid well! Here're how I rank possible solutions, from best to worst:

- 1) Provide basic income, but with the expectation that people receiving it will keep learning, so that they can gain new skills.
- 2) Provide basic income, with no expectations.
- 3) Raise the minimum wage, thus giving robots a bigger advantage, and making it even harder for people to find jobs.



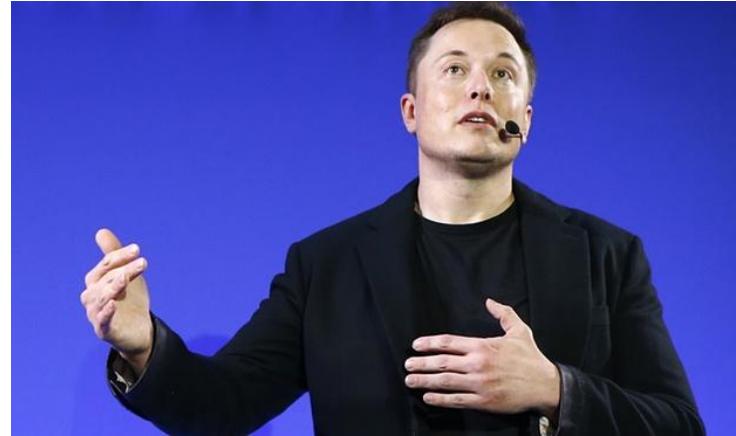
California's \$15-an-hour minimum wage may spur automation

Artificial intelligence

OpenAI



Andrej Karpathy

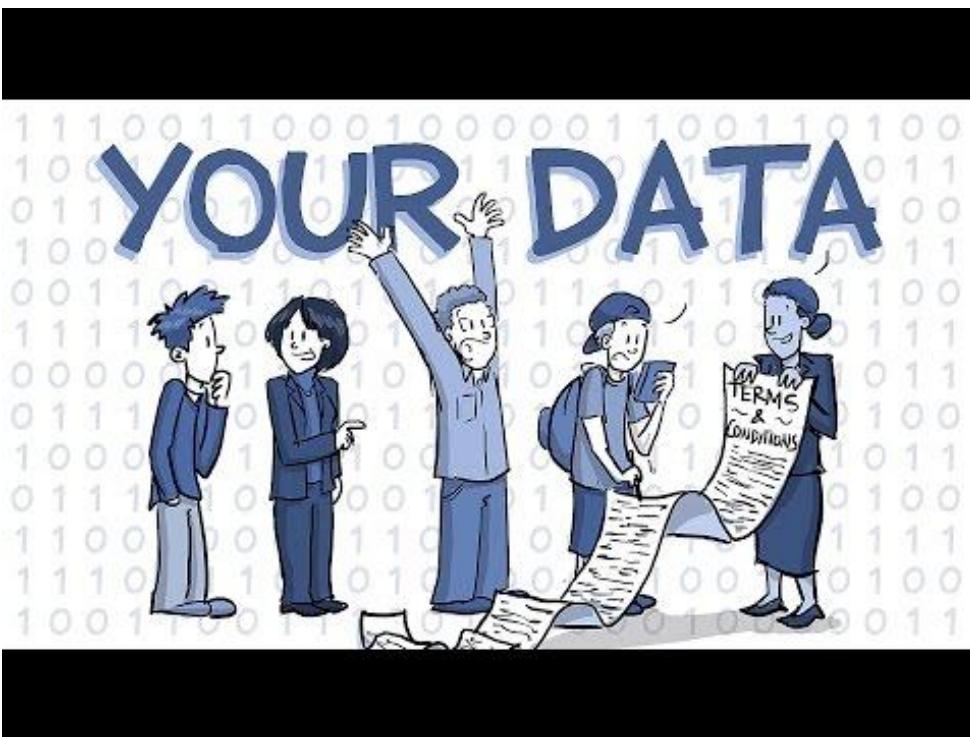


Elon Musk (Tesla), one of [OpenAI](#) promoters

Artificial intelligence



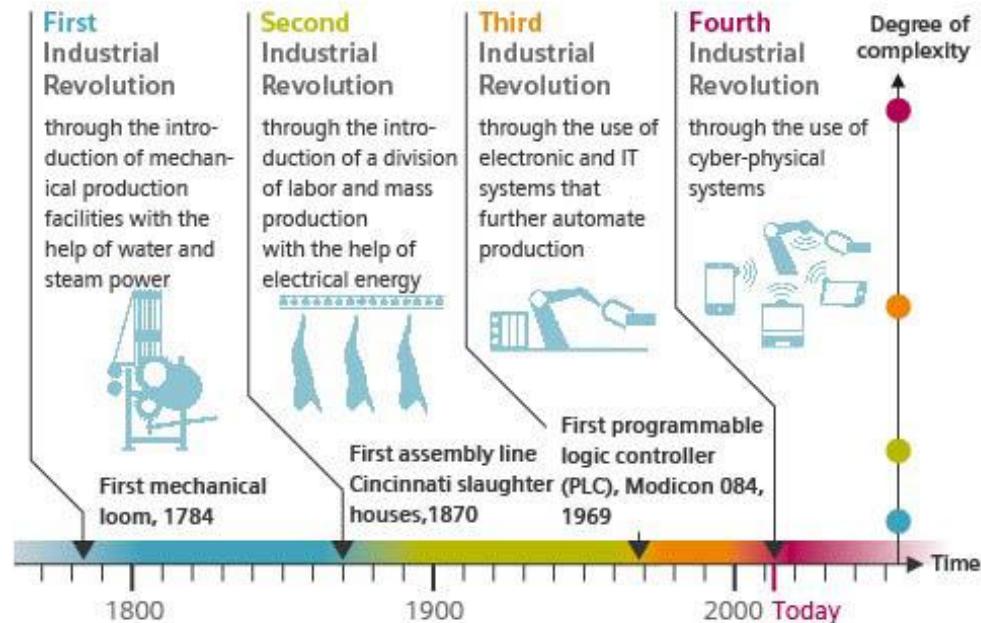
Neil Lawrence, [OpenAI won't benefit humanity without open data sharing](#) (The Guardian, 14/12/2015)



