Universidade Federal de Pernambuco

Centro de Informática UFPE

Visão Computacional Aplicado a Testes

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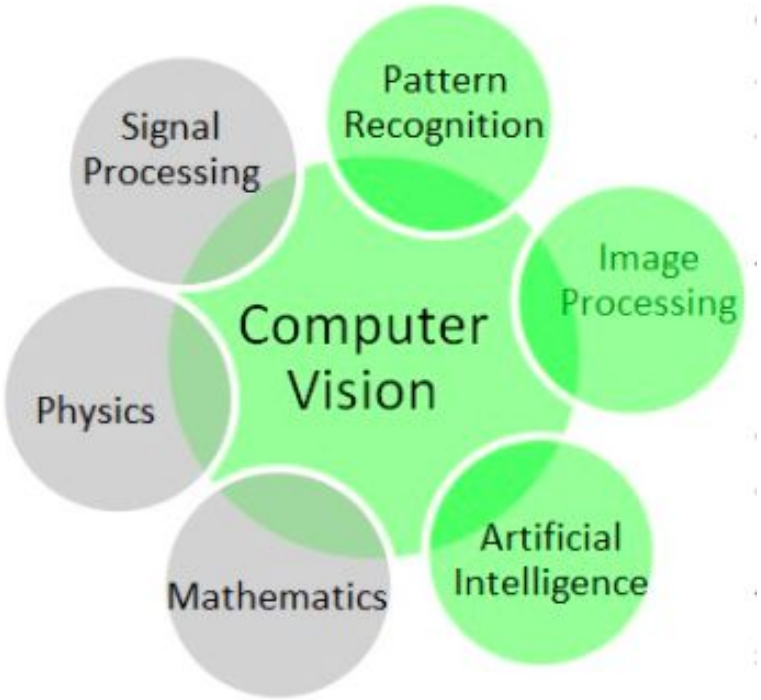
Centro de Informática

Universidade Federal de Pernambuco

Conceitos



1. **Visão computacional** é a ciência e tecnologia das máquinas que enxergam (Wikipedia).

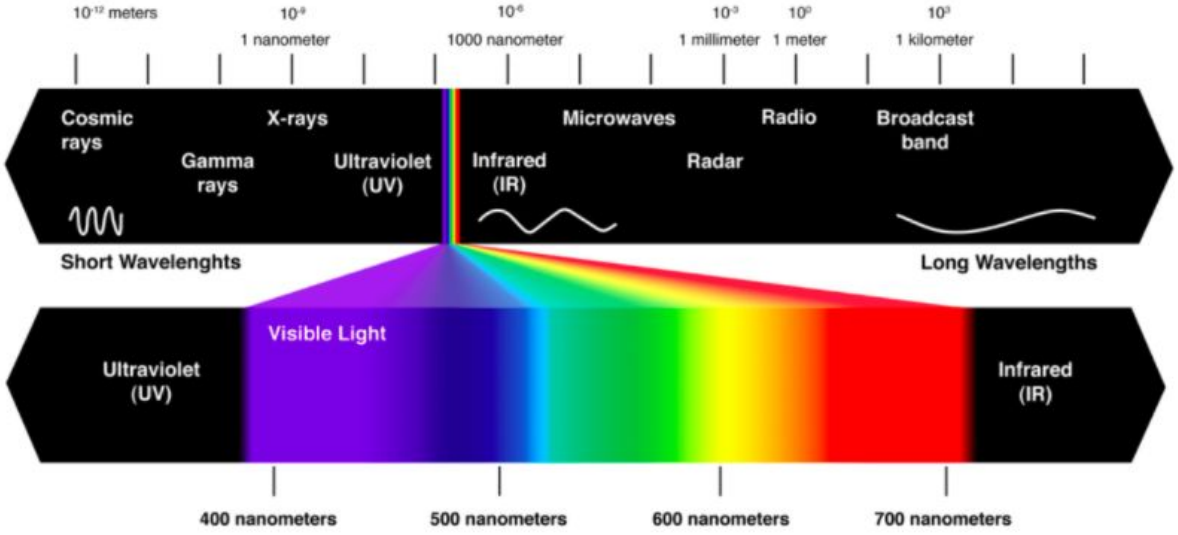
2. **Área Interdisciplinar** que envolve neurobiologia processamento de sinais, inteligência artificial…

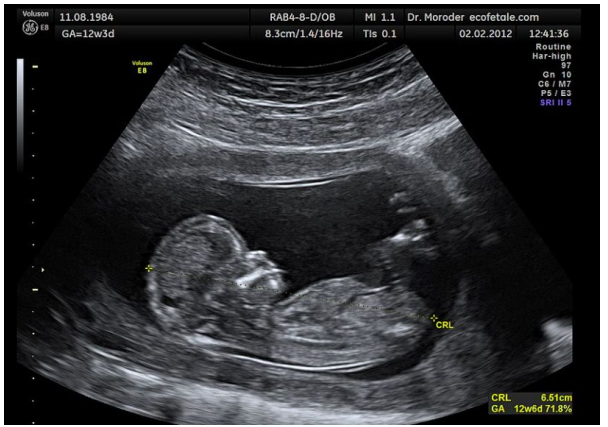
3. **Relação** com processamento de imagens, computação gráfica, análise de imagens, fotografia computacional.

https://codalab.lri.fr/competitions/111

Conceitos

Sensores diversos, atuando na faixa visível do espectro mas também em outra faixa como infravermelho. **Formas diferente de aquisição** de imagens, como na tomografia, ressonância, ultrassom....





https://www.once.lighting/visible-light-spectrum/

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

Conceitos

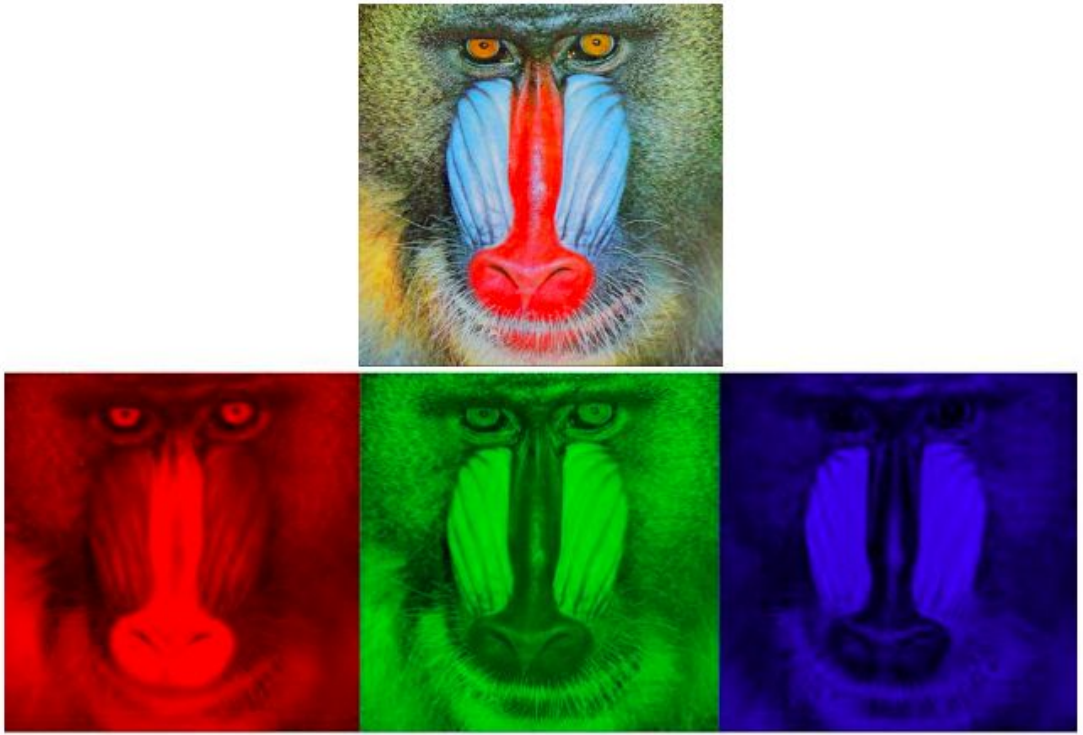
O que o computador ver? Pixels.

