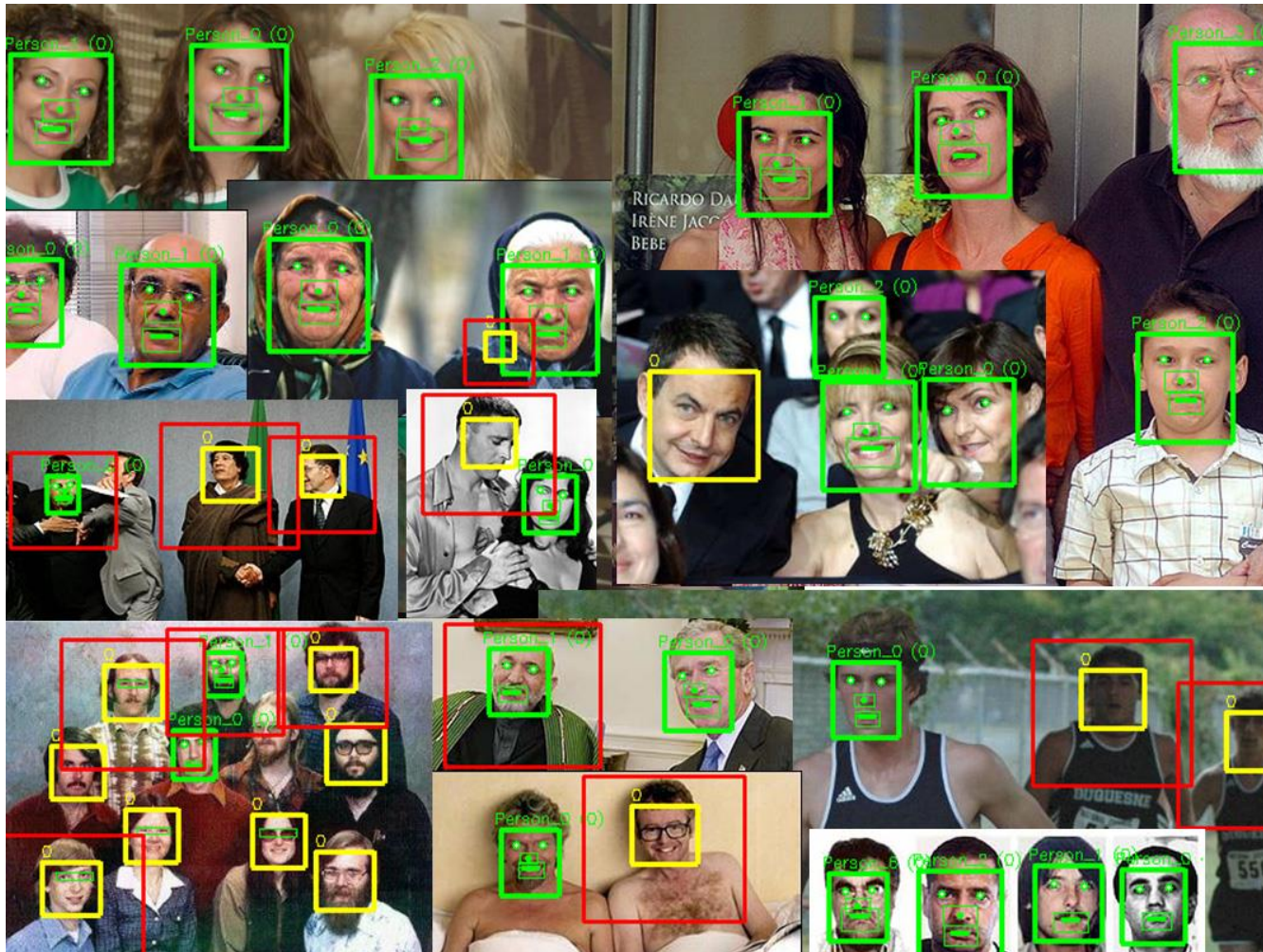


Aula de Inteligencia Artificial

Detección



World's Largest Selfie ©