Phd Comics:
Who owns your
data ?
(Hint: it is not you)

Artificial intelligence

From Industry 1.0 to Industry 4.0

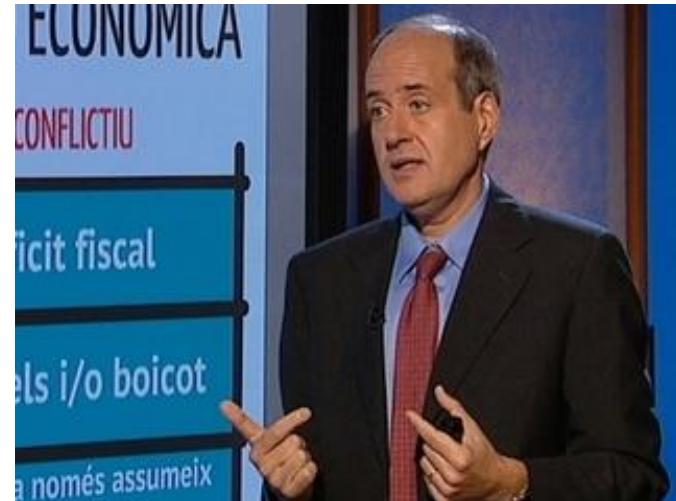


Source: DFKI (2011)

Artificial intelligence



Xavier Sala-i-Martin (Columbia University),
"Les conclusions del Fòrum de Davos"
(TV3, 03/02/2016) - in Catalan



Carles Boix (Princeton University),
"La quarta revolució industrial"
(Diari Ara, 08/02/2016) - in Catalan

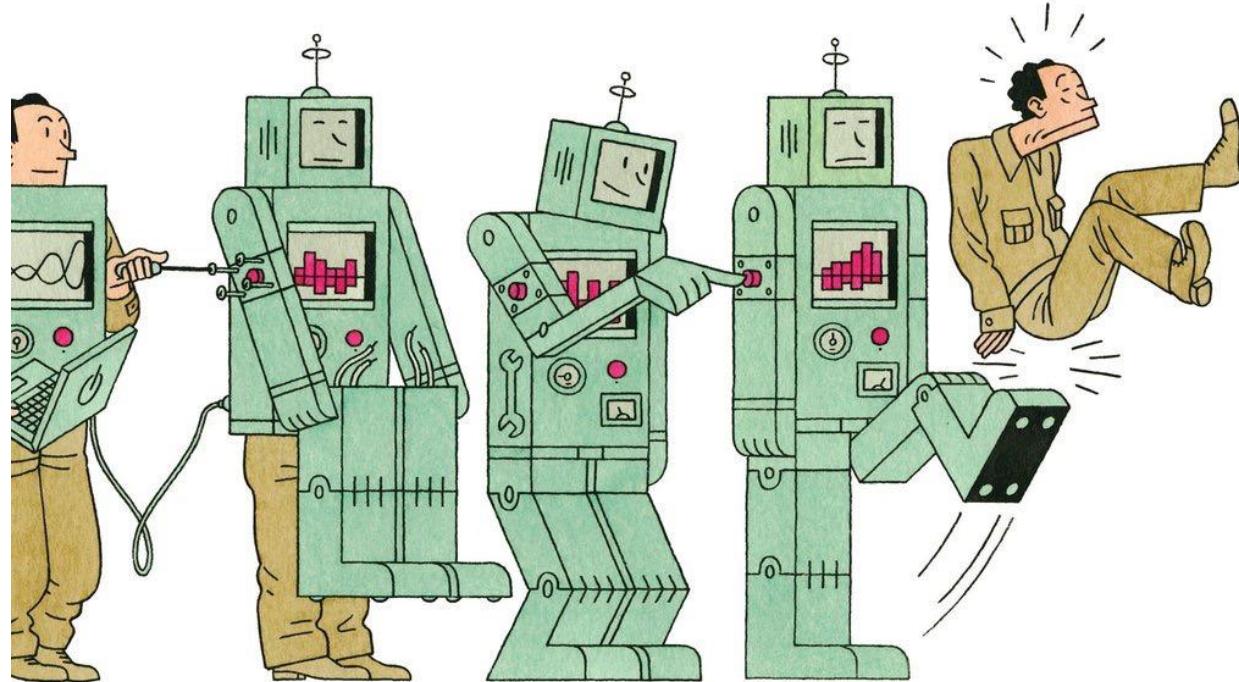
Artificial intelligence

The White House: "How to prepare the future for the Future Intelligence"



Artificial intelligence

Open question: in which jobs will robots replace humans first ?