142 152 152 132
151 212 154 232
121 254 132 215
252 224 121 151
254 181 145 212

0 1 0 0 0 0
0 1 1 1 0 0
0 1 1 0 0 0
1 1 1 0 0 0
0 0 1 0 1 0

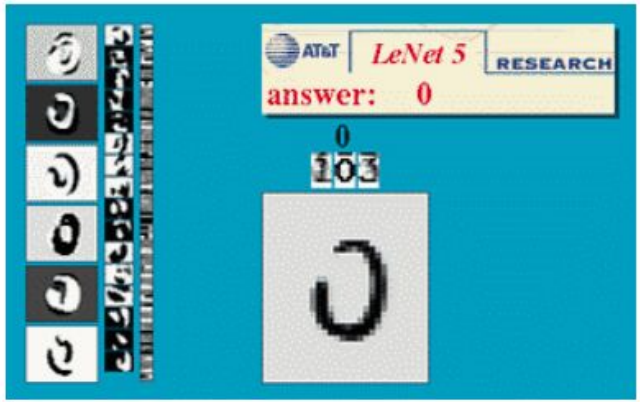
Conceitos

O que o computador ver? Imagens colorida RGB



Áreas de aplicação

OCR - Optical Character Recognition



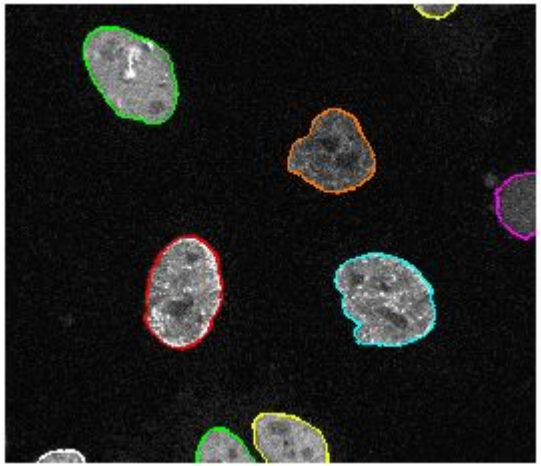
Digit recognition, AT&T labs
http://www.research.att.com/~yann/

License plate readers
http://en.wikipedia.org/wiki/Automatic_number_plate_recognition

Áreas de aplicação

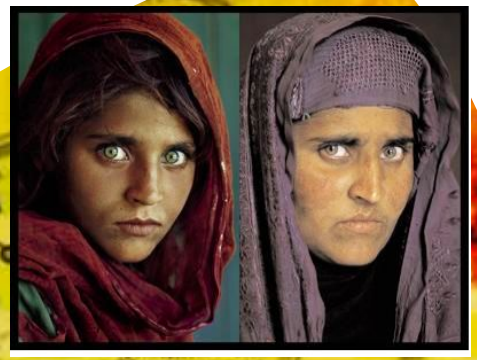
Imagens Médicas

a. Contagem de células
b. Melhoramento de Imagens CT, Ressonância..
c. Detecção de câncer de pele...



https://grand-challenge.org/challenges/

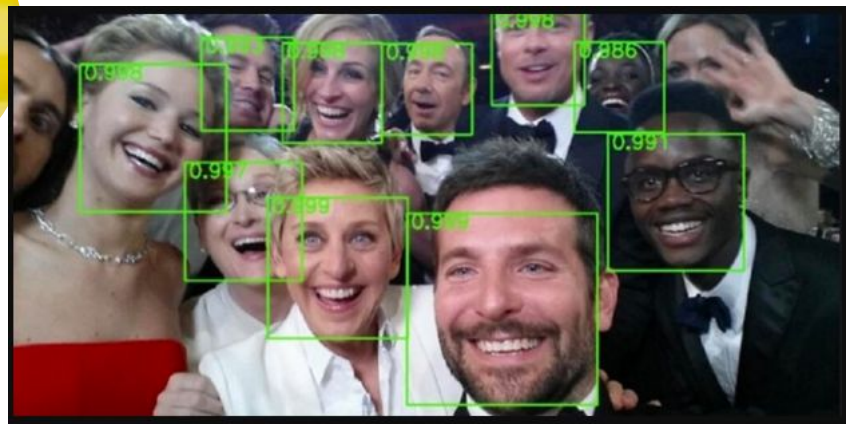
Áreas de aplicação

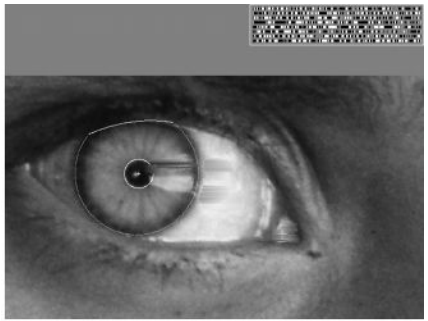


Segurança

a. Detecção de pessoas
b. Reconhecimento de pessoas (faces, gestos..)
c. Biometria ….

….

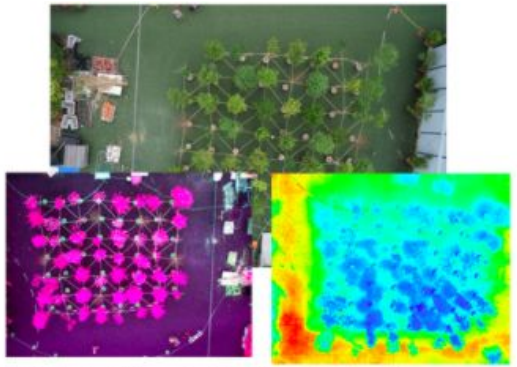




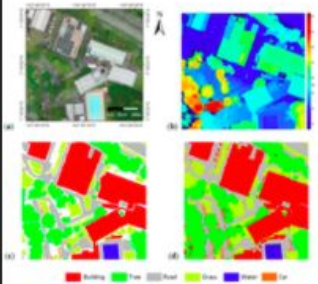
Áreas de aplicação

Sensoriamento Remoto

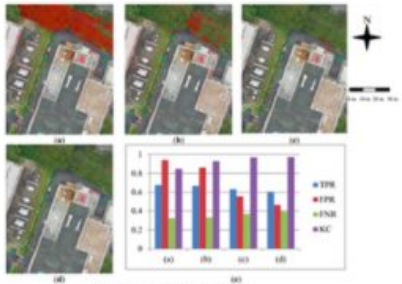
An example of UAV platform



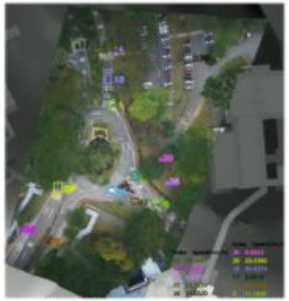
RGB (up), Multispectral (left) and thermal images (right)



