

Andrea Rapuzzi

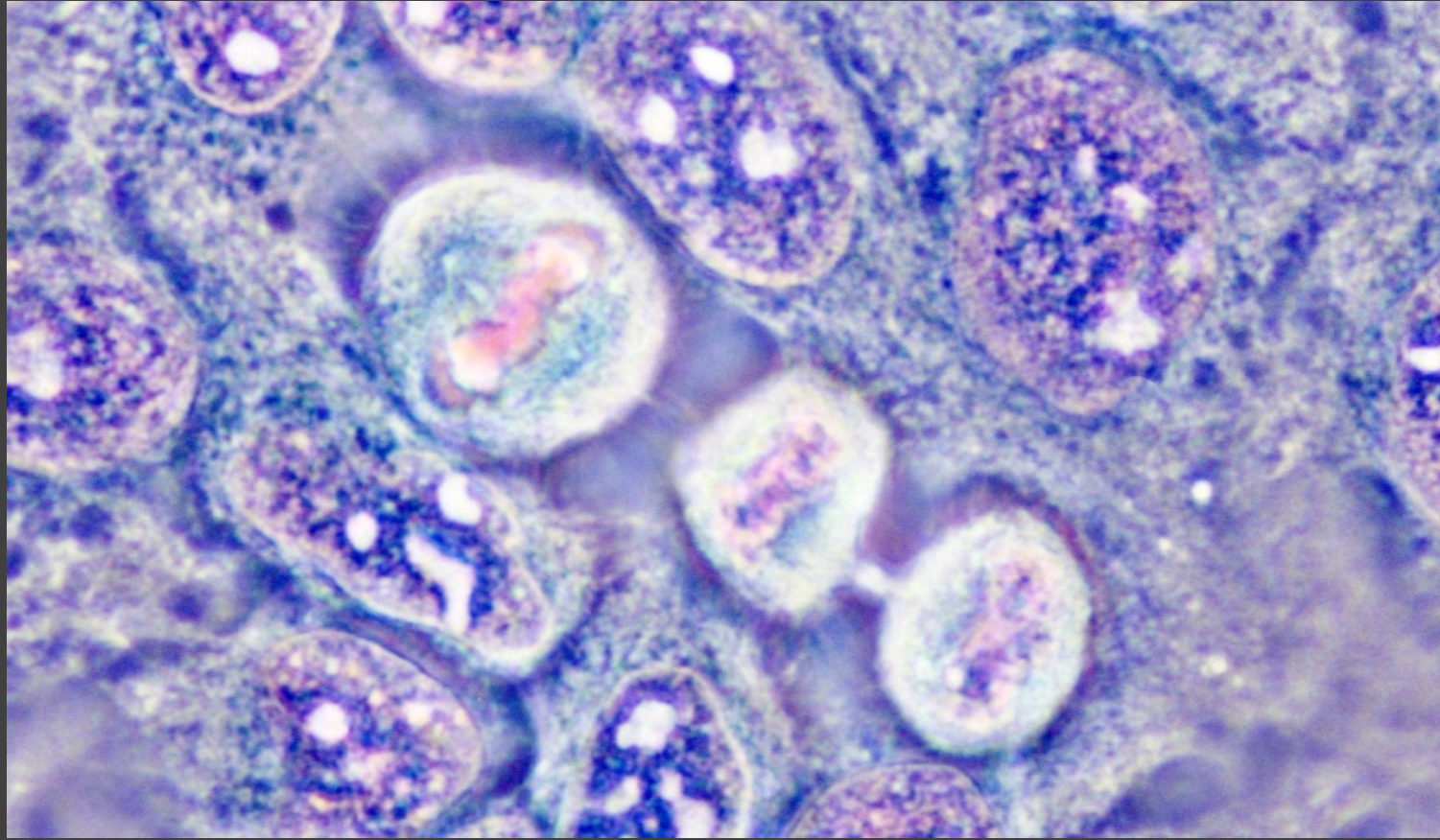
DataScienceSeed Meetup #4

Digital Tree - Innovation Habitat, 14 Marzo 2019

Parleremo di...

kaggleTM

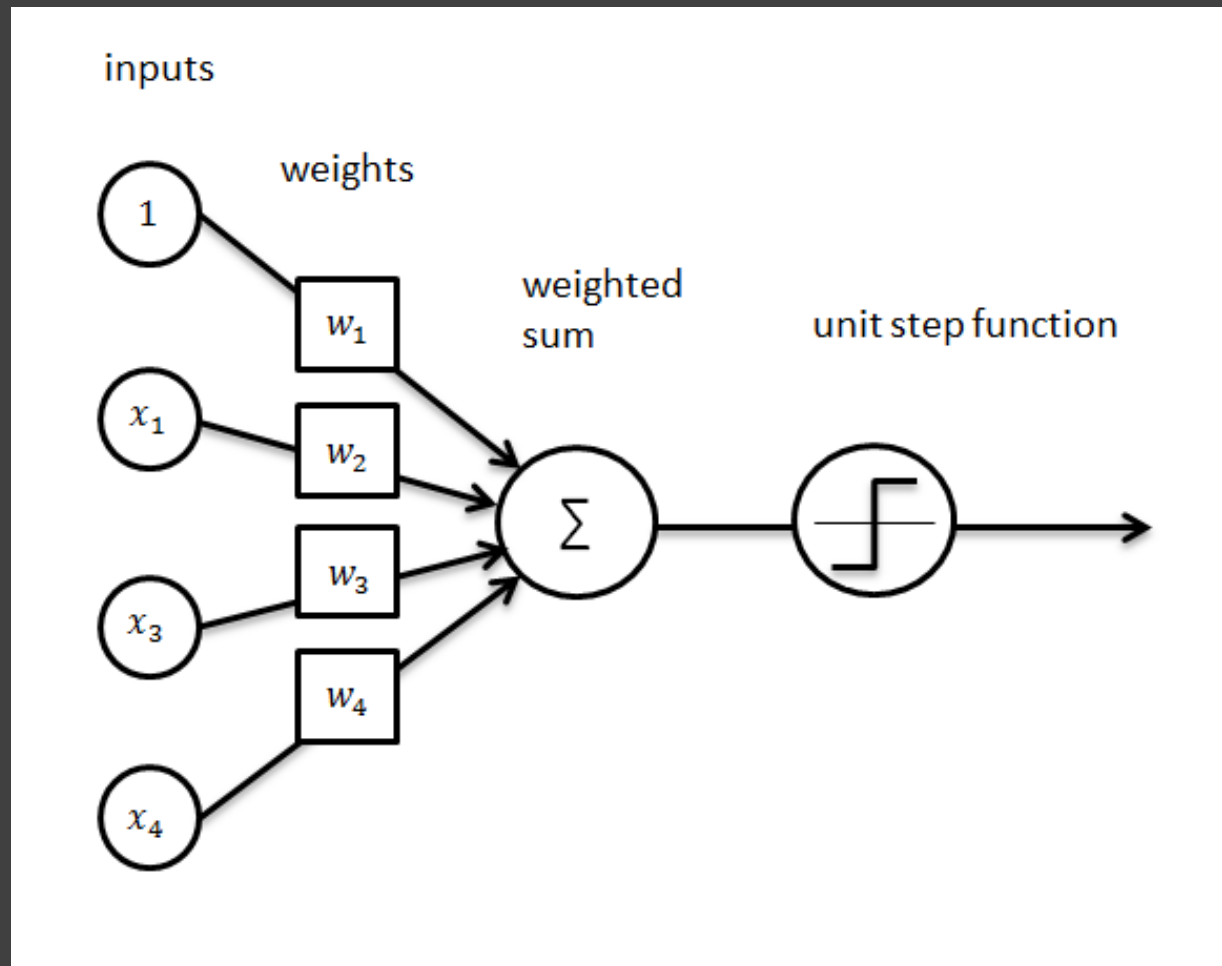
Parleremo di...



Parleremo di...