Learn more

January/February 2017

Deep Learning for Natural Language



Learn more



**DEEP LEARNING
FOR COMPUTER VISION**

Summer Course in Barcelona , 4 - 8 July 2016

Instructors

Xavier Giró-i-Nieto	Elisa Sayrol	Amaia Salvador	Jordi Torres	Eva Mohedano	Kevin McGuinness
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Organizers

UPC UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

telecom BCN

DCU DUBLIN CITY UNIVERSITY

BCS Supercomputing Center Centro Nacional de Supercomputación

Insight Centre for Data Analytics

Co-funded by the Erasmus+ Programme of the European Union

+ info: www.DeepLearning.Barcelona

June/July 2017

- Course content will be updated with the latest advances.
- Current BSc students enrolled in MSc program can do the project.
- Second edition will be better (and worse than the third one).

Learn more (for BSc students)

Master MET



<http://pagines.uab.cat/mcv/>

Learn more

- Reading Group with [public listing of videos, slides and papers](#).
- E-mail to xavier.giro@upc.edu if you want to join in Fall 2016.



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Learn more

Consider extending your project to a workshop paper (not announced yet) and apply for some volunteer opportunities for free registration.



Also: specific
workshop and
social event for
Women in
Machine Learning

[\[Website\]](#)

Learn more

<http://cs231n.stanford.edu/>

The screenshot shows the homepage of the CS231n website. At the top, there is a navigation bar with icons for eye, search, and help. The main title "CS231n: Convolutional Neural Networks for Visual Recognition" is centered above a large image. This image features a grid of small, square image patches from a neural network's feature maps, followed by a larger image of a truck. To the right of the grid, there is a legend identifying five categories: "truck" (green), "car" (green), "cat" (green), "horse" (green), and "ship" (green). Below the image, a caption reads "*This network is running live in your browser". The page content includes a "Course Description" section with a detailed paragraph about computer vision applications and the course's focus on deep learning for image classification. It also includes sections for "Course Instructors" and "Teaching Assistants", each featuring circular profile pictures of the respective individuals.

CS231n: Convolutional Neural Networks for Visual Recognition

*This network is running live in your browser

Course Description

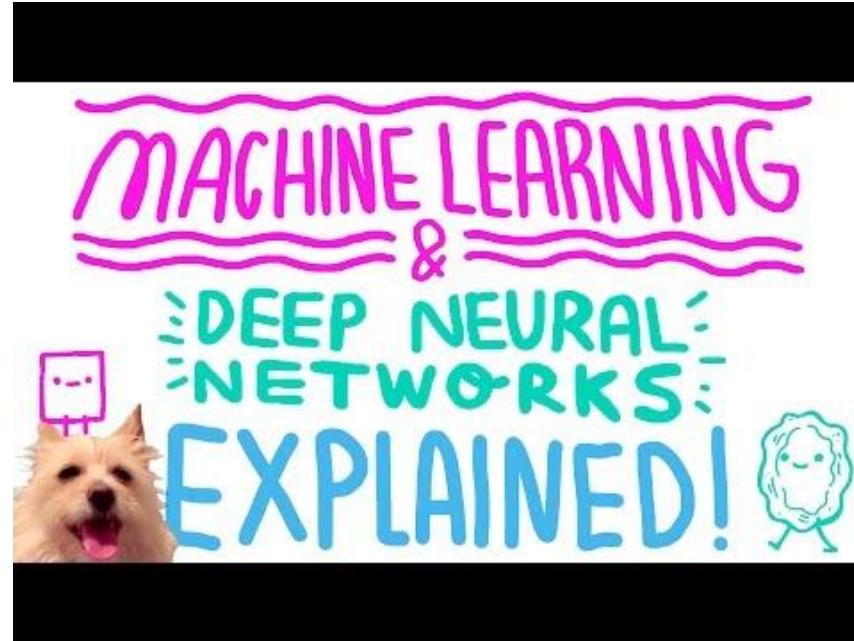
Computer Vision has become ubiquitous in our society, with applications in search, image understanding, apps, mapping, medicine, drones, and self-driving cars. Core to many of these applications are visual recognition tasks such as image classification, localization and detection. Recent developments in neural network (aka “deep learning”) approaches have greatly advanced the performance of these state-of-the-art visual recognition systems. This course is a deep dive into details of the deep learning architectures with a focus on learning end-to-end models for these tasks, particularly image classification. During the 10-week course, students will learn to implement, train and debug their own neural networks and gain a detailed understanding of cutting-edge research in computer vision. The final assignment will involve training a multi-million parameter convolutional neural network and applying it on the largest image classification dataset (ImageNet). We will focus on teaching how to set up the problem of image recognition, the learning algorithms (e.g. backpropagation), practical engineering tricks for training and fine-tuning the networks and guide the students through hands-on assignments and a final course project. Much of the background and materials of this course will be drawn from the [ImageNet Challenge](#).