Classification



Chang Detection

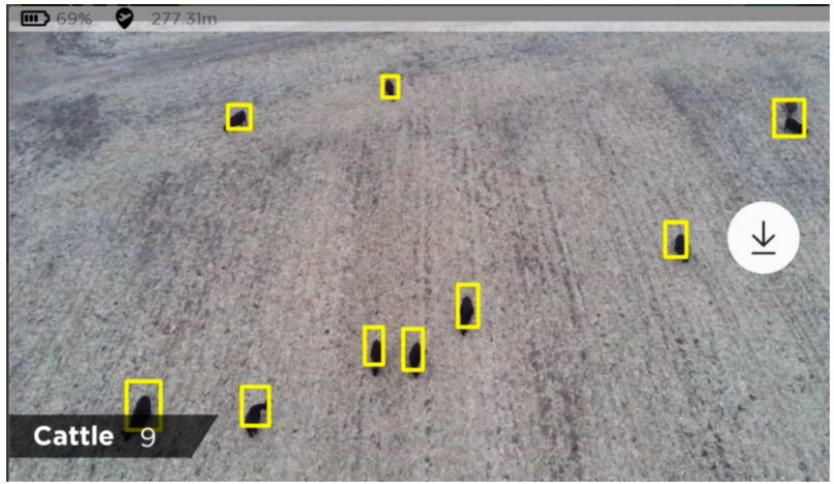


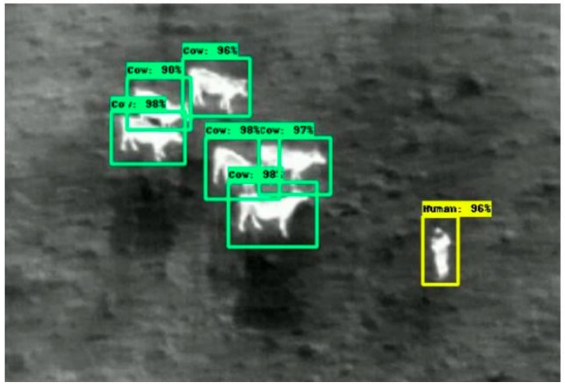
Car Detection and Tracking

Áreas de aplicação

Monitoramento Imagens de Satélites, Aviões, Drones.

a. Contagem de gado





Áreas de aplicação

Monitoramento Imagens de Satélites, Aviões, Drones.

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NEWS AND VIEWS · 14 OCTOBER 2020

Satellites could soon map every tree on Earth

An analysis of satellite images has pinpointed individual tree canopies over a large area of West Africa. The data suggest that it will soon be possible, with certain limitations, to map the location and size of every tree worldwide.

Niall P. Hanan & Julius Y. Anchang

Áreas de aplicação

Monitoramento Imagens de Satélites, Aviões, Drones.

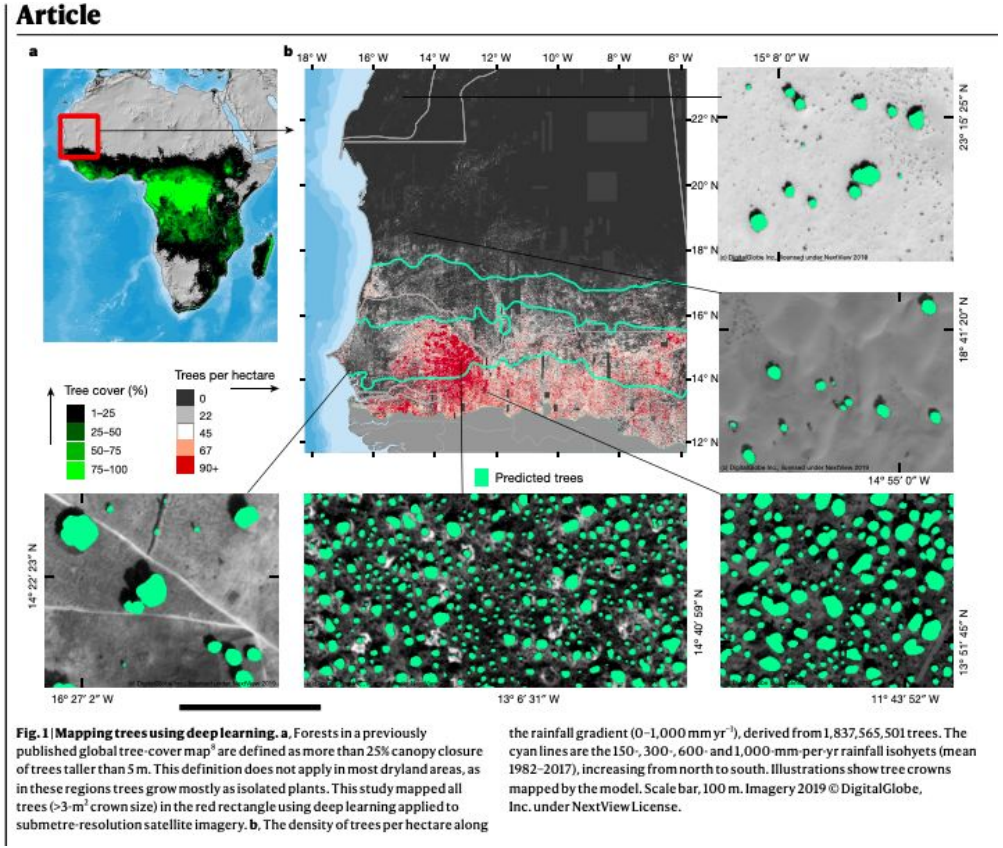
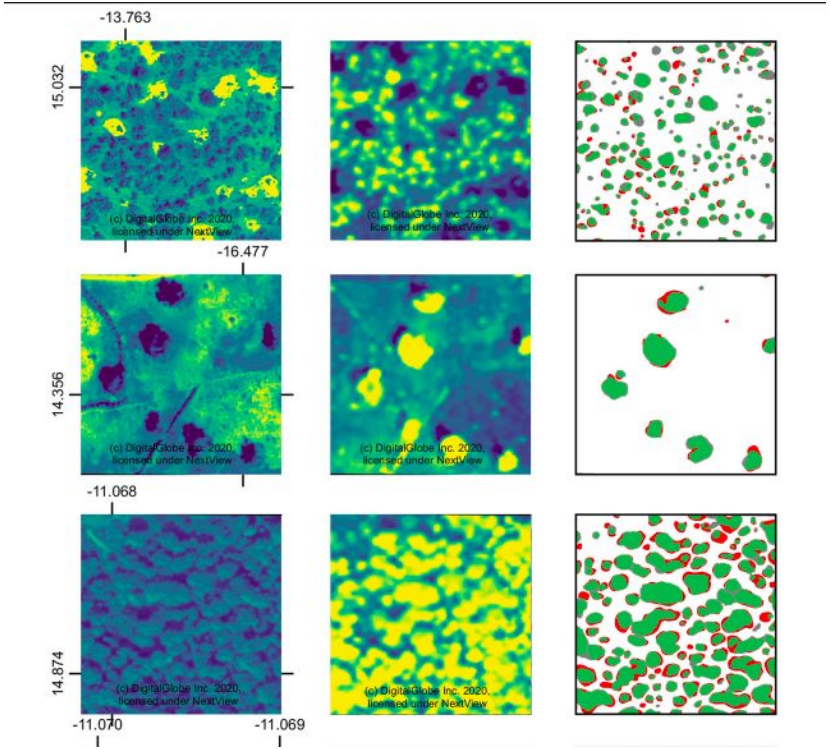


Fig. 1 | Mapping trees using deep learning. a, Forests in a previously published global tree-cover map[8] are defined as more than 25% canopy closure of trees taller than 5 m. This definition does not apply in most dryland areas, as in these regions trees grow mostly as isolated plants. This study mapped all trees (>3-m^2 crown size) in the red rectangle using deep learning applied to submetre-resolution satellite imagery. **b**, The density of trees per hectare along the rainfall gradient (0–1,000 mm yr^{-1}), derived from 1,837,565,501 trees. The cyan lines are the 150-, 300-, 600- and 1,000-mm-per-yr rainfall isohyets (mean 1982–2017), increasing from north to south. Illustrations show tree crowns mapped by the model. Scale bar, 100 m. Imagery 2019 © DigitalGlobe, Inc. under NextView License.