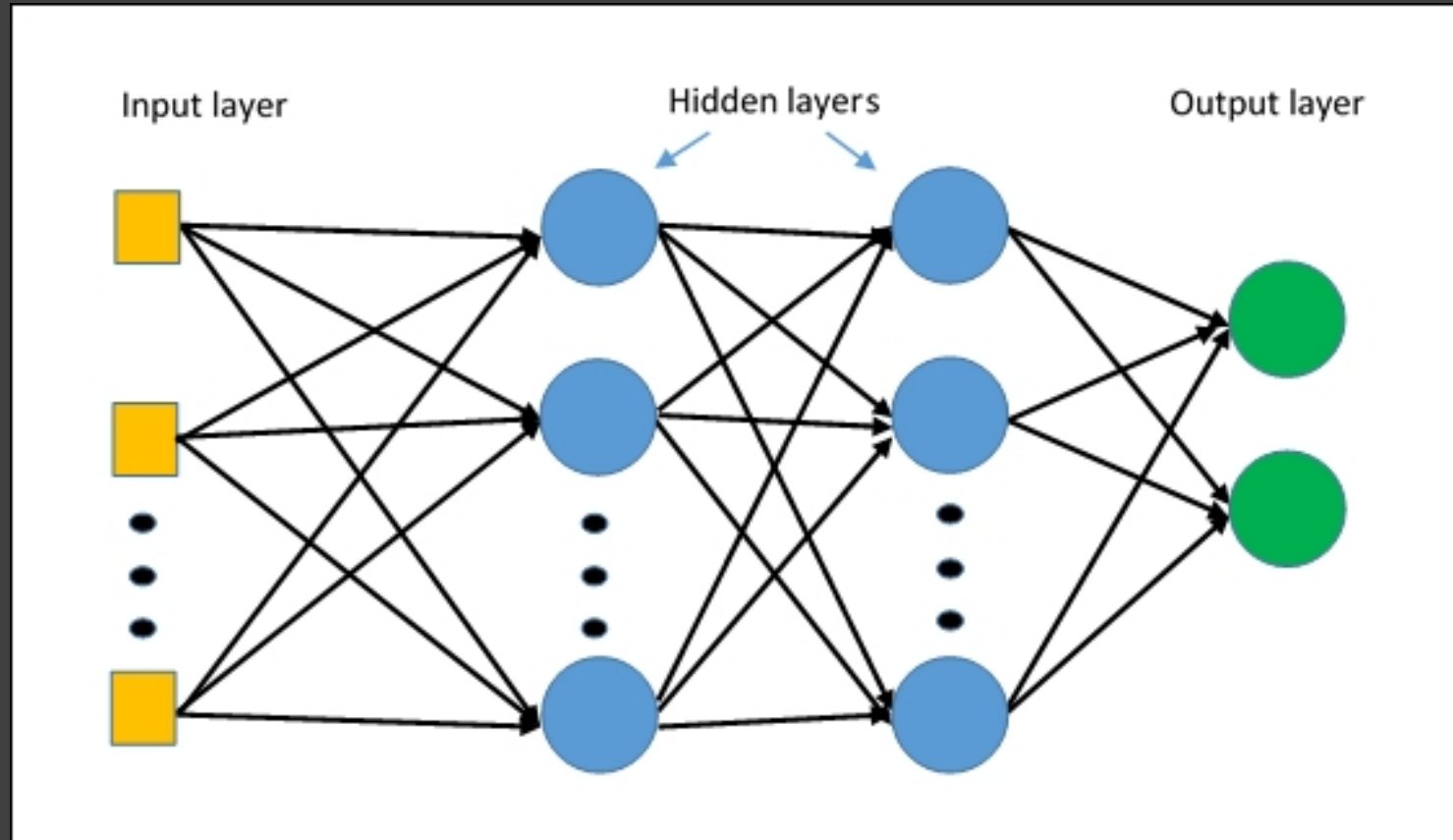
Parleremo di...



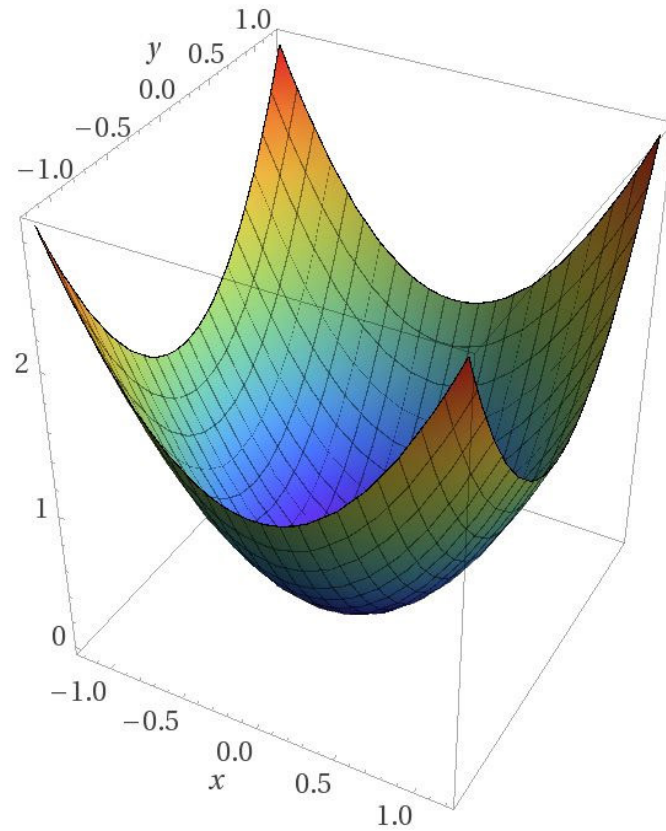
Parleremo di...



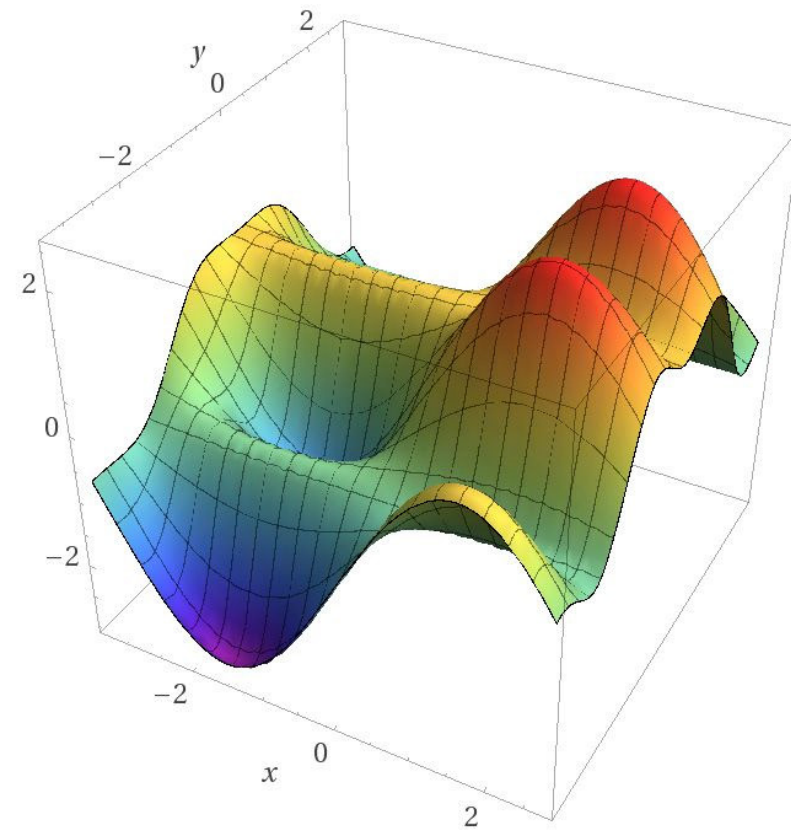
Parleremo di...



Parleremo di...