Course Instructors

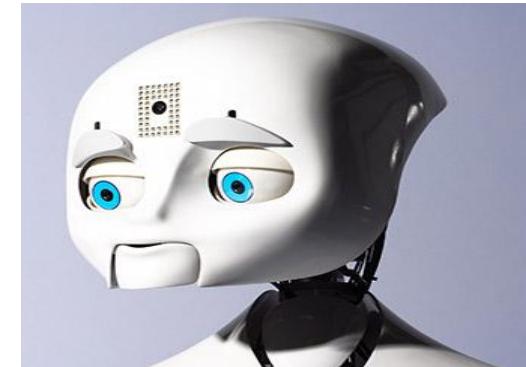
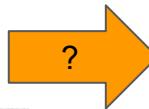
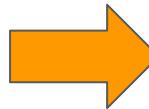
Teaching Assistants

Learn more

Learn more with [Nat & Lo 20% Google Project](#):



Learn more



Learn more

“Machine learning” sub-Reddit.



in self-serve (which is the norm virtually everywhere else)? What is the best bottle wine to order on a date? What do I have to do to become a Master Sommelier? Why do British and American chocolate taste different? Why are so many restaurants in New York City located in the Financial District? How can you save your film flop at the box office? Do insects sleep? What's the best car-sharing service? Why is there a tech bubble in the San Francisco Bay Area? Is it seemingly more difficult to get a job in the Bay Area than in good venues for a 100-500 seat venue? San Francisco? What are the biggest obstacles for people moving to the Bay Area? What's the most useful, shortest, and most generally applicable piece of wisdom you could today send a tweet to yourself back when you were graduating high school? What would you say? What are the best song covers in a completely different genre?

Quora

Learn more

Categories ▾

Search

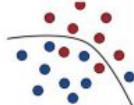
GitXiv

samim ▾ No notifications

Post

Collaborative Open Computer Science Links

View: Top New Best Single Day Daily



Sentiment Analysis of Movie Reviews

Ensemble of Generative & Discriminative Techniques for Sentiment Analysis of Movie Reviews

DEEP LEARNING (DL) NATURAL LANGUAGE PROCESSING (NLP)

graphitic 1 point 2 hours ago | Edit 0 Comments | score: 0.162, clicks: 0, views: 4



Recurrent Neural Network for Spoken Language Understanding

Using Recurrent Neural Networks for Slot Filling in Spoken Language Understanding

DEEP LEARNING (DL) RECURRENT NEURAL NETWORKS (RNN) AUDIO PROCESSING

hendrik 2 points 6 hours ago | Edit 0 Comments | score: 0.132, clicks: 0, views: 6



Memory Networks

Reason with inference components combined with a long-term memory components.

RECURRENT NEURAL NETWORKS (RNN) NATURAL LANGUAGE PROCESSING (NLP) NEURAL TURING MACHINE (NTM)

hendrik 1 point 6 hours ago | Edit 0 Comments | score: 0.064, clicks: 0, views: 4



Random Indexing

aka "Sparse Distributed Memory" or "Random Projections"

NATURAL LANGUAGE PROCESSING (NLP) MATRIX FACTORIZATION METHODS SHALLOW WINDOW-BASED METHODS

graphitic 2 points 8 hours ago | Edit 0 Comments | score: 0.103, clicks: 0, views: 3



LSD neural net

Interactive Deep Neural Net Hallucinations (visualizing top level features)

DEEP LEARNING (DL) CONVOLUTIONAL NEURAL NETWORKS (CNN) GENERATIVE COMPUTER VISION

graphitic 1 point 10 hours ago | Edit 0 Comments | score: 0.04, clicks: 0, views: 7



Learn more



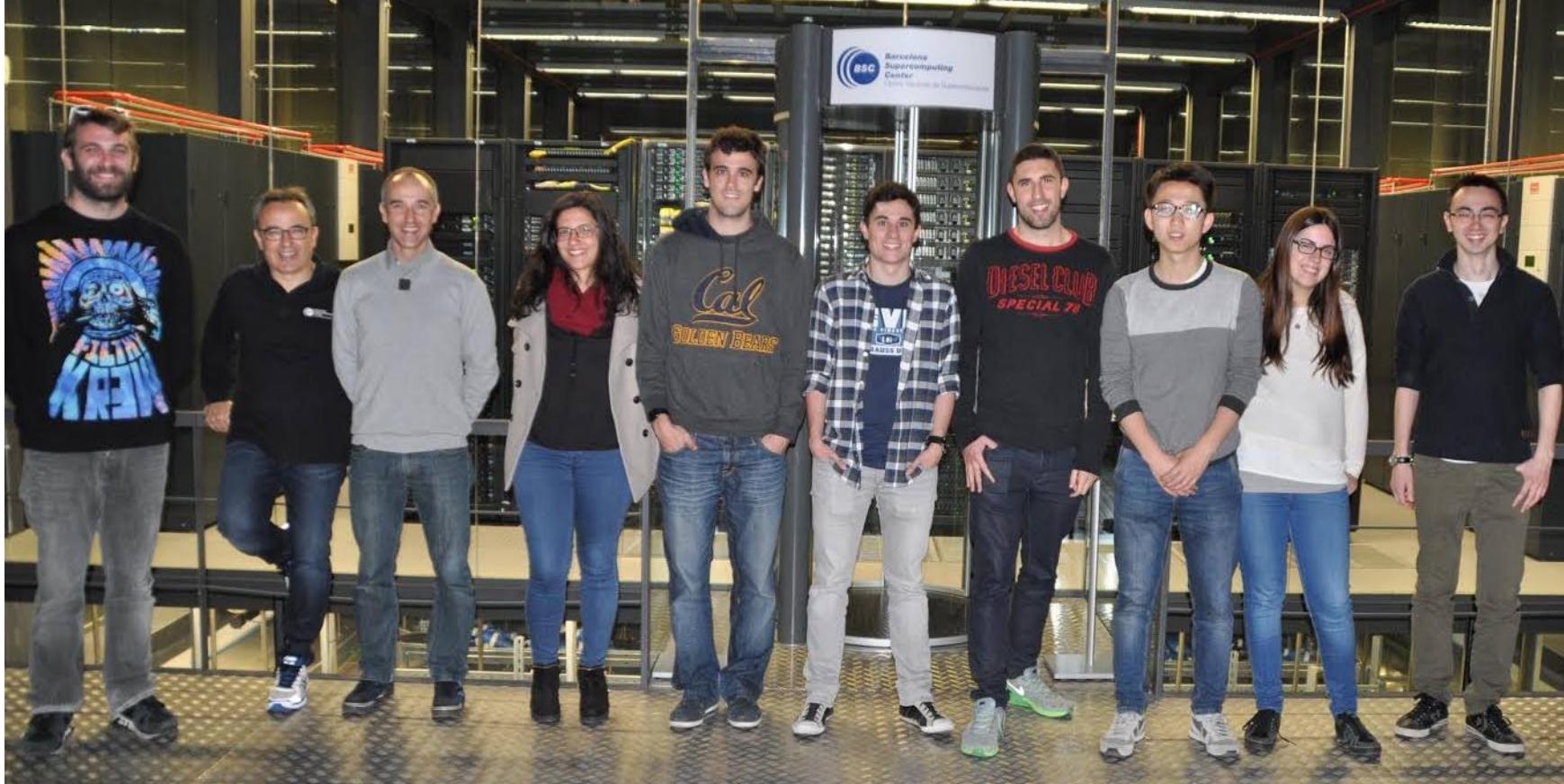
[Grup d'estudi de machine learning Barcelona](#)