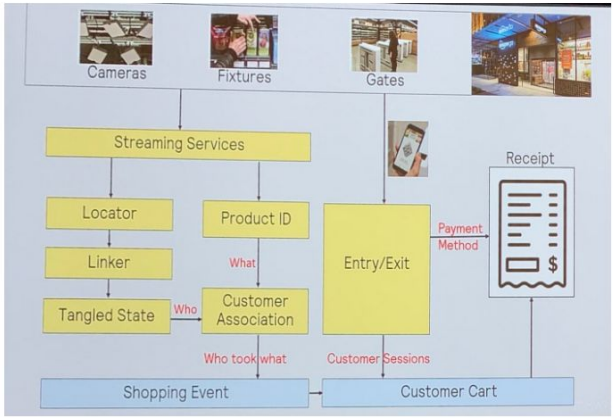
Áreas de aplicação

Monitoramento Imagens de Satélites, Aviões, Drones.

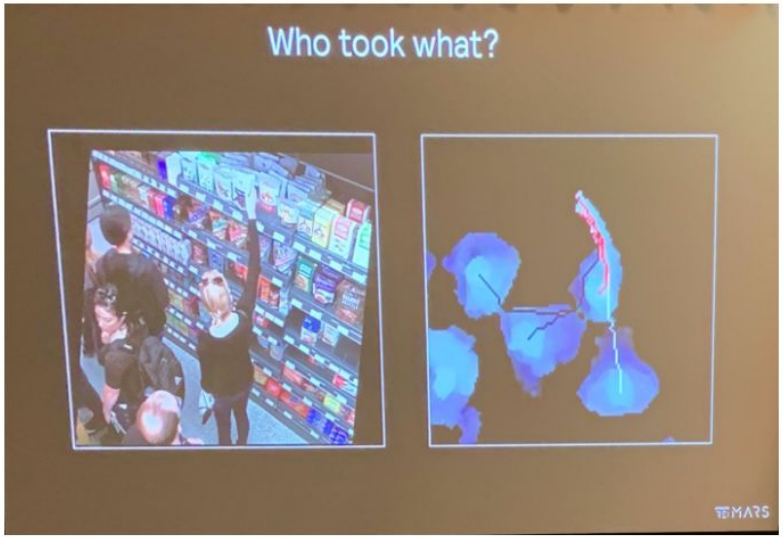


Áreas de aplicação

Amazon GO



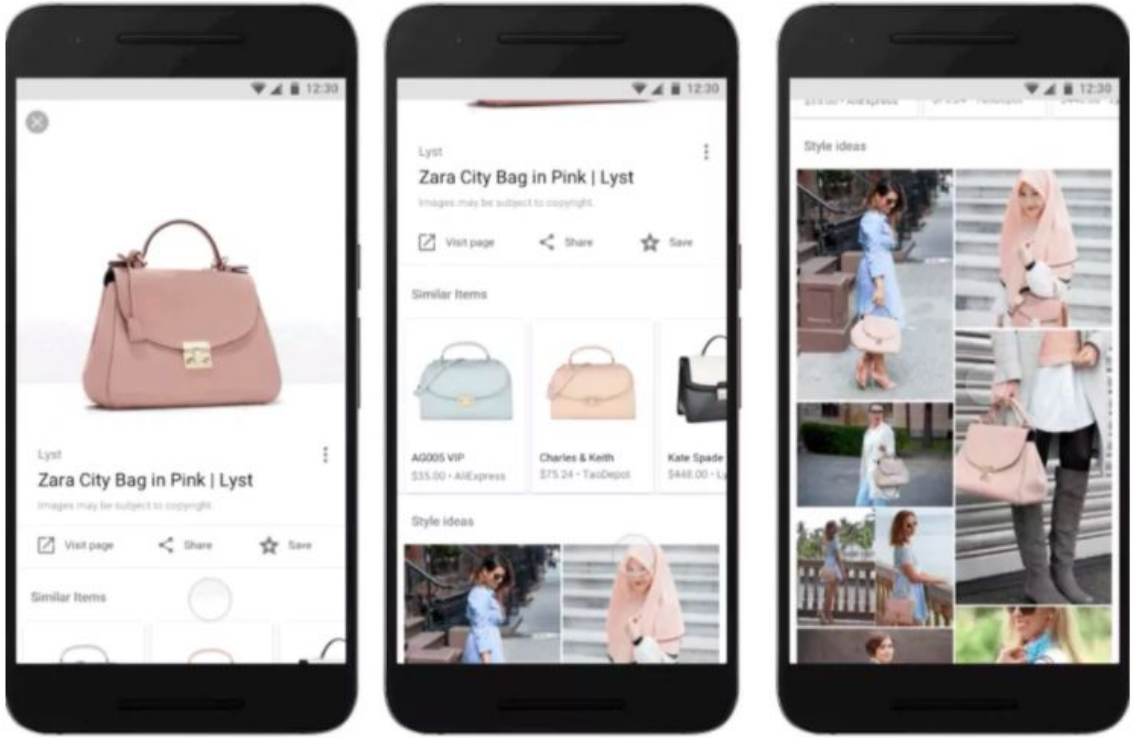
Just Walk Out Architecture



Simulated data is used to solve for difficult situations

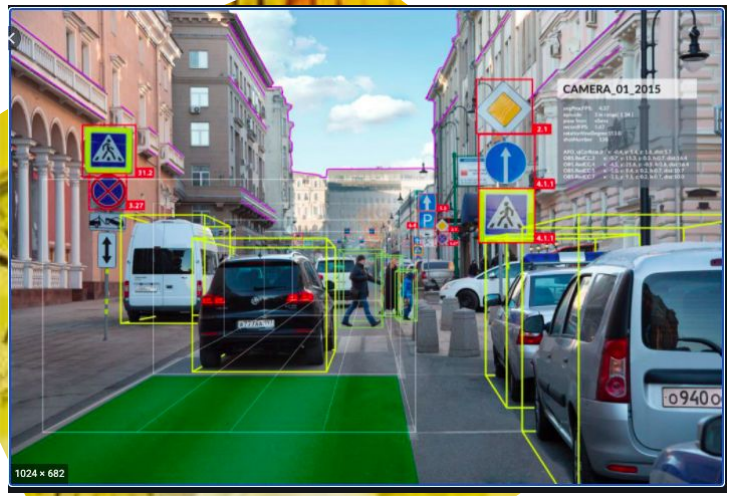
Áreas de aplicação

Busca por imagem