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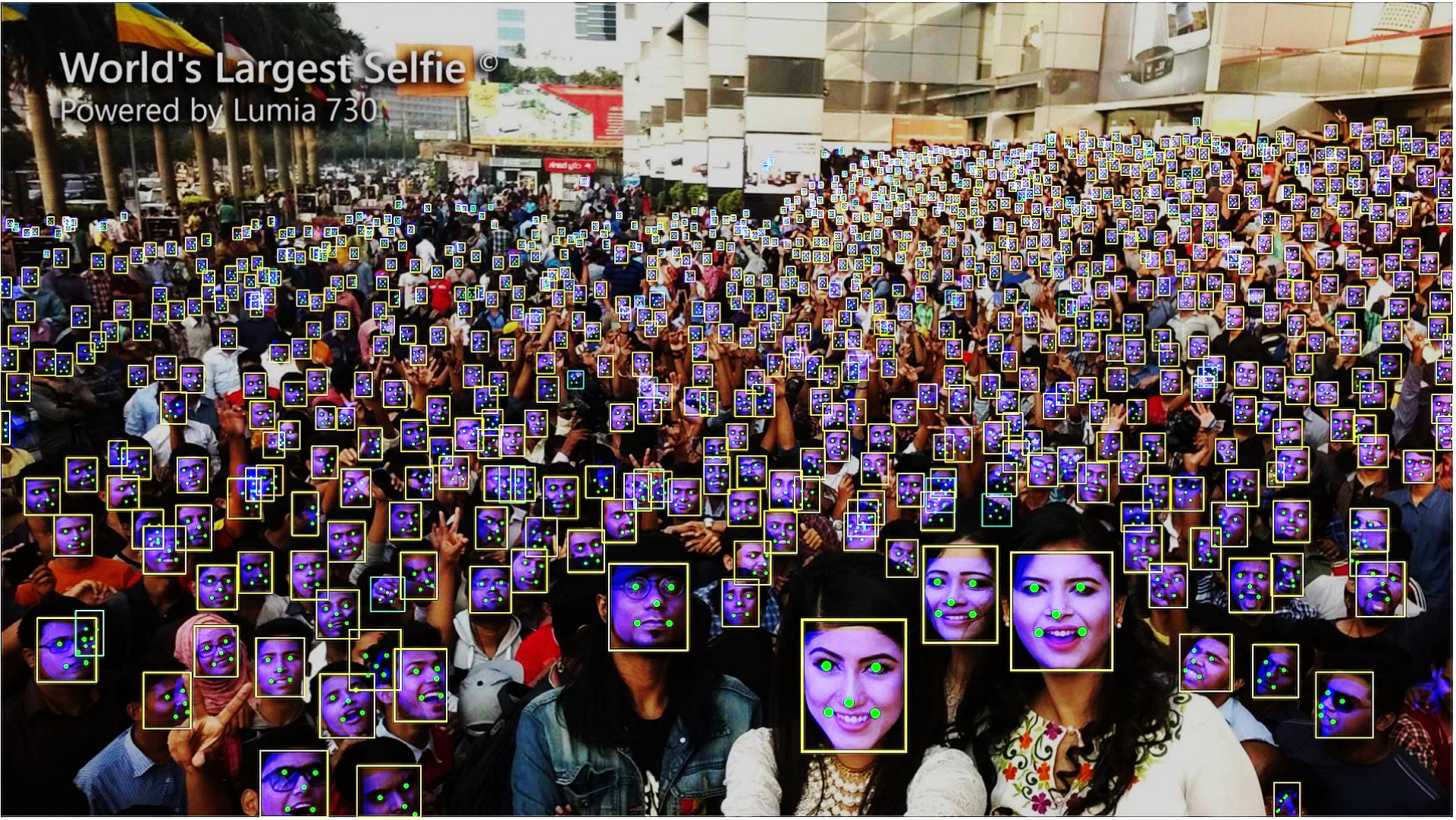
World's Largest Selfie ©