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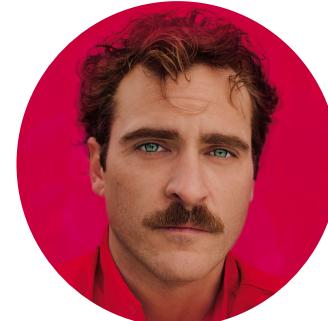
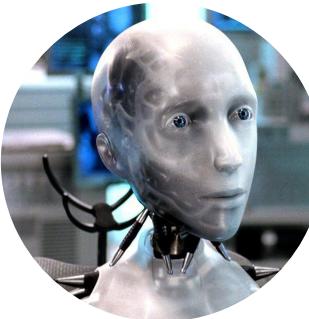
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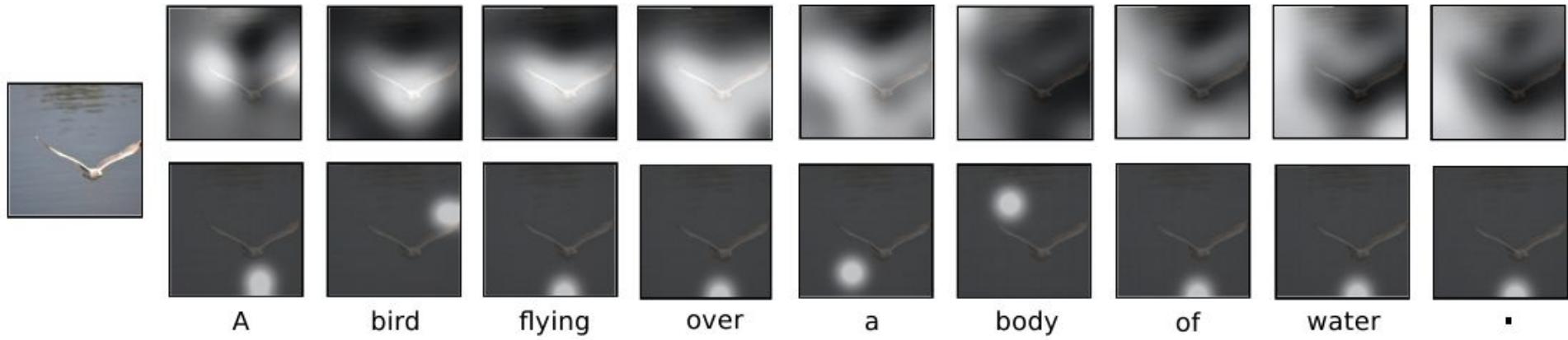
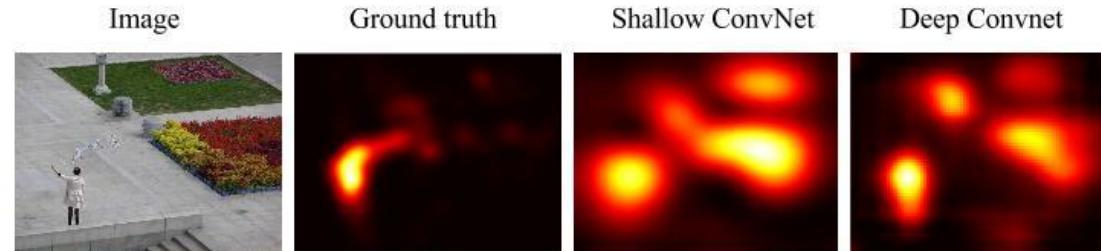
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- Language and Vision