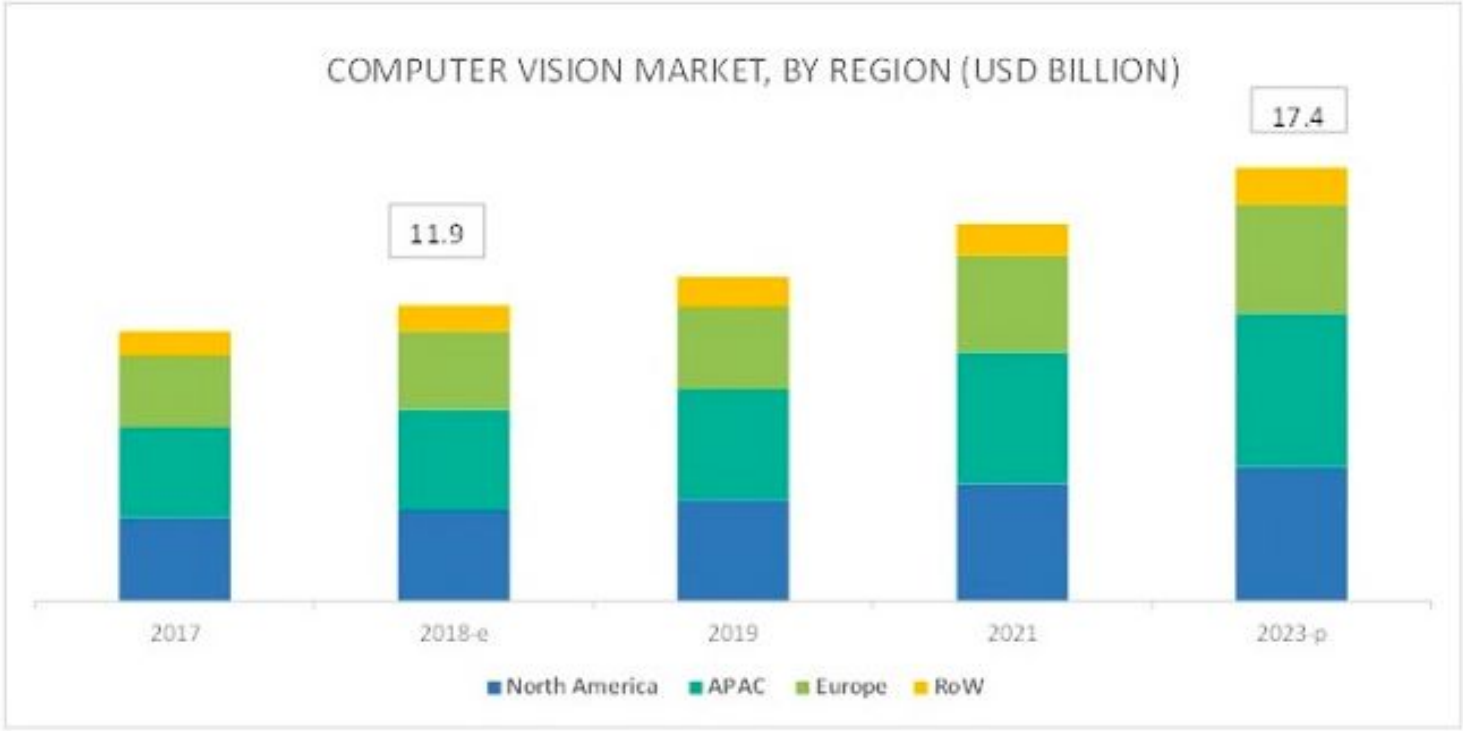


Áreas de aplicação

Carro autônomo



Tamanho do Mercado



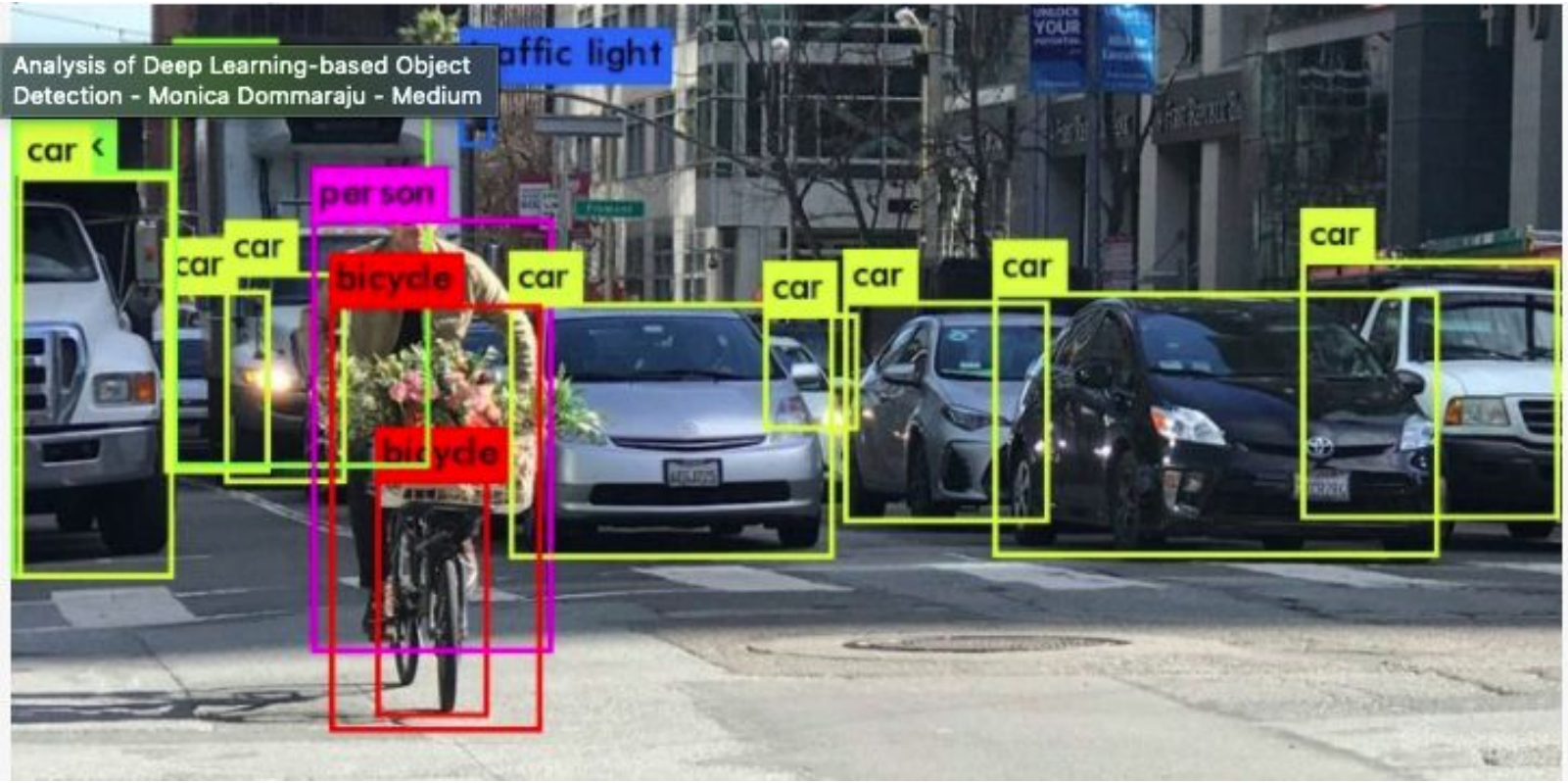
https://www.marketsandmarkets.com/Market-Reports/computer-vision-market-186494767.html

Tarefas

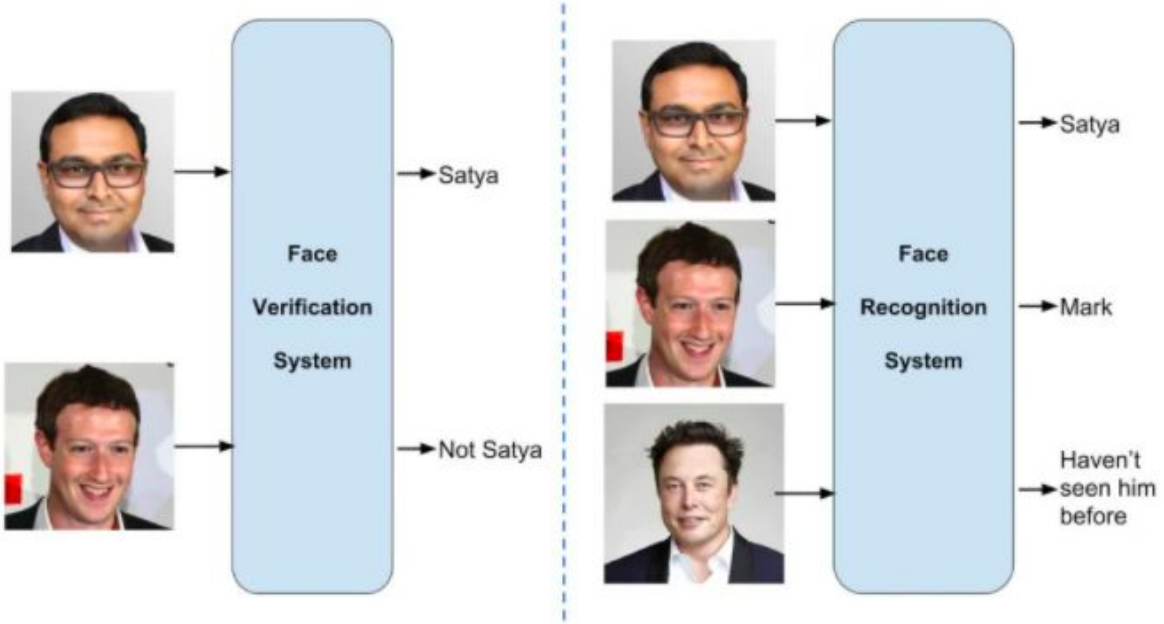
1. Detecção de objetos
2. Reconhecimento de objetos
3. Rastreamento de objetos
4. Segmentação de objetos