Computed by Wolfram|Alpha

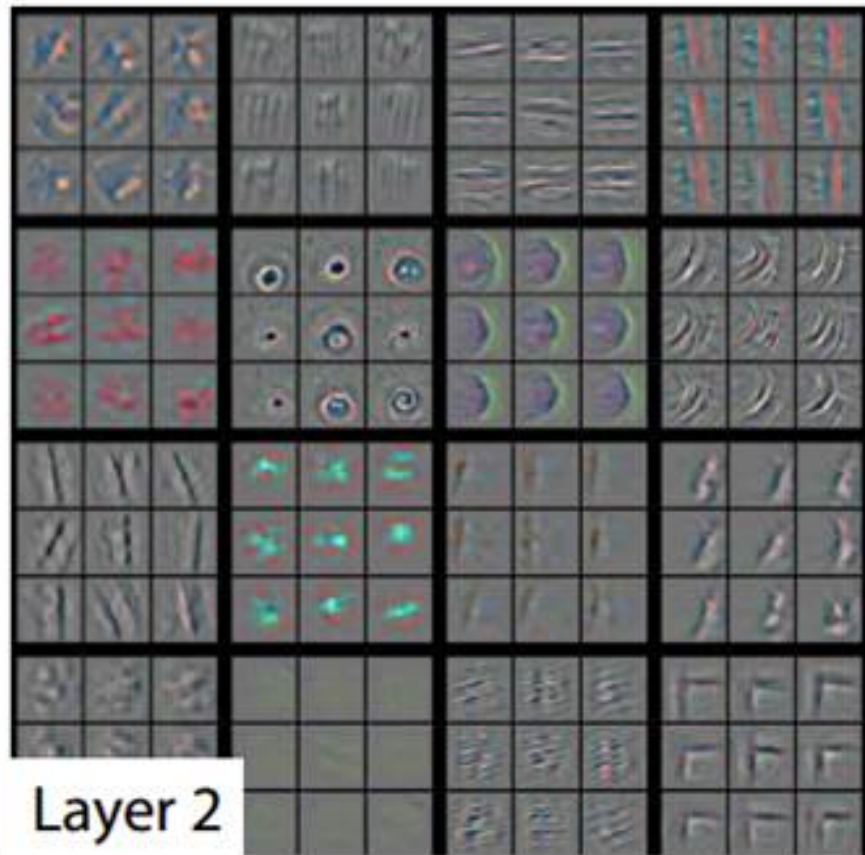


Computed by Wolfram|Alpha

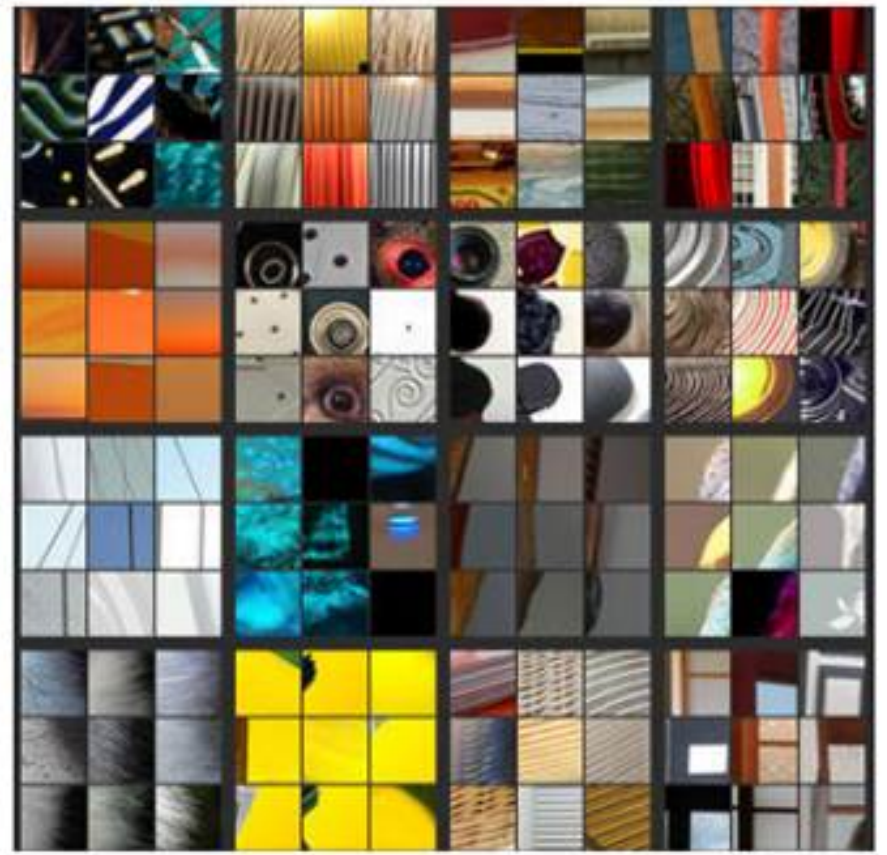
Parleremo di...



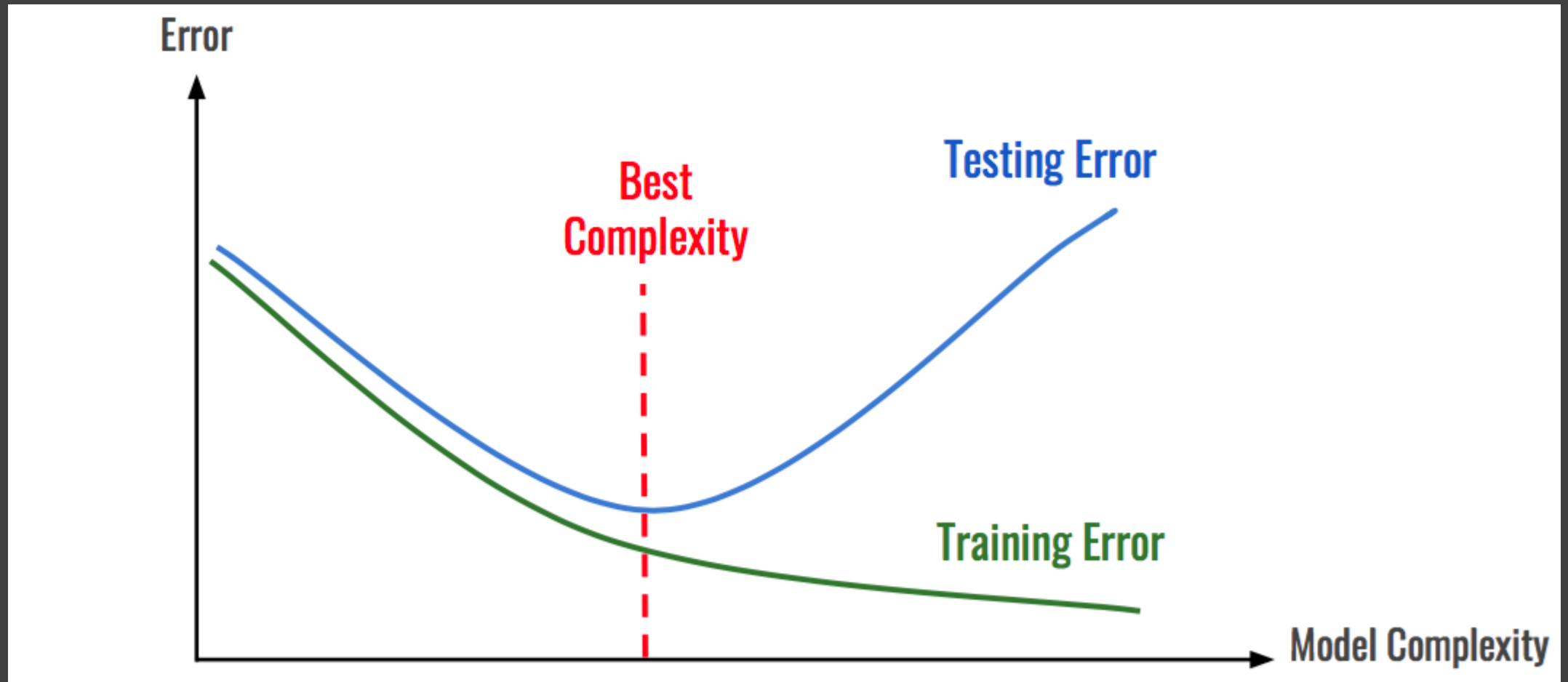
Layer 1



Layer 2



Parleremo di...



Parleremo di...

$$\text{IoU} = \frac{\text{Area of Overlap}}{\text{Area of Union}}$$


The diagram illustrates the Intersection over Union (IoU) metric. It consists of two parts. The top part shows two overlapping squares with blue outlines, representing the 'Area of Overlap' and 'Area of Union'. The bottom part shows the same two squares filled with solid blue, representing the 'Area of Union'.

Parleremo di...



2018 Data Science Bowl

Find the nuclei in divergent images to advance medical discovery

Booz Allen Hamilton



\$100,000
Prize Money

Presented by
Booz | Allen | Hamilton & kaggle

Spot Nuclei. Speed Cures.

The challenge: Create an algorithm to automate nucleus detection

40%

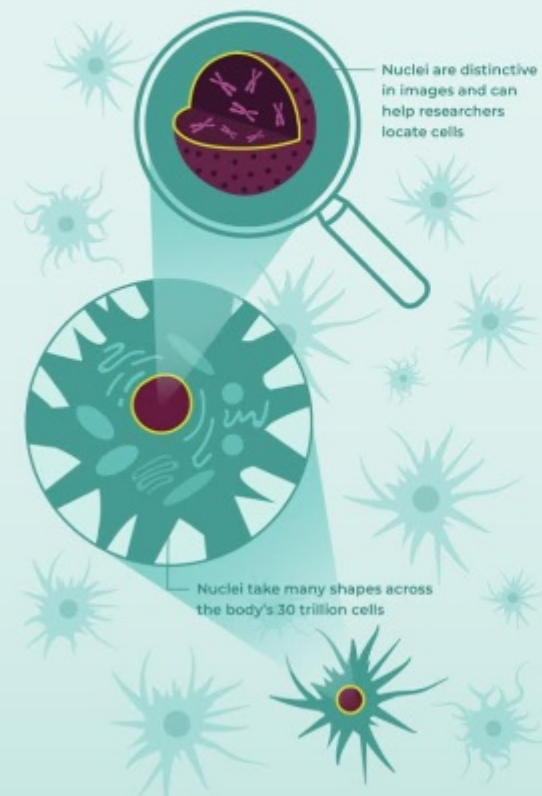
of all deaths are caused by illnesses like heart disease and cancer¹

75%

of rare diseases affect children²

30%

of affected children with rare diseases die before age 5²



Finding the nucleus helps to...