New visual **Turing test**

- Saliency vs Attention



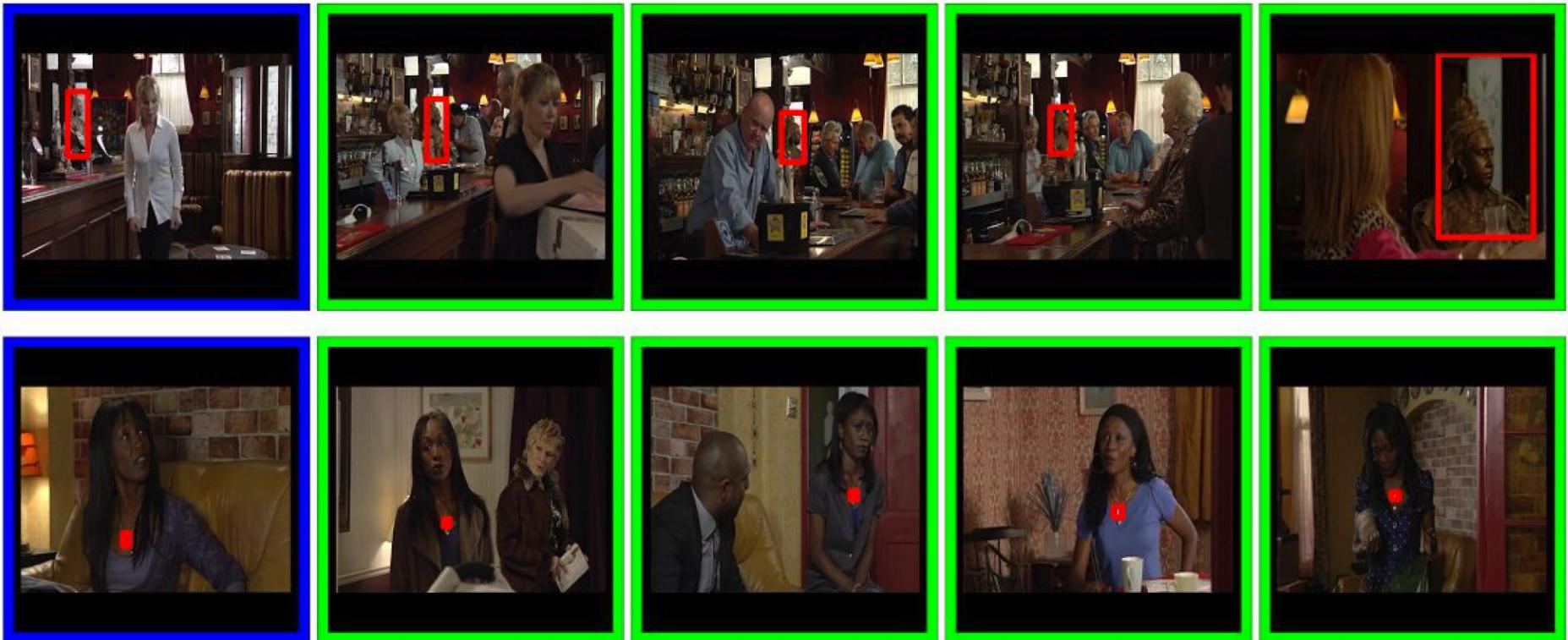
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- Image and Video Retrieval



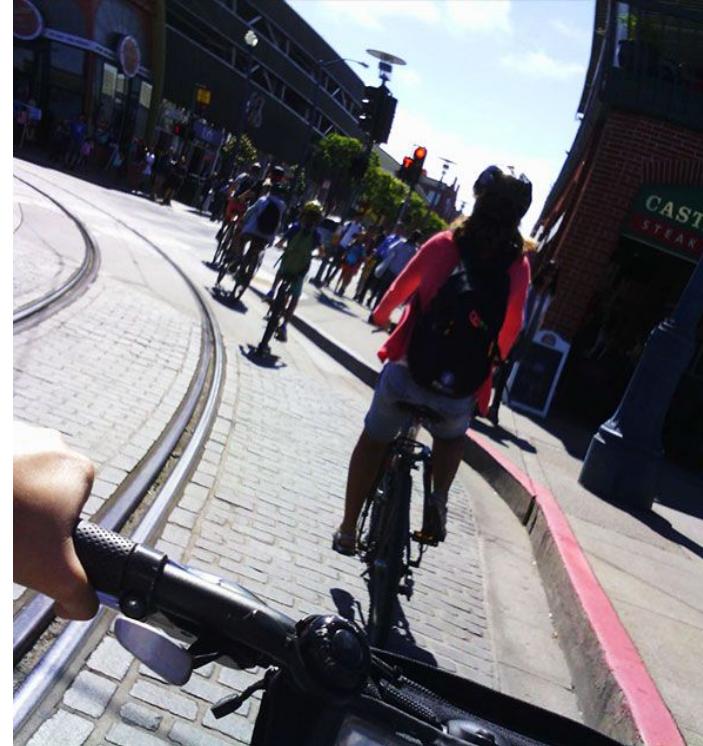
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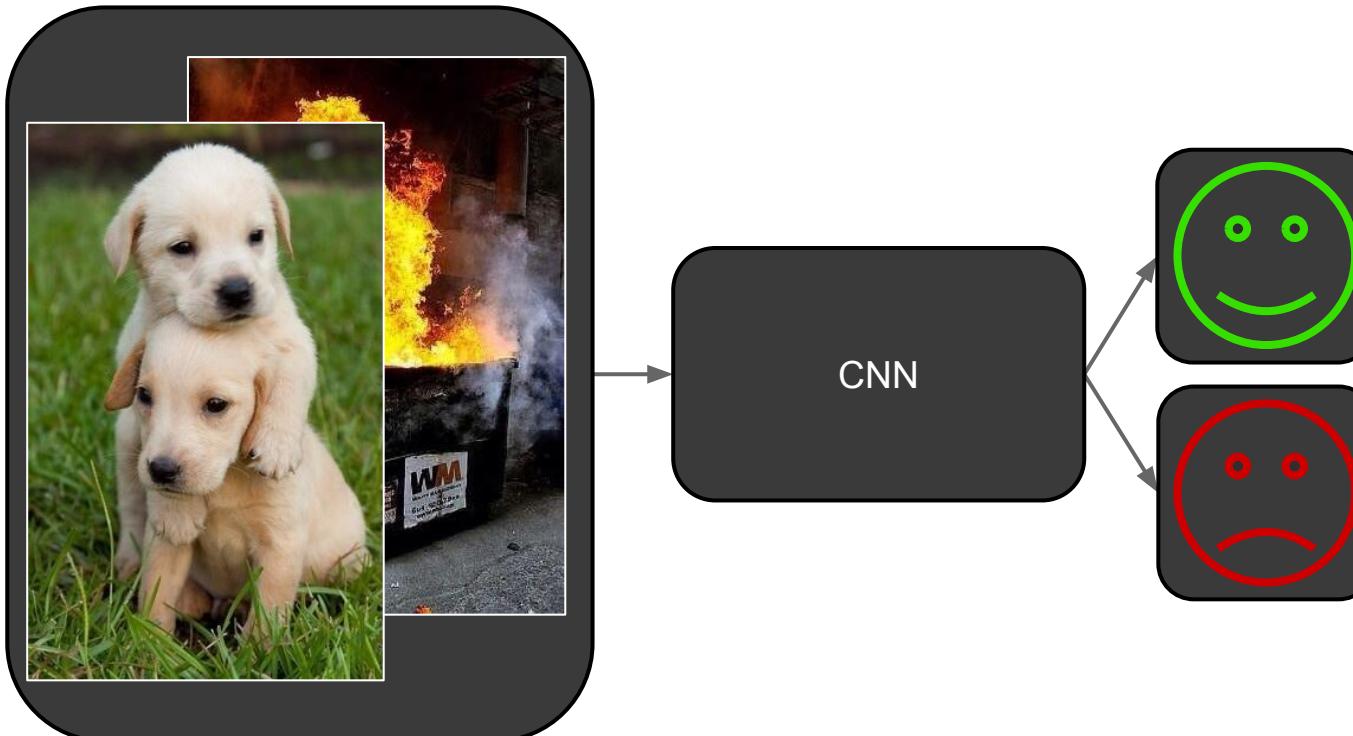
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- Wearables & Egocentric Vision