5. Reconhecimento de Gesto e Poses
6. Vídeo Analítico (Interpretação de cenas)

Detecção de objetos

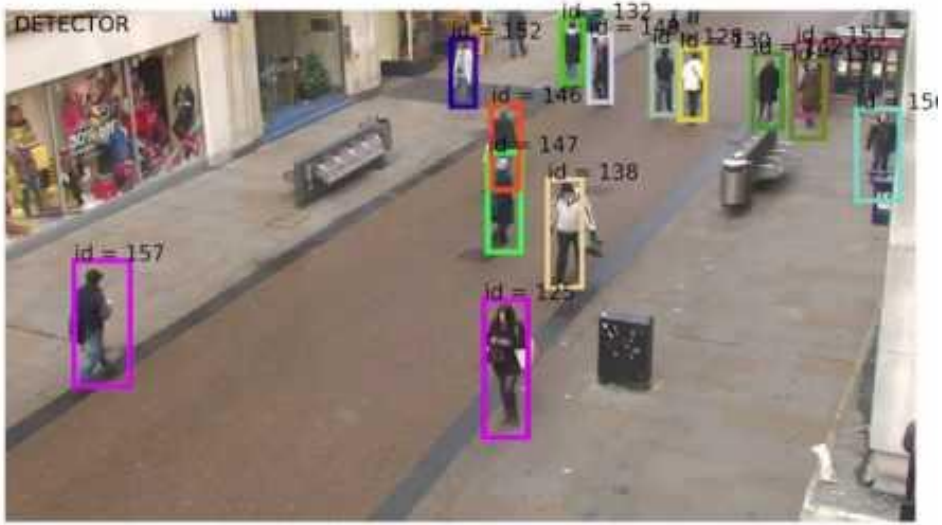


Reconhecimento de objetos



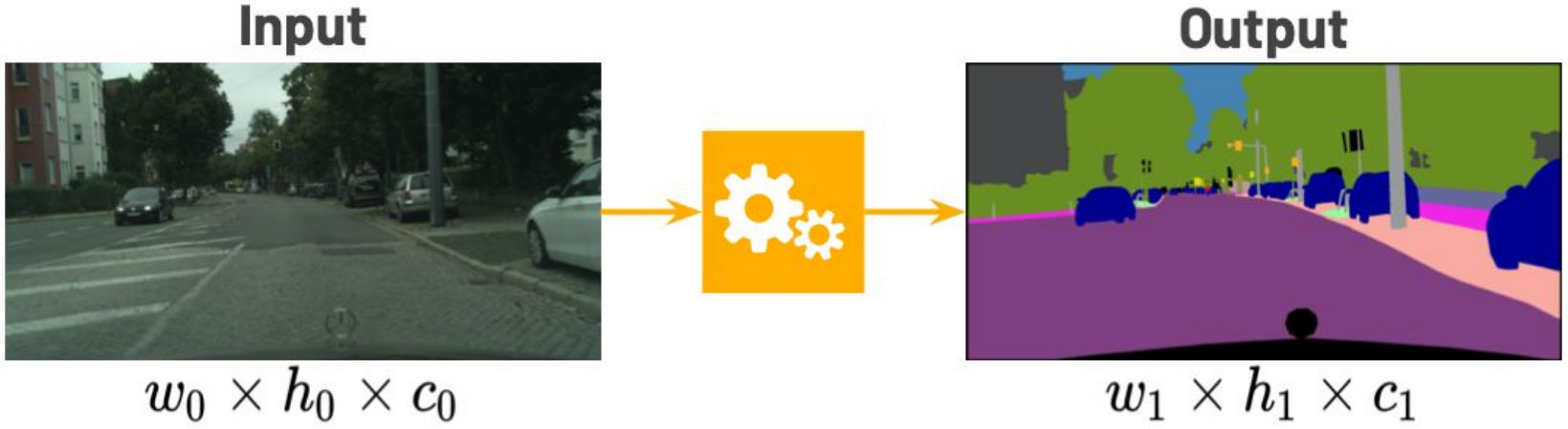
https://www.learnopencv.com/face-recognition-an-introduction-for-beginners/

Rastreamento de objetos



Segmentação de Imagens

Pixel-level tasks



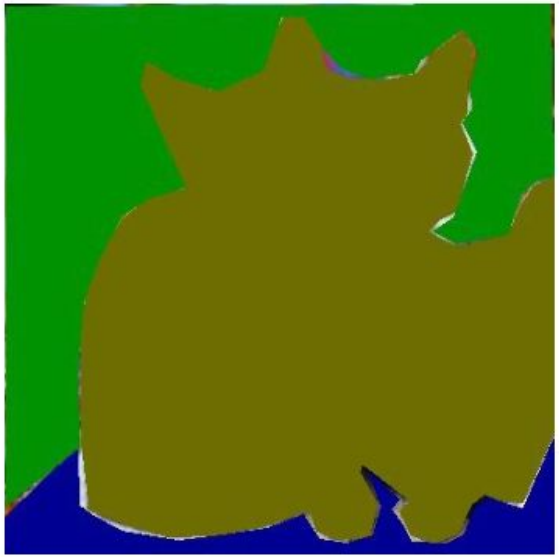
Same spatial resolution $w_0 = w_1$ and $h_0 = h_1$