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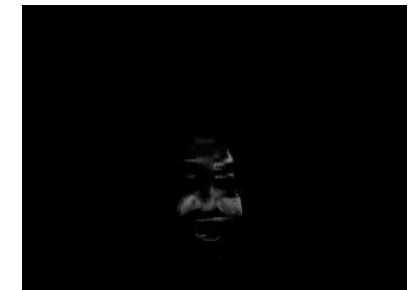
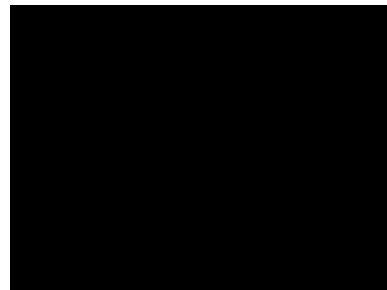
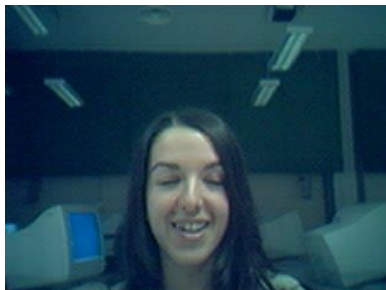
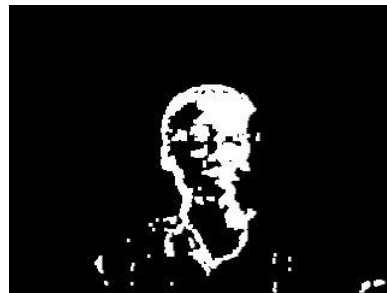
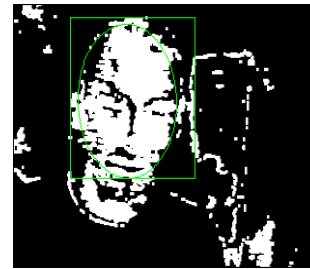
World's Largest Selfie ©

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Color y movimiento, restricciones



Esquema simple

Jones and Rehg [1]

Kruppa [2]

Viola Jones

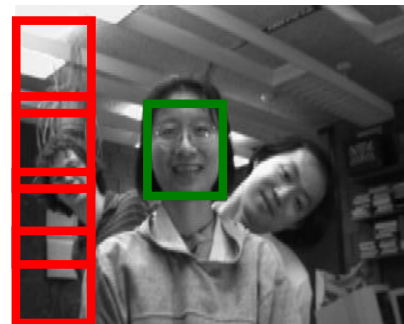
Detección no basada en heurísticas

Ventana deslizante

Coste temporal del clasificador

Clasificador en cascada, desecha zonas poco prometedoras

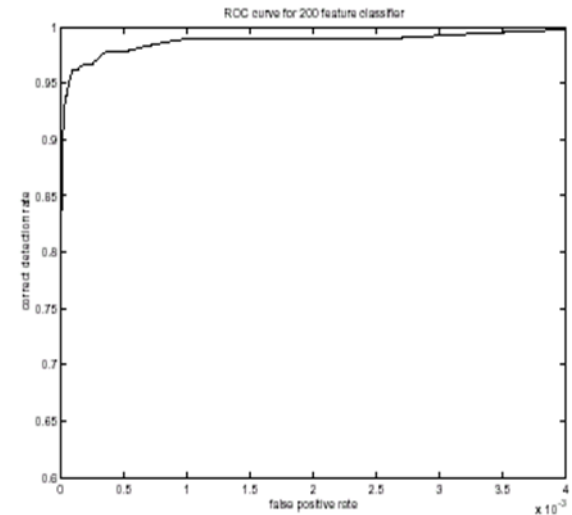
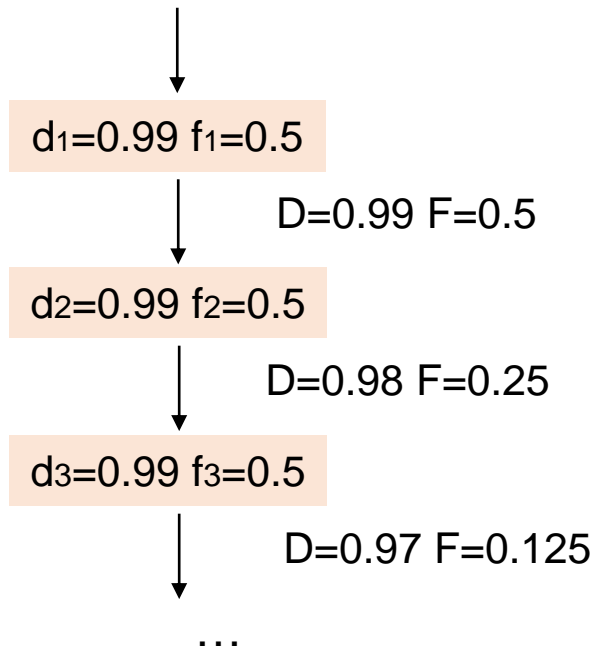
Mayor velocidad