- Affective Computing



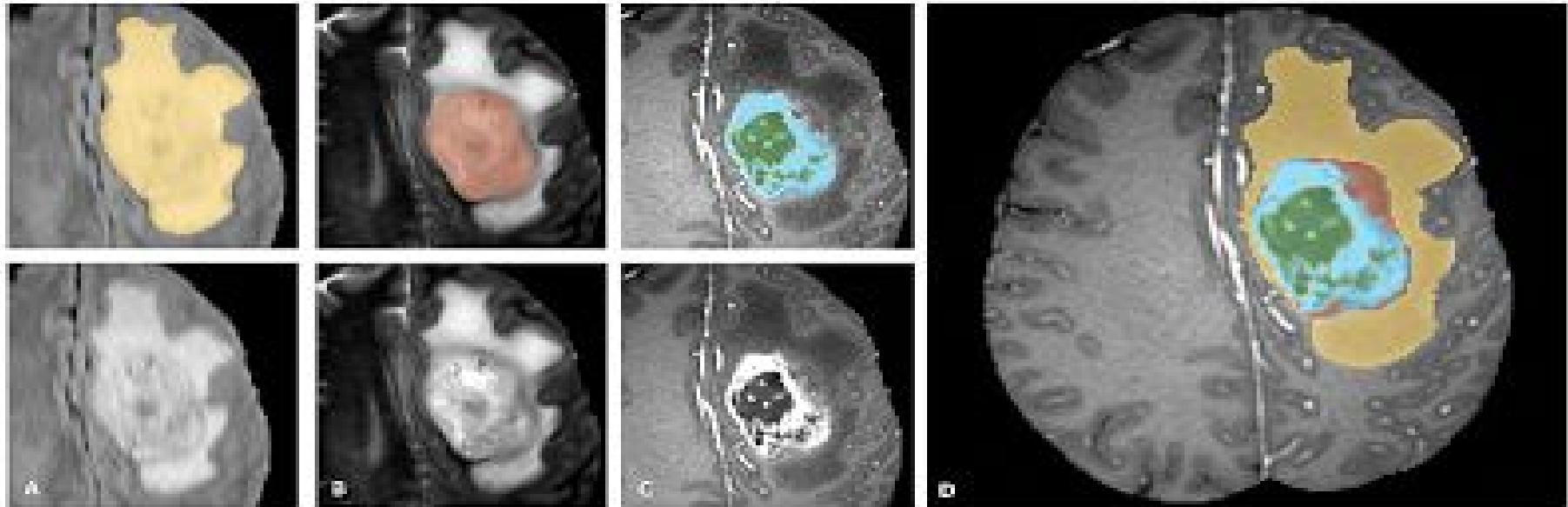
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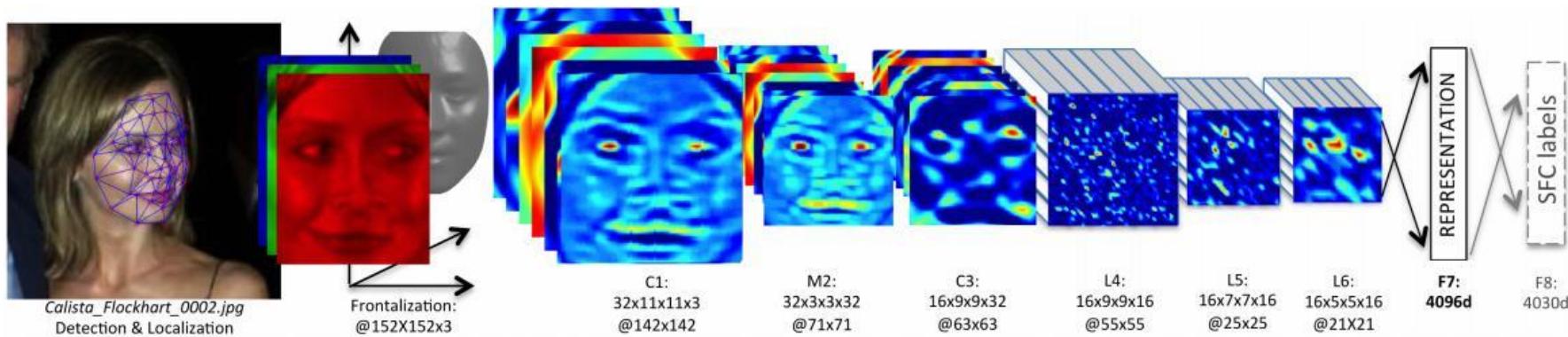
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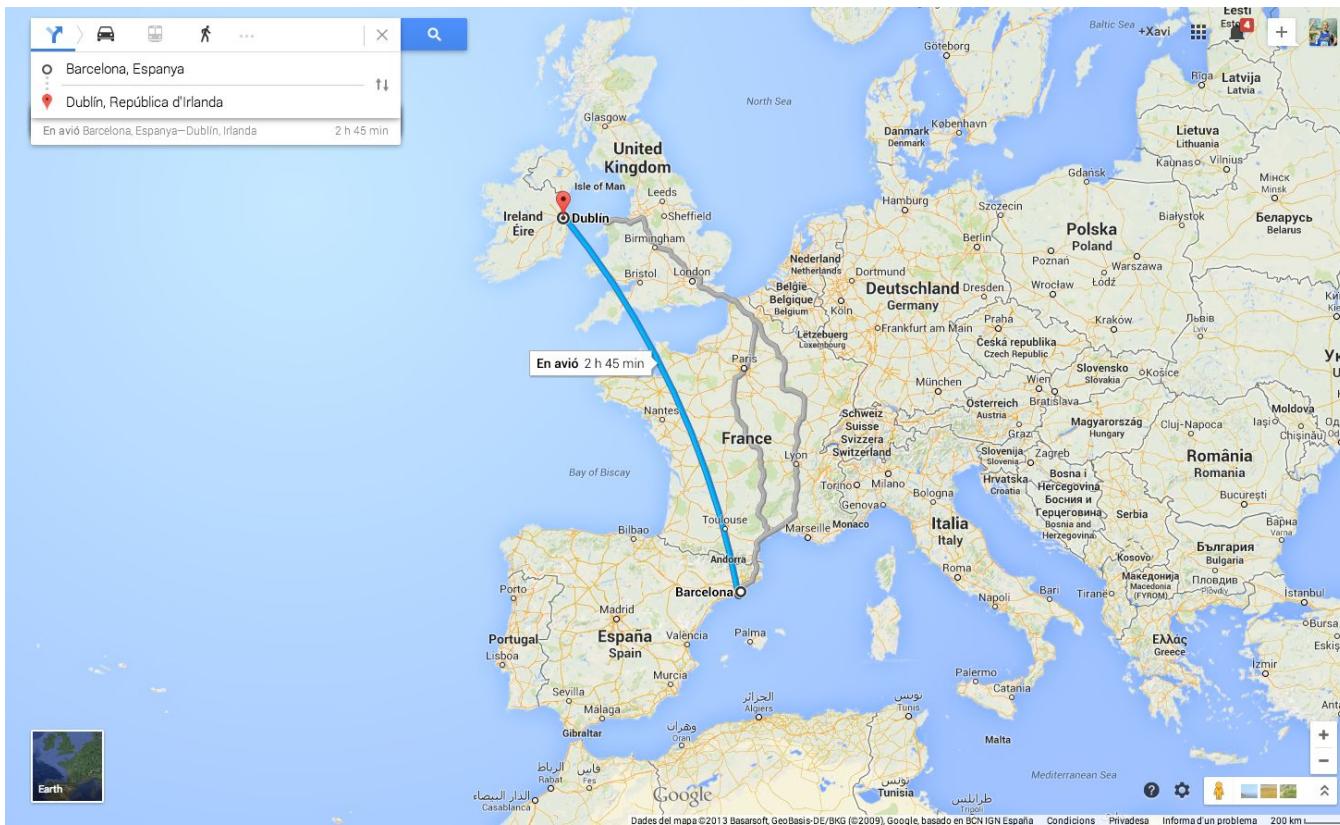
- Medical Imaging



- Multimodal People Recognition



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[Eva Mohedano](#)



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[Prof Noel O'Connor](#)



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Croke Park is the world's first internet of things stadium

by John Kennedy

4 SEP 2015

1035 SHARES



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8 MINUTES AGO



Social media changed my life, says Sinéad Burke

1 HOUR AGO



New device creates 'non-stop' wine, but there's a catch

1 HOUR AGO



The five minute CIO: Jerry Horgan, TSSG

1 HOUR AGO