Segmentação de Imagens

Pixel-level tasks: Binary Segmentation

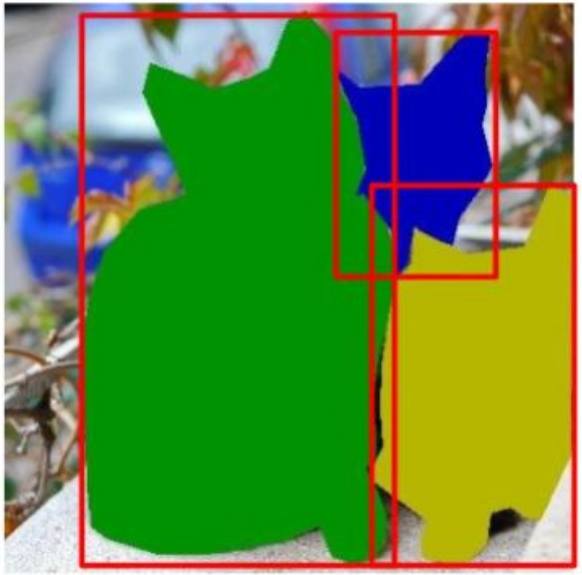
Segmentação de Imagens

Pixel-level tasks: Semantic Segmentation



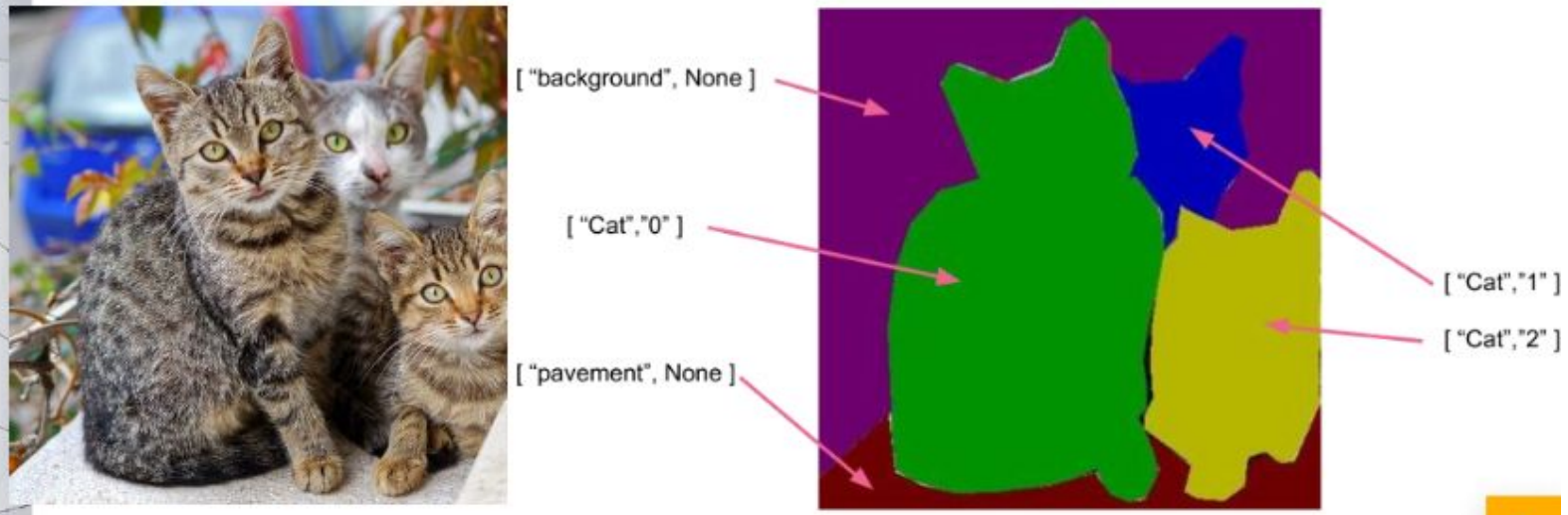
Segmentação de Imagens

Pixel-level tasks: Instance Segmentation

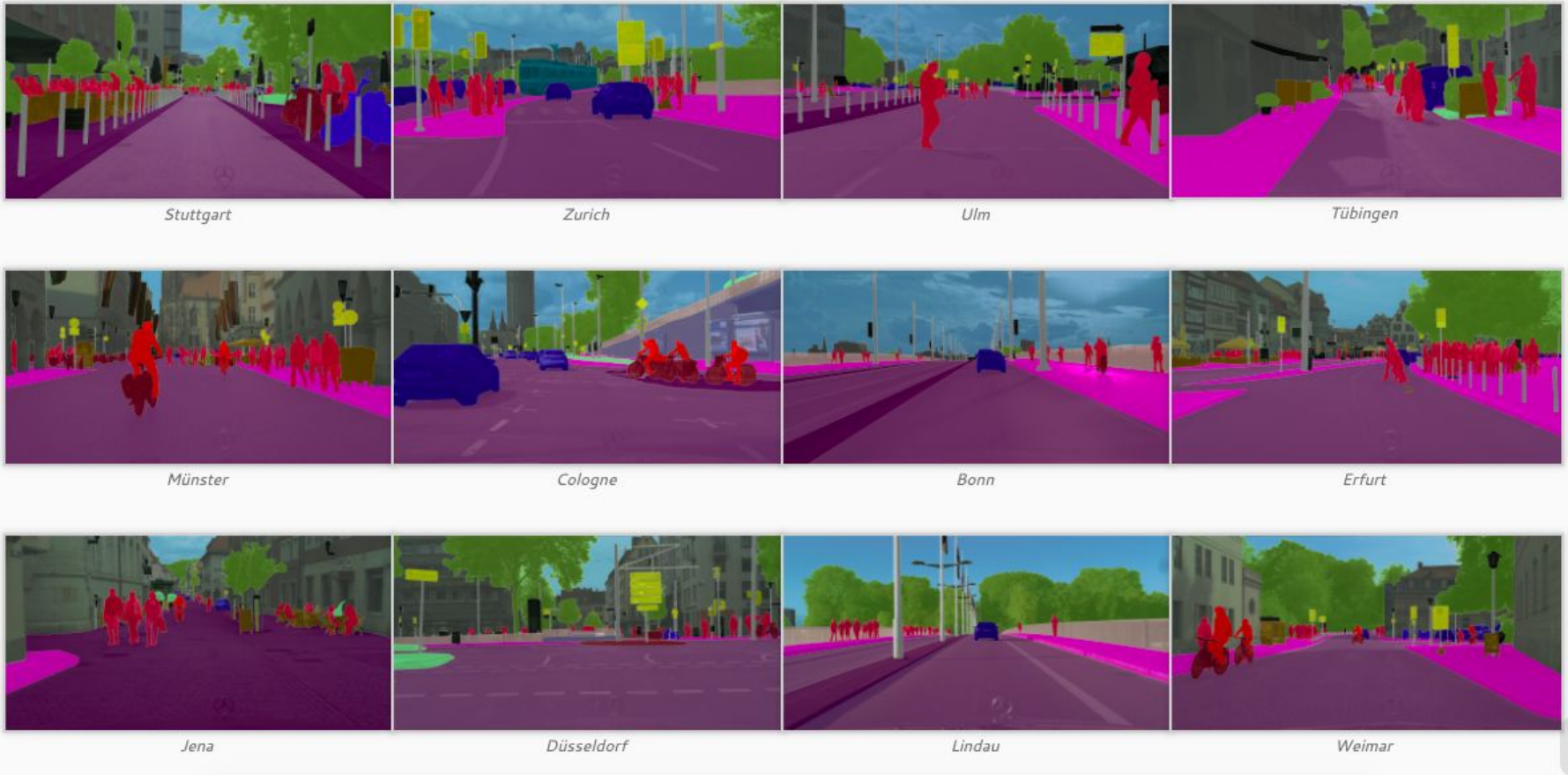


Segmentação de Imagens

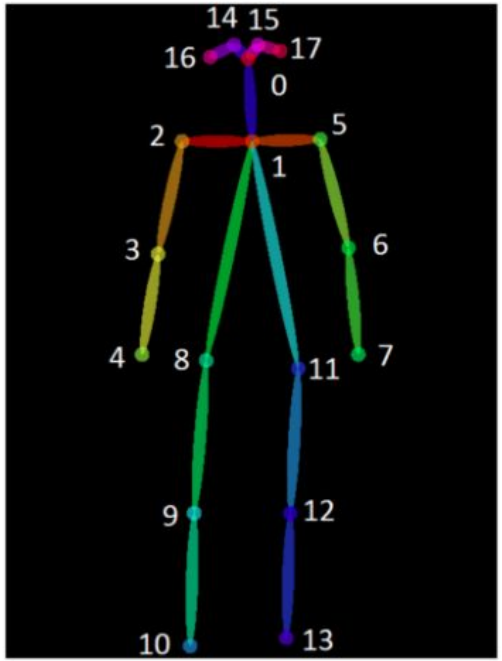
Pixel-level tasks: Panoptic Segmentation