Viola Jones

Clasifica cada ventana

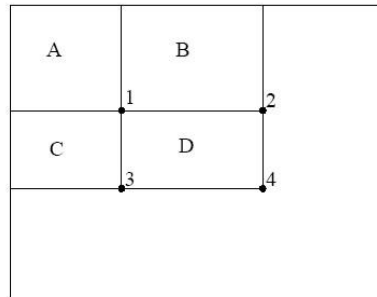
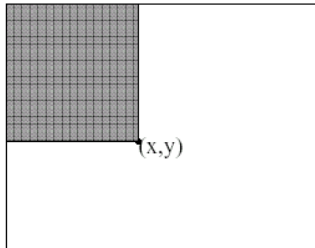
Cascada clasificadores débiles



Viola Jones

Características de cómputo rápido

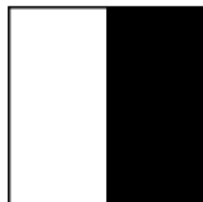
Imagen integral



31	2	4	33	5	36
12	26	9	10	29	25
13	17	21	22	20	18
24	23	15	16	14	19
30	8	28	27	11	7
1	35	34	3	32	6

31	33	37	70	75	111
43	71	84	127	161	222
56	101	135	200	254	333
80	148	197	278	346	444
110	186	263	371	450	555
111	222	333	444	555	666

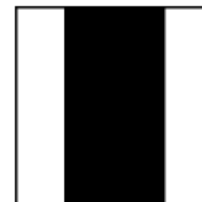
$$15 + 16 + 14 + 28 + 27 + 11 = 101 + 450 - 254 - 186 = 111$$



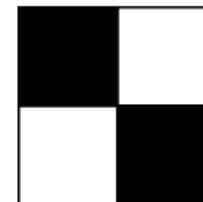
1



2



3

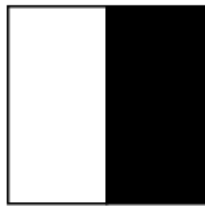


4

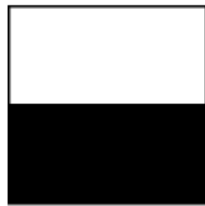
Viola Jones

Características de cómputo rápido

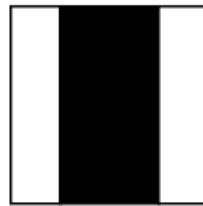
Imagen integral



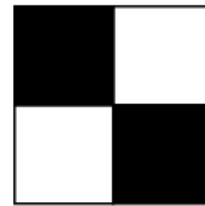
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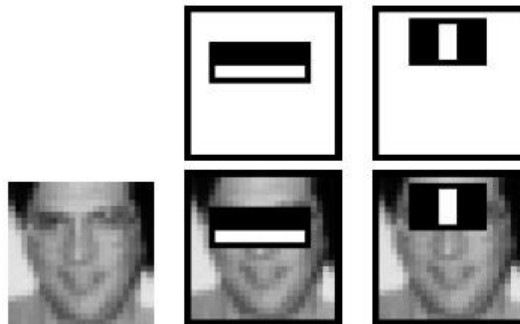
2