locate cells in varied conditions to enable faster cures



free biologists to focus on solutions



improve throughput for research and insight



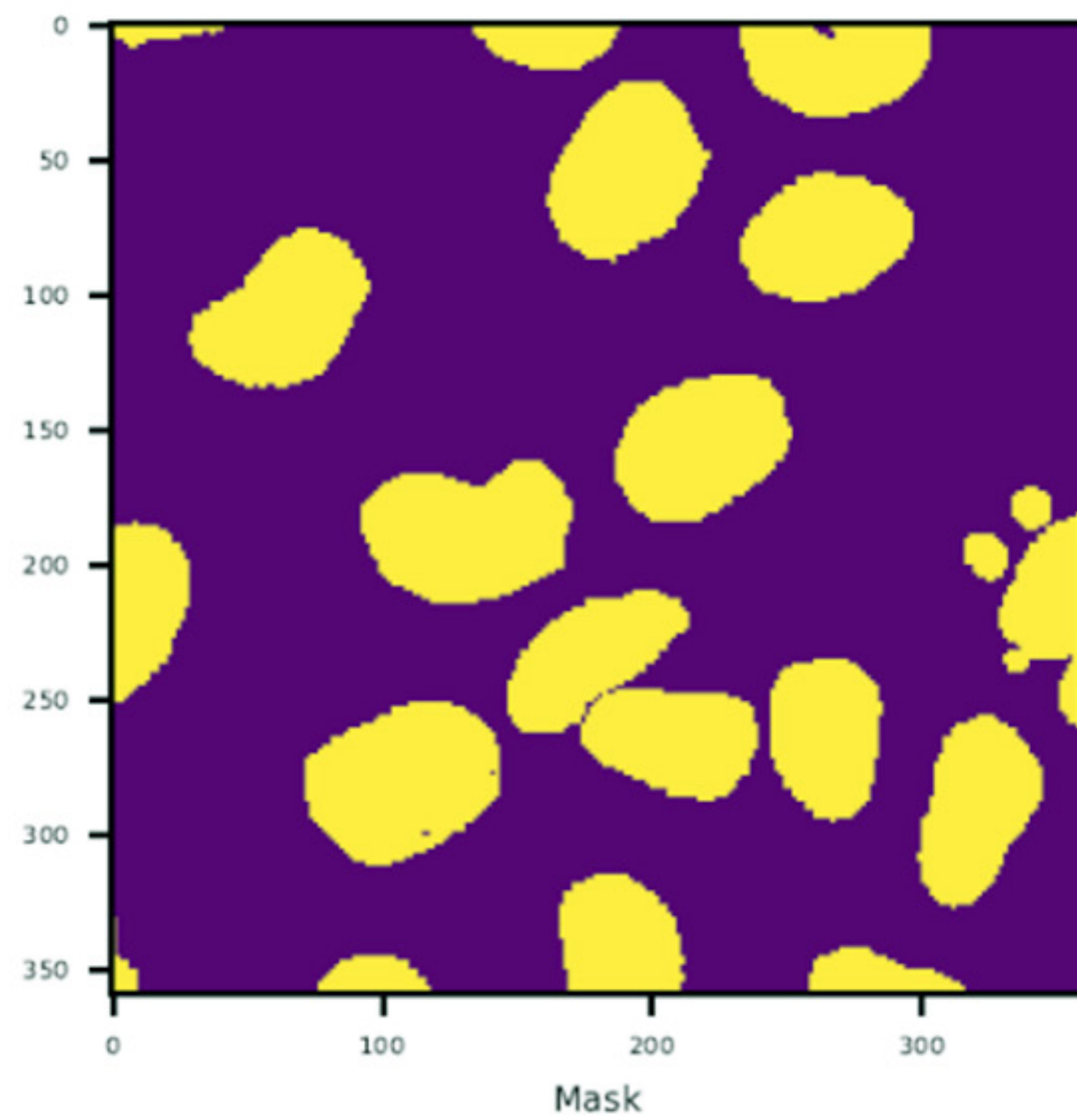
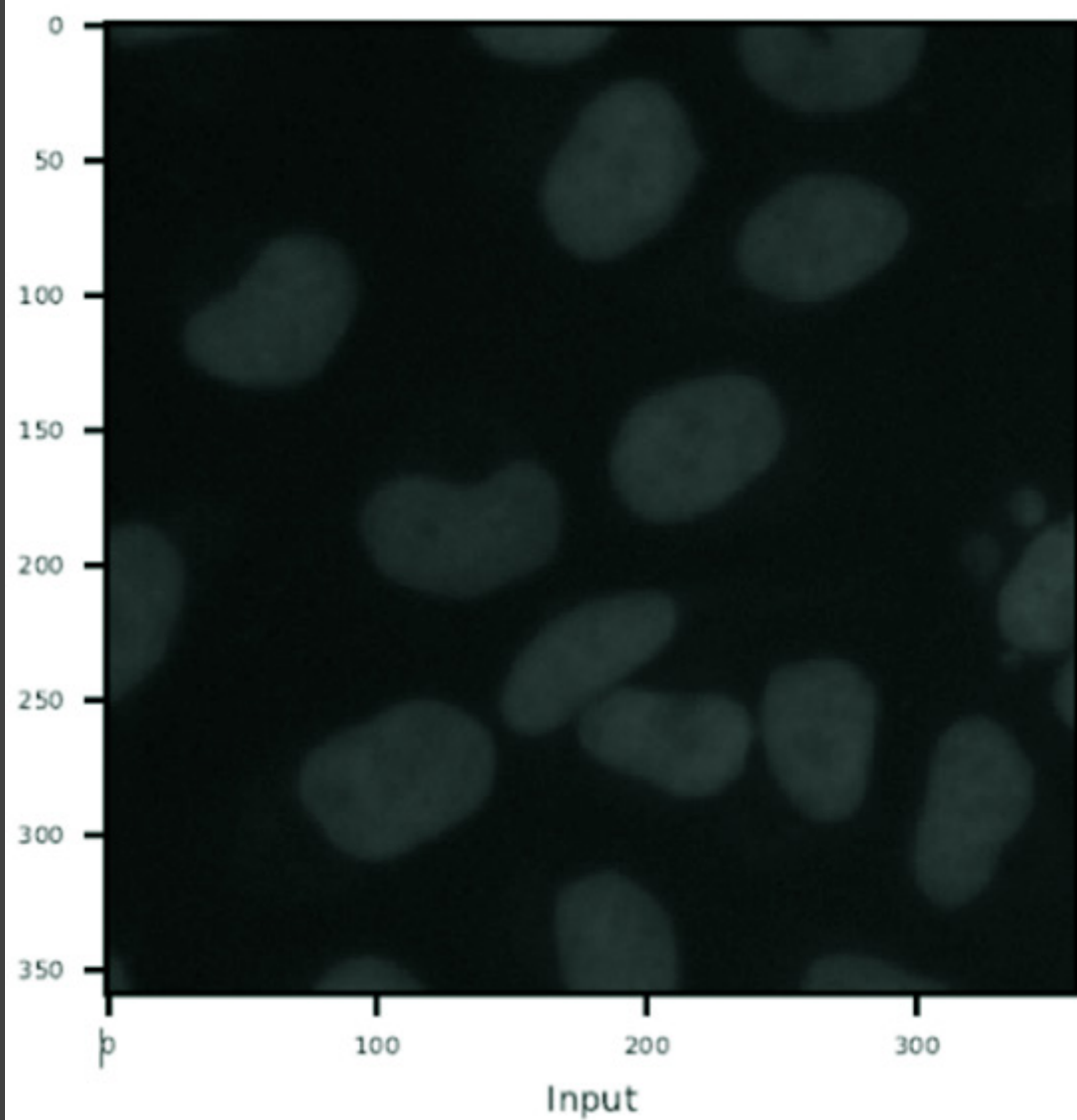
reduce time-to-market for new drugs— currently 10 years

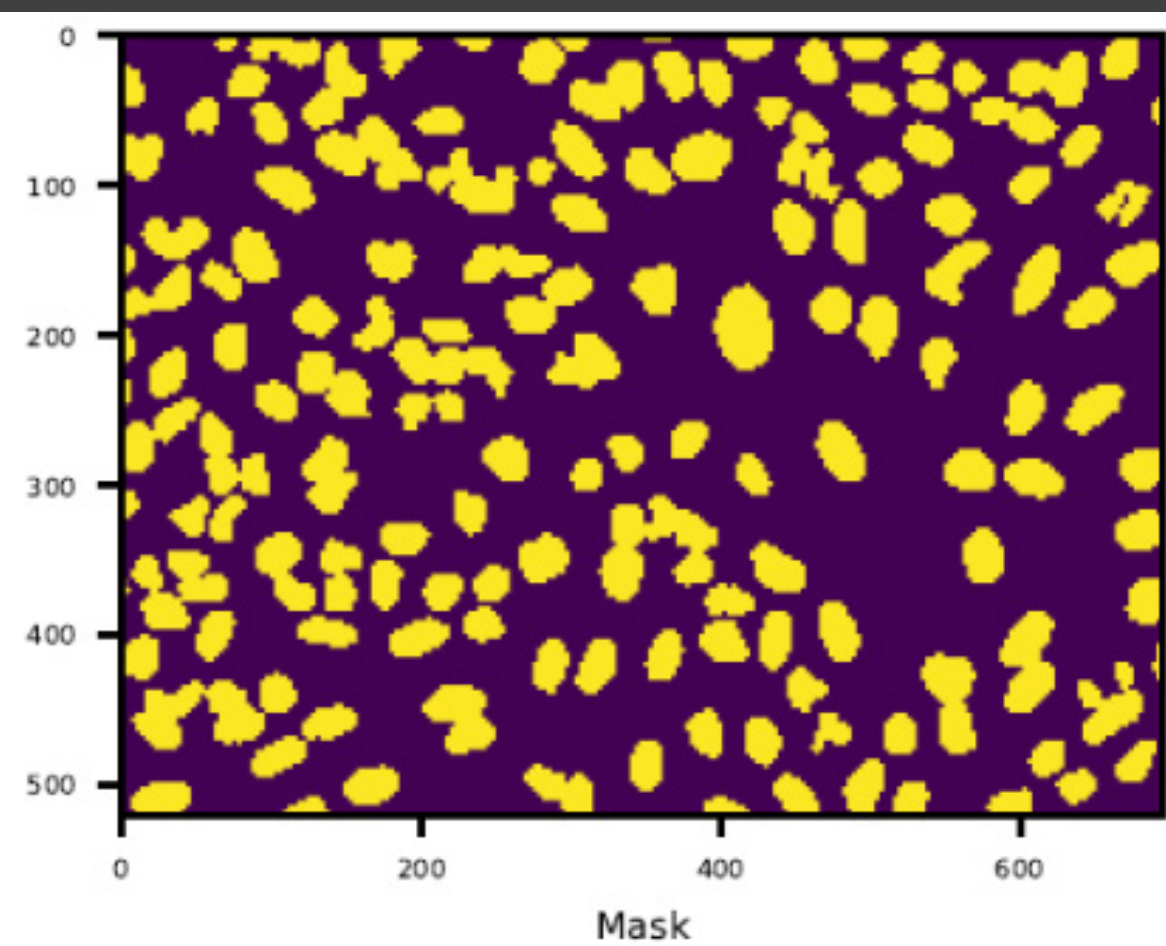
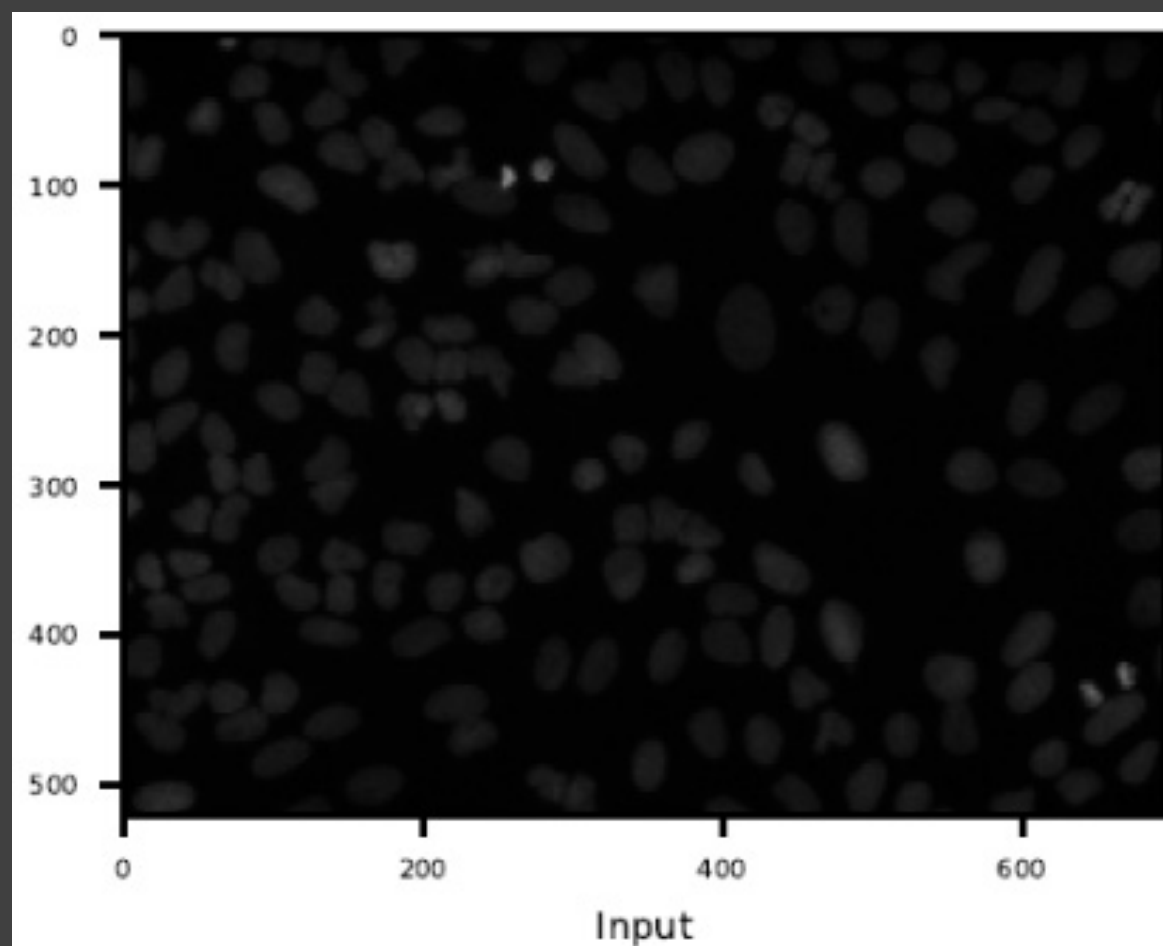