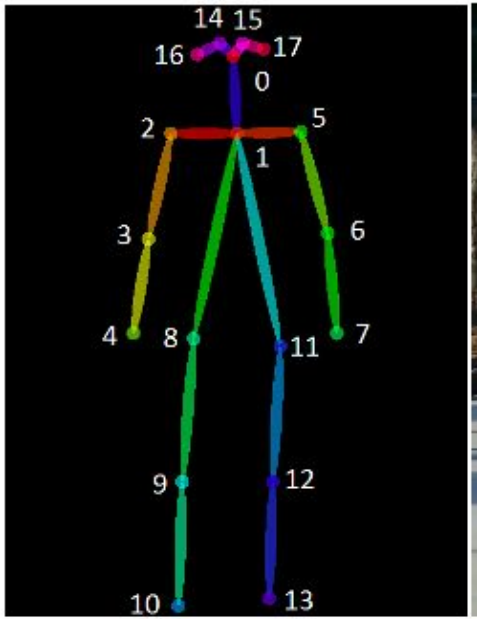
Cityscape dataset



Reconhecimento de Gestos e Poses

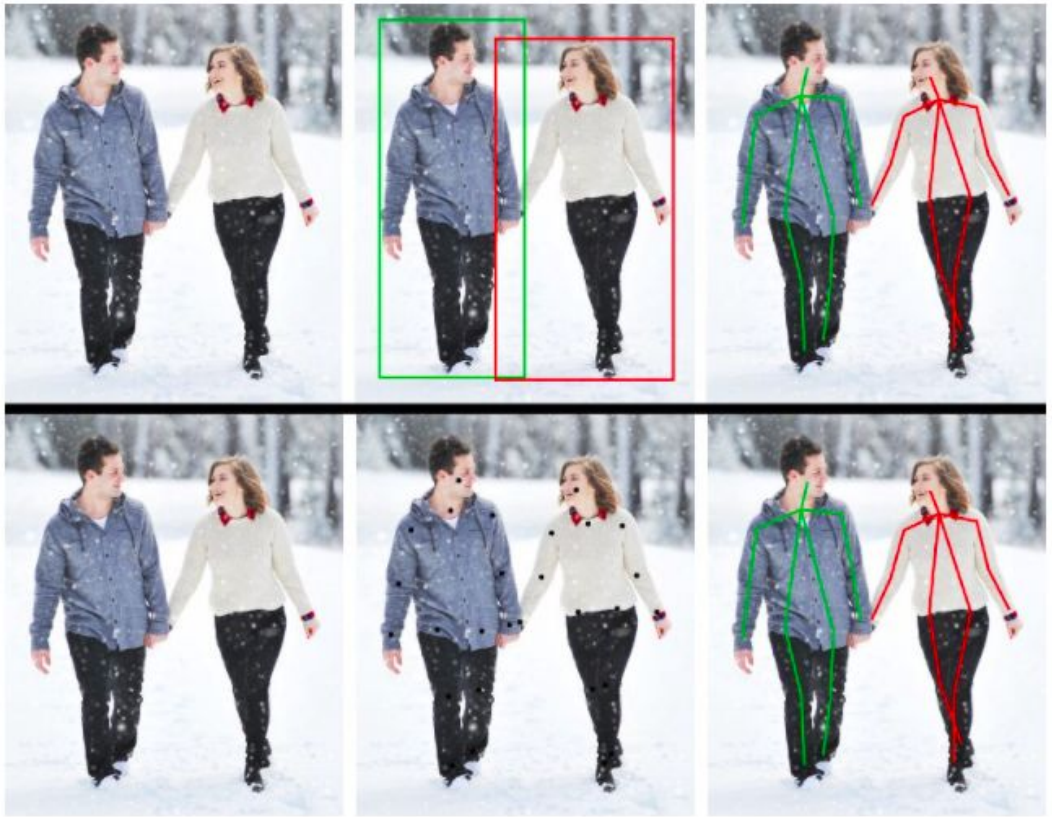


Reconhecimento de Gestos e Poses



Left: COCO keypoint format for human pose skeletons. Right: Rendered human pose skeletons. (Source)

Reconhecimento de Gestos e Poses



Detecção de Violência

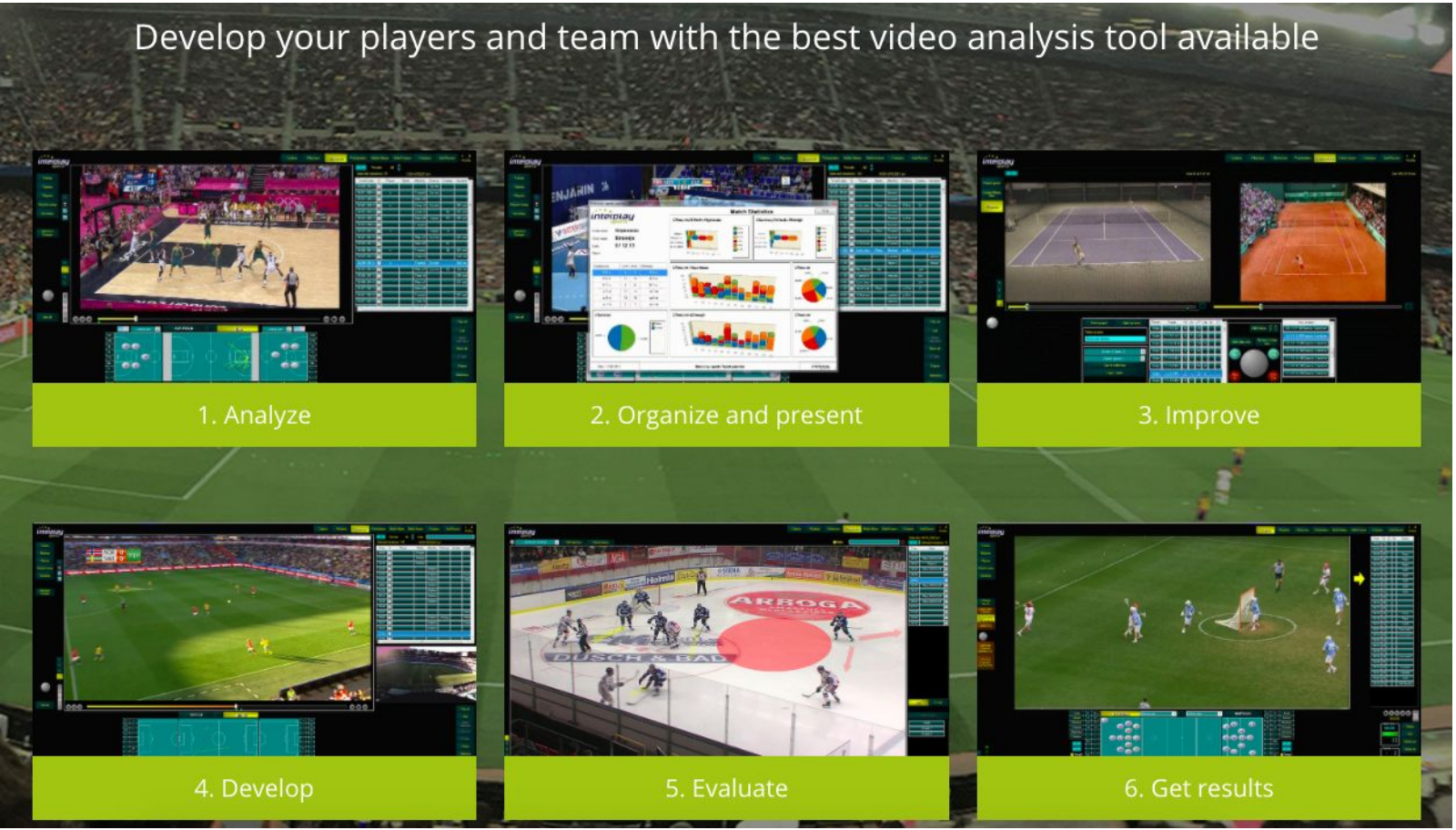
Sample videos from the XD-Violence dataset.

https://roc-ng.github.io/XD-Violence/

Vídeo Analítico

https://metrica-sports.com/

Vídeo Analítico



https://interplay-sports.com/

Openpilot e Tesla autopilot