3

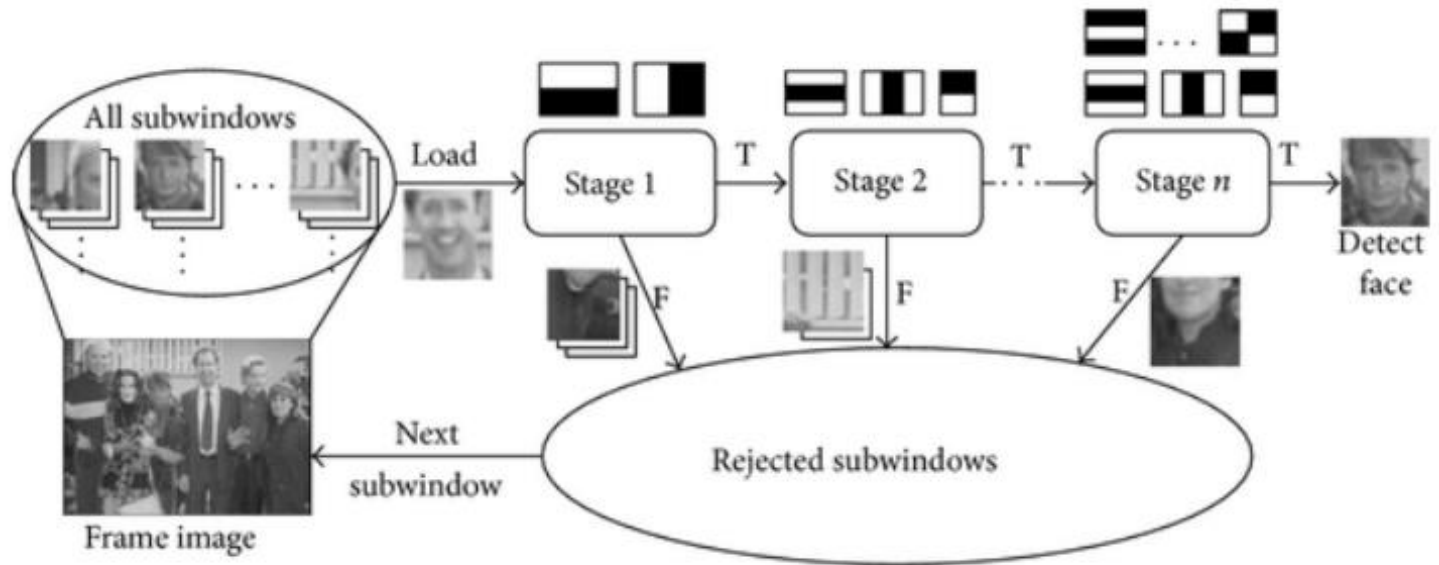


4

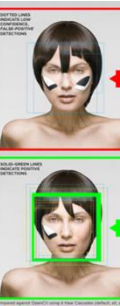


Viola Jones

Esquema general



Fuente: [Cascade structure for Haar classifiers.](#)



Viola Jones

Código python

```
import cv2

# Carga del clasificador para detección
cascada = cv2.CascadeClassifier('./haarcascade_frontalface_alt.xml')
# Cargas la imagen
imagen = cv2.imread("worlds-largest-selfie.jpg")

# Conversión a grises
gris = cv2.cvtColor(imagen, cv2.COLOR_BGR2GRAY)

# Detecta objetos
caras = cascada.detectMultiScale(gris)

# Para cada cara detectada
for (x, y, w, h) in caras:
    # Dibuja contenedor
    imagen = cv2.rectangle(imagen, (x, y), (x + w, y + h), (255, 0, 0), 2)

cv2.imshow("Imagen", imagen)
```

Viola Jones

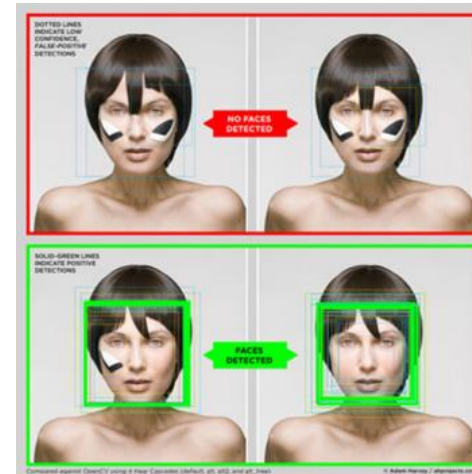
Códigos ejemplo proyecto AulalA_Detectores