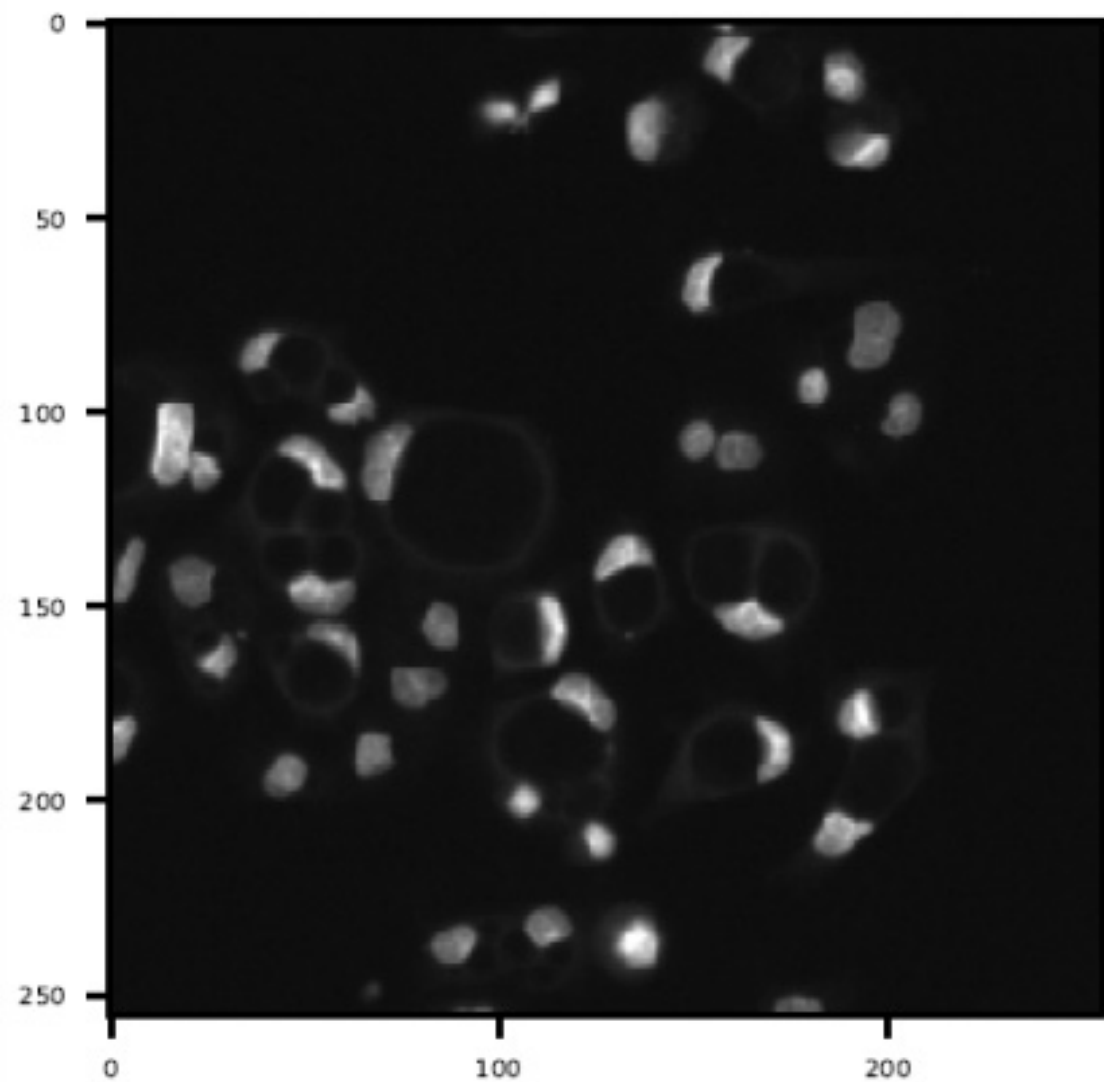
increase # of compounds for experiments



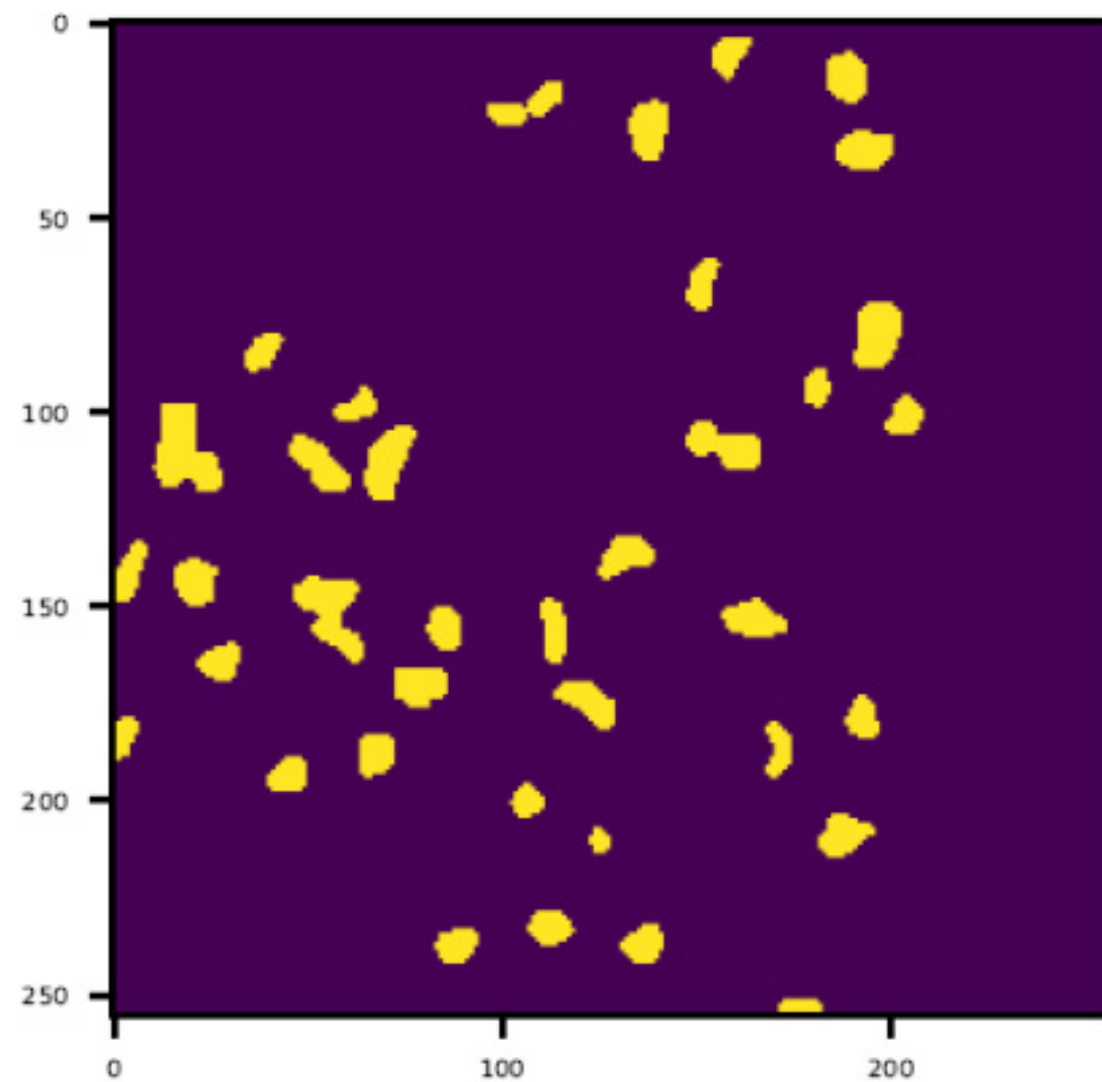
improve health and increase quality of life



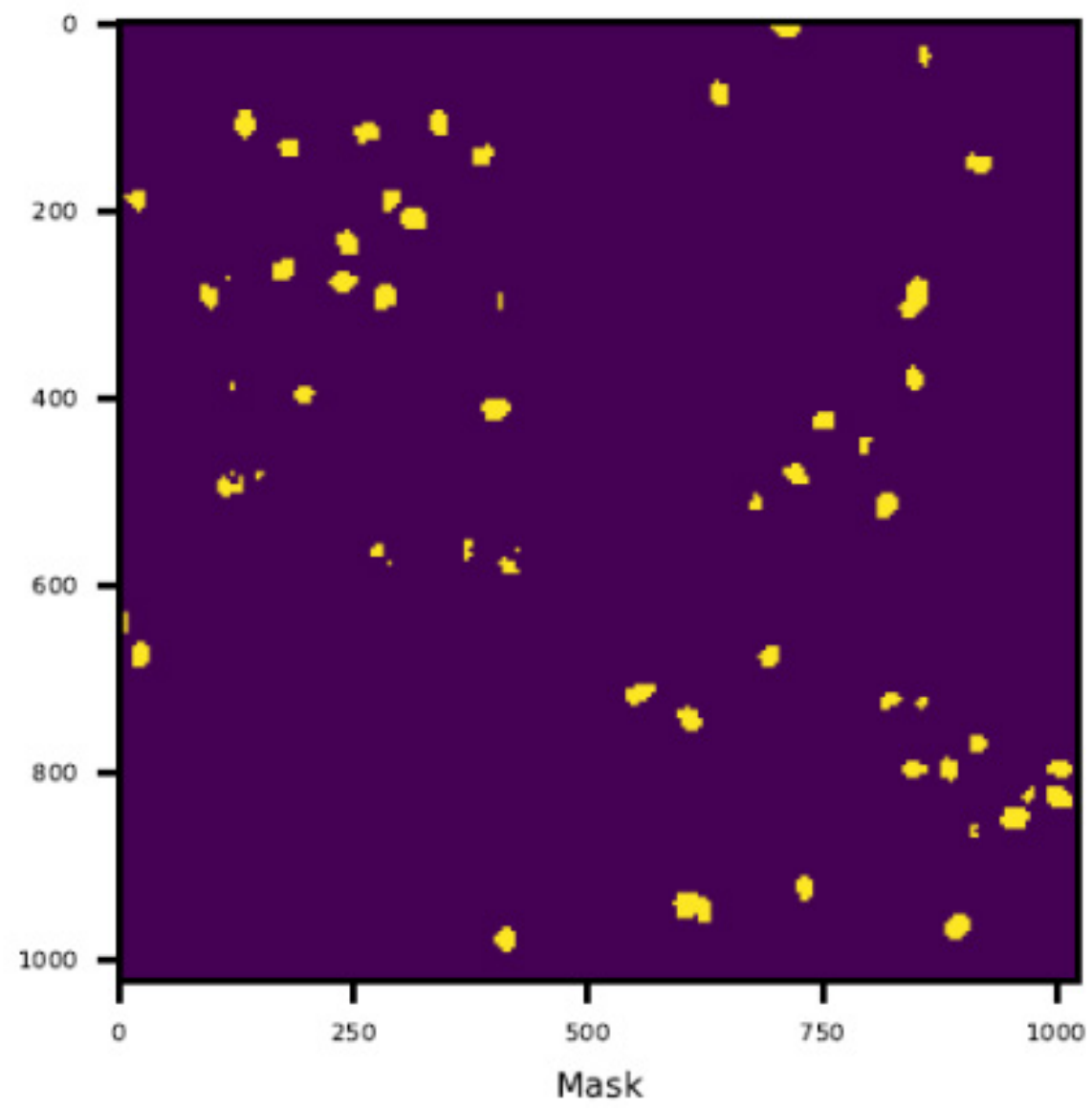
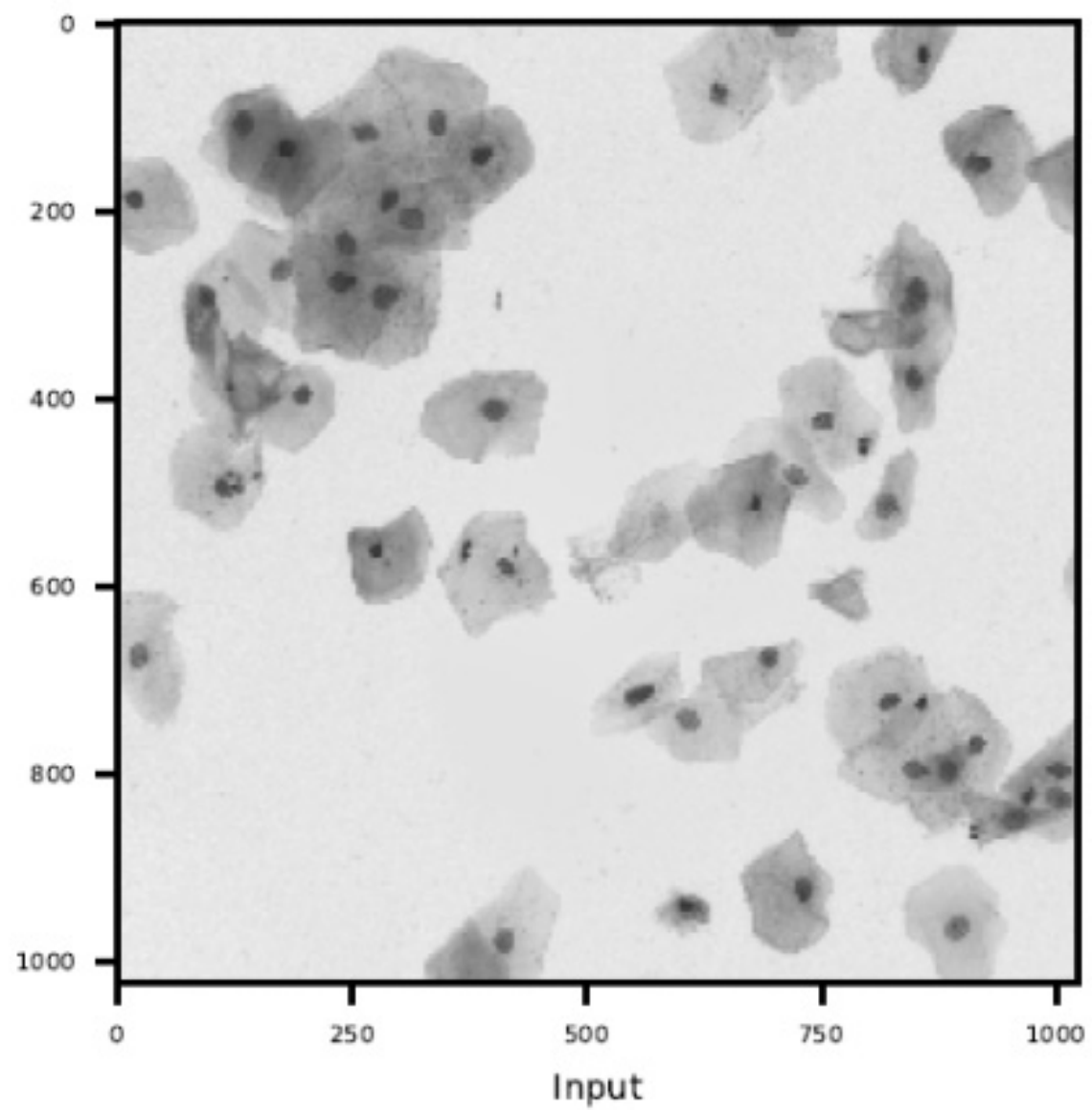


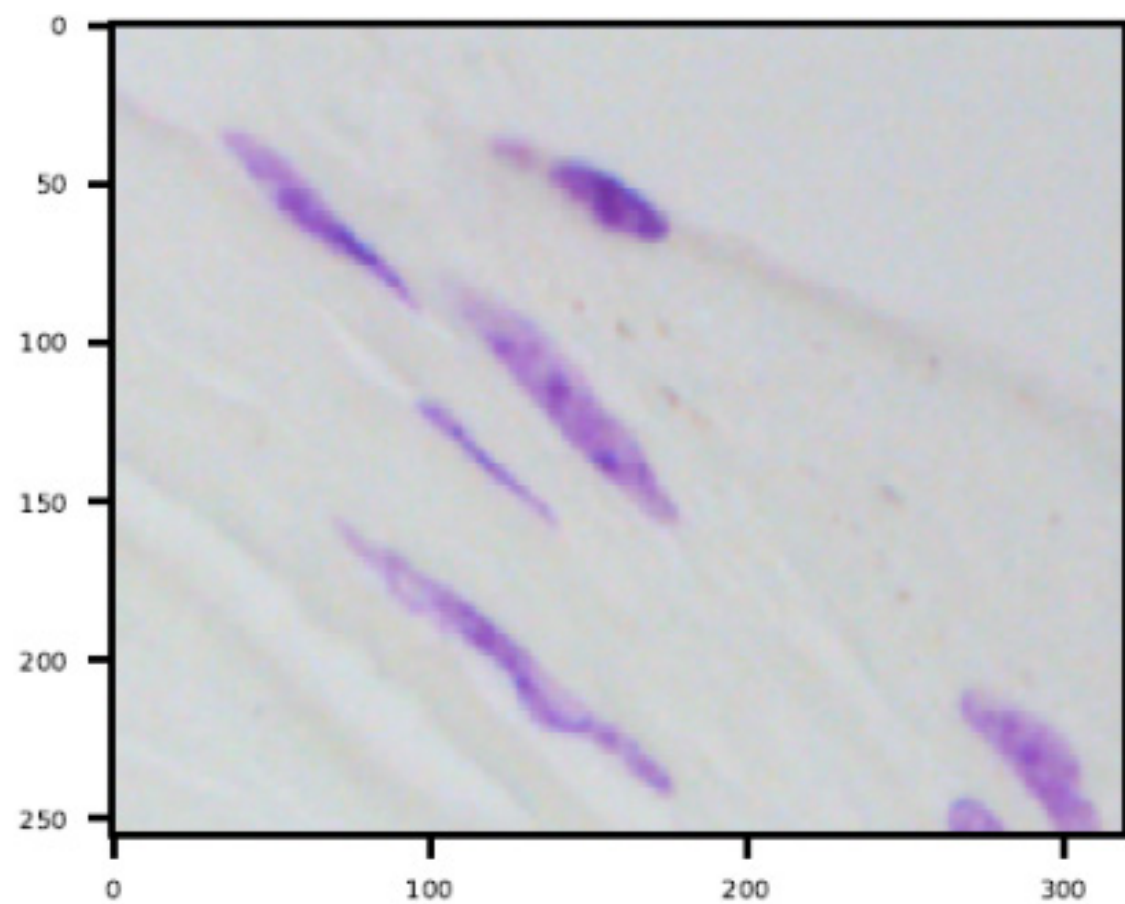


Input

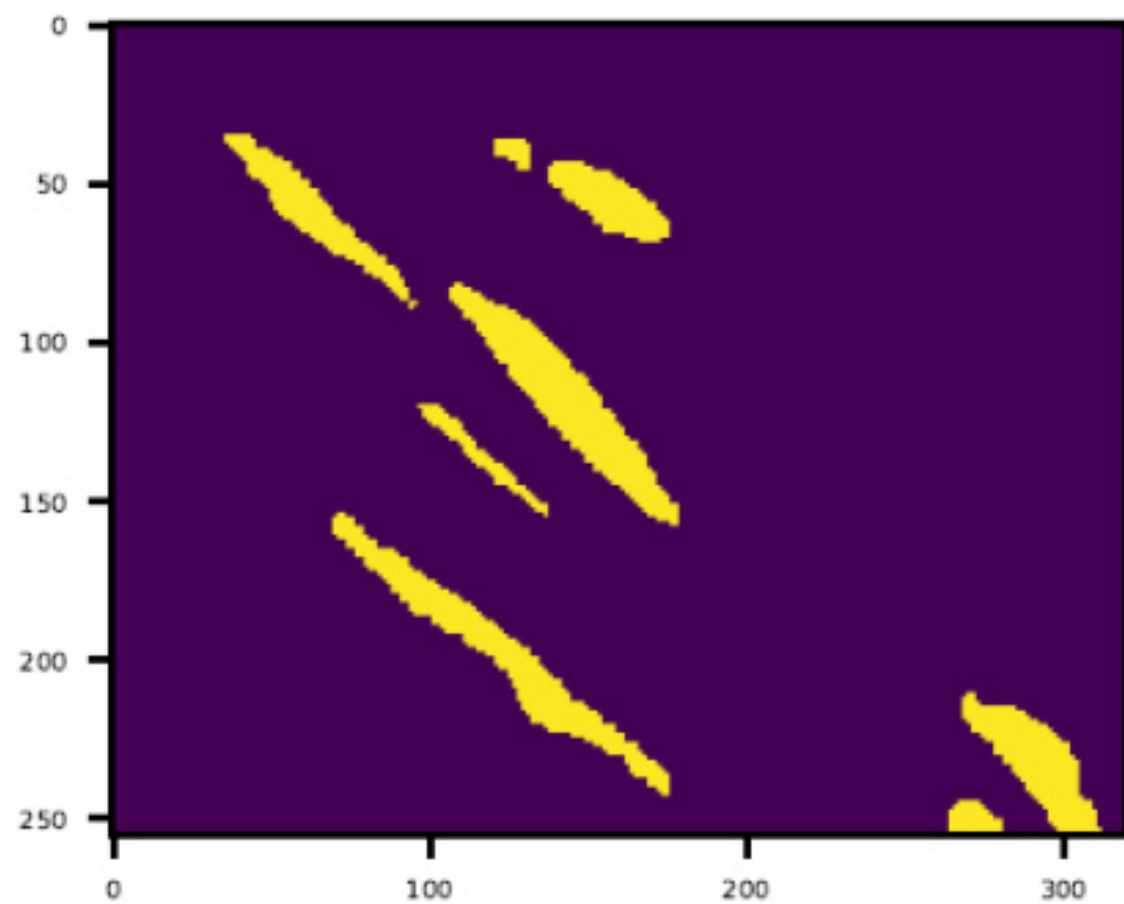


Mask

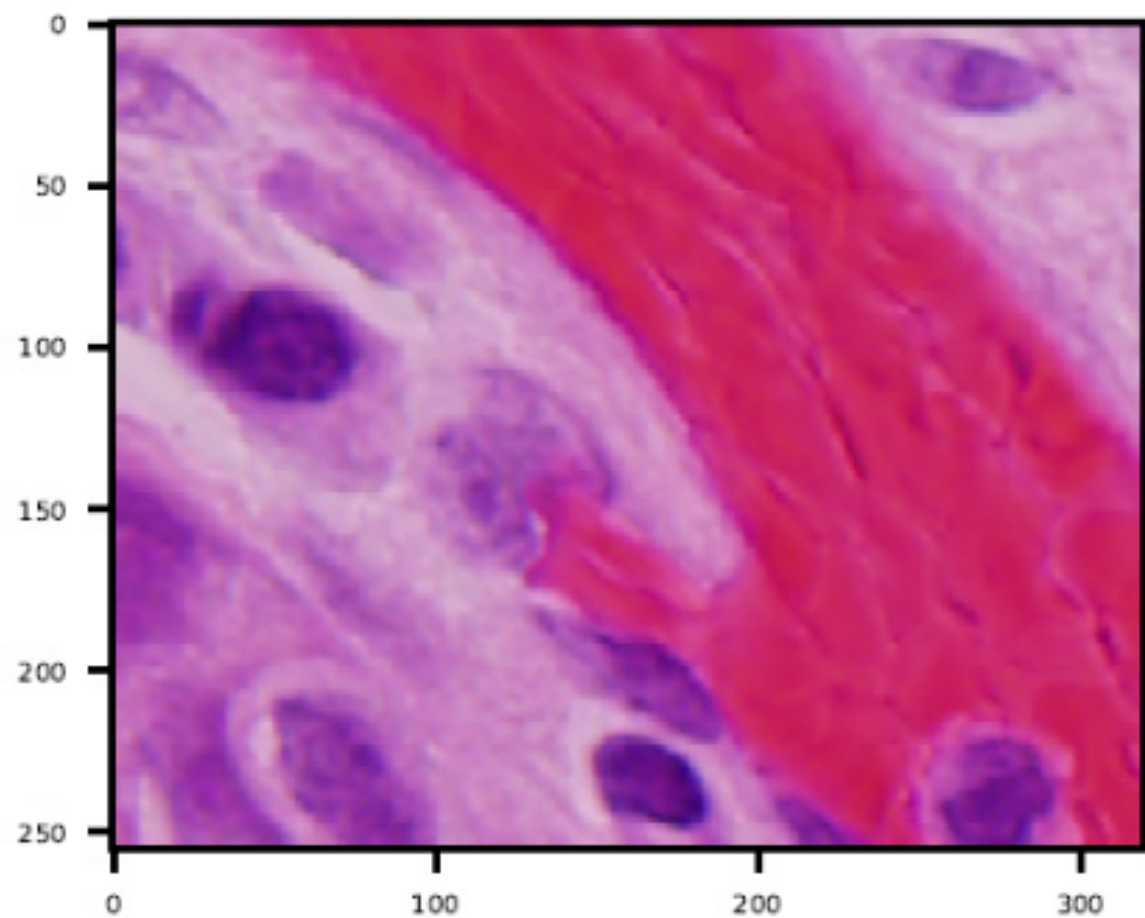




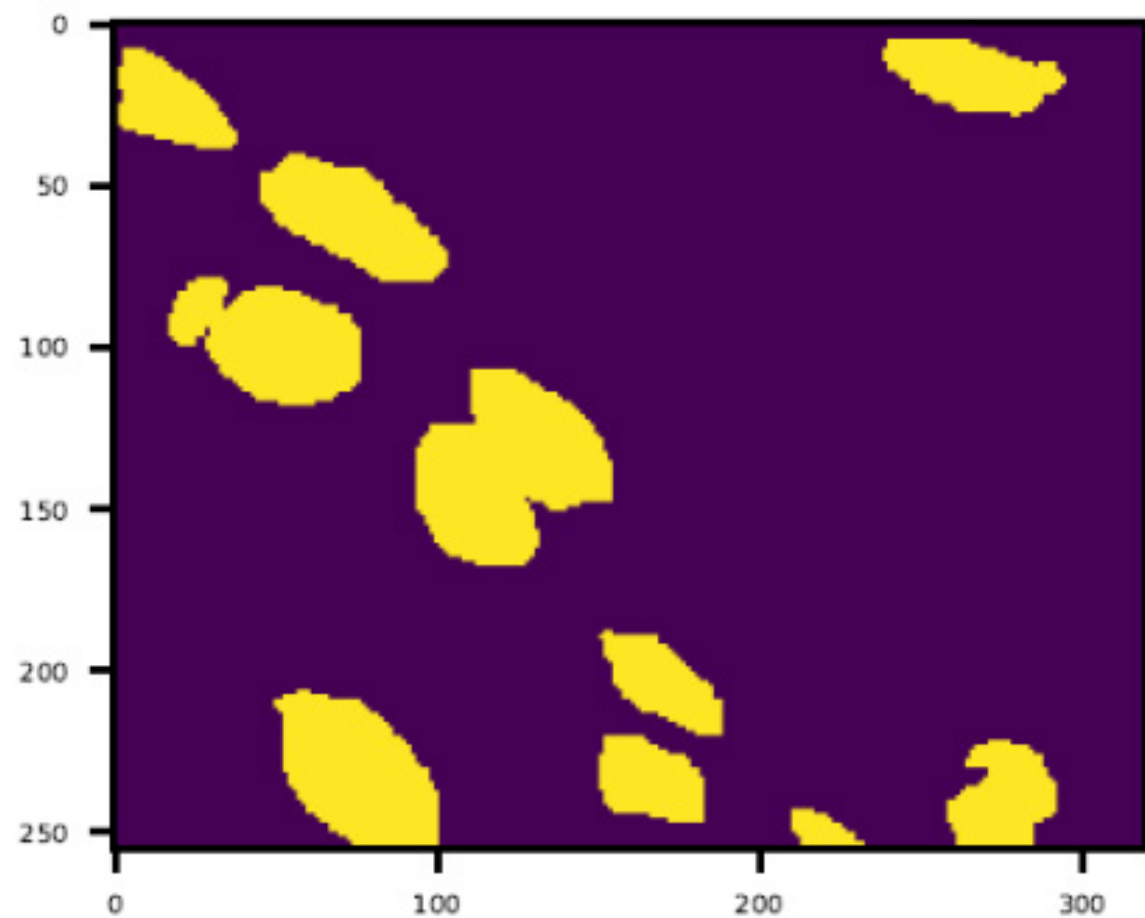
Input



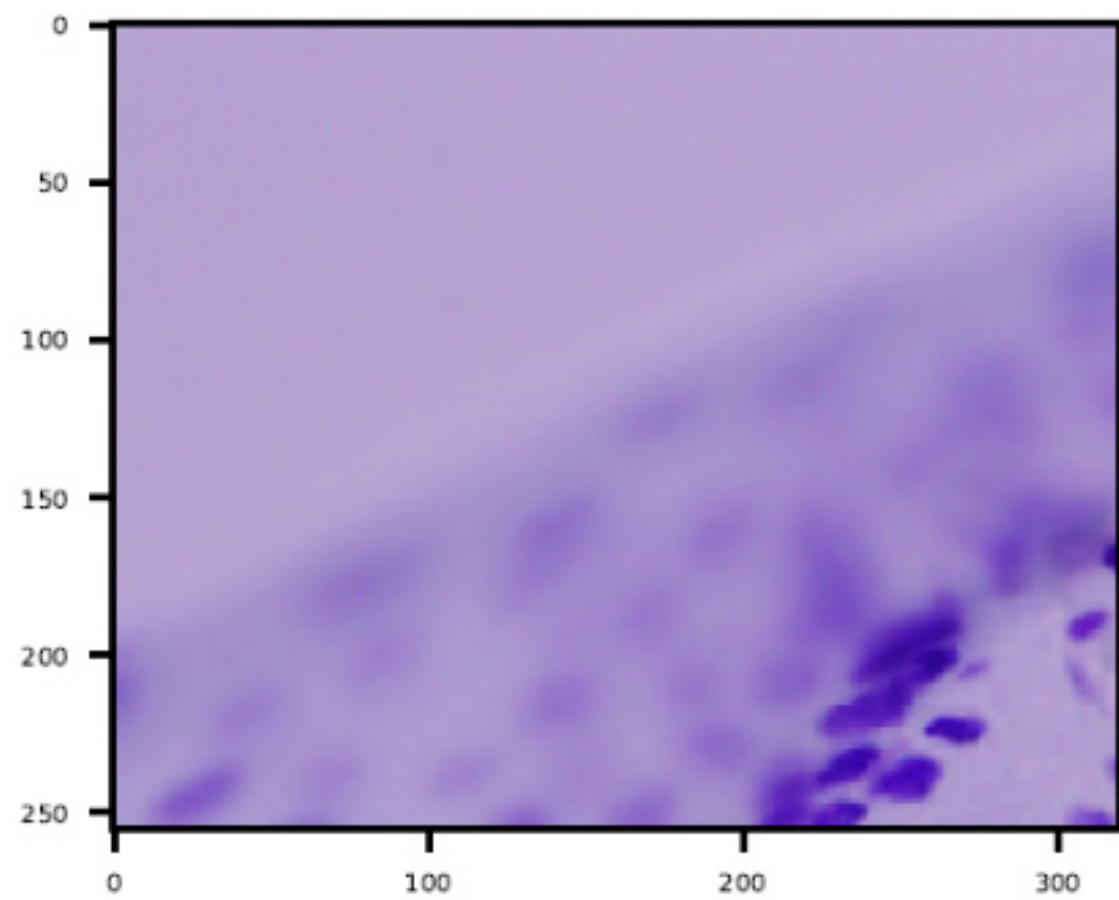
Mask



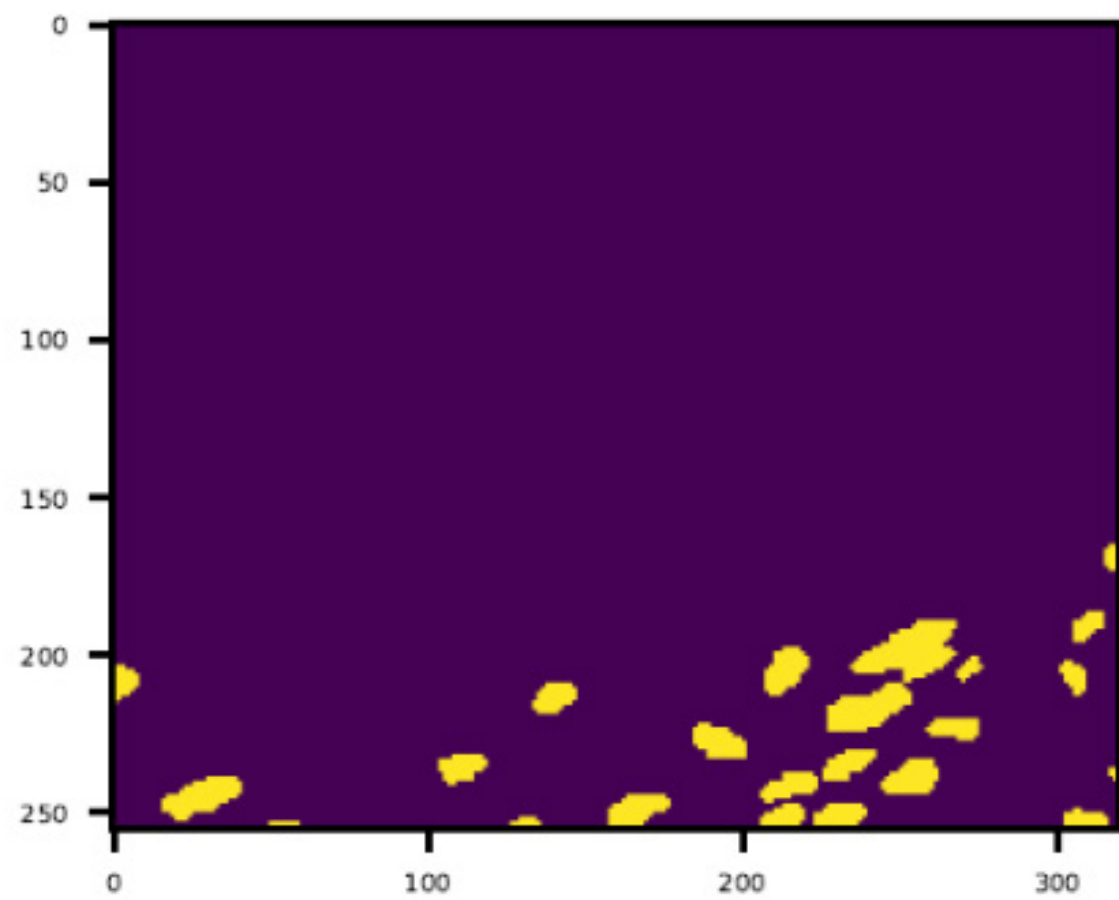
Input