- DetectaVJenimagen
- DetectaVJenimagenysalva
- DetectaVJencam

Repositorios clasificadores

- [opency](#)
- [opencvcontrib](#)

Viola Jones



Tarea

Detecta caras con sonrisa y dibuja un sol en su caso

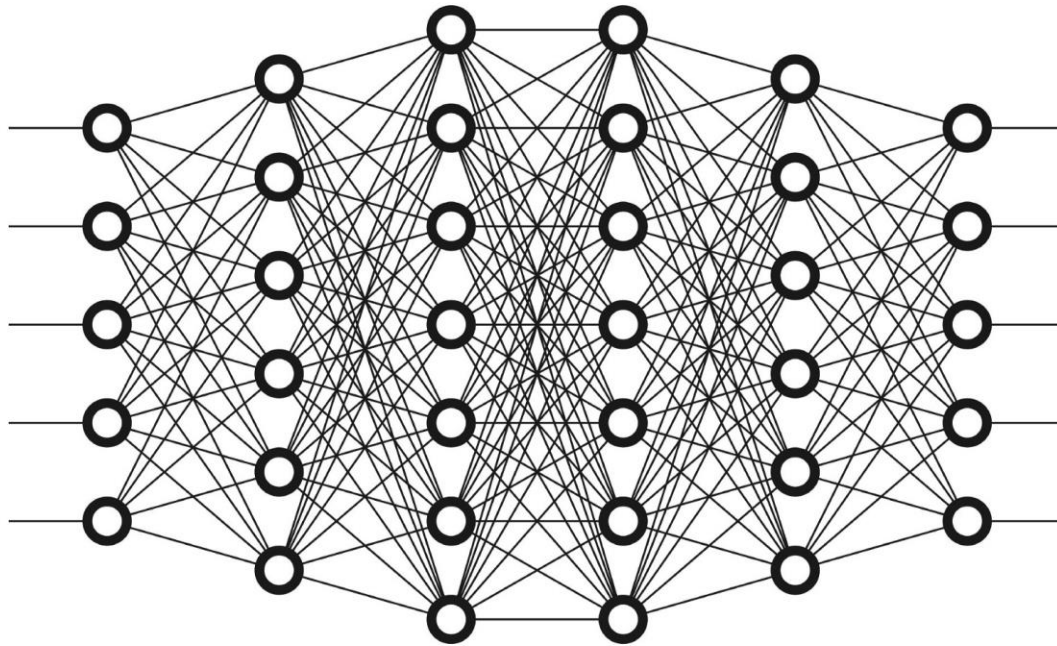


Más que la cara, Zach
Lieberman, 2017

Redes profundas

GPUs

Paralelización masiva



Redes profundas

Códigos ejemplo proyecto AulalA_Detectores

- DetectaDNNcaras
- DetectaDNNedadysexo
- DetectaVJedadysexo

Modelos clasificadores sexo y edad

- Sexo: https://www.dropbox.com/s/iyv483wz7ztr9gh/gender_net.caffemodel?dl=0"
- Edad: https://www.dropbox.com/s/xfb20y596869vbb/age_net.caffemodel?dl=0"

Tarea: Detección con comportamiento diferenciado por sexo/edad

Referencias

- P. Viola and M. J. Jones. Rapid Object Detection using a Boosted Cascade of Simple Features. In Computer Vision and Pattern Recognition, 2001
- Rainer Lienhart and Jochen Maydt. An extended set of Haar-like features for rapid object detection. In IEEE International Conference on Image Processing, 2002
- Wei Liu, Dragomir Anguelov, Dumitru Erhan, Christian Szegedy, Scott Reed, Cheng-Yang Fu and Alexander C. Berg. SSD: Single Shot MultiBox Detector. In European Conference on Computer Vision, 2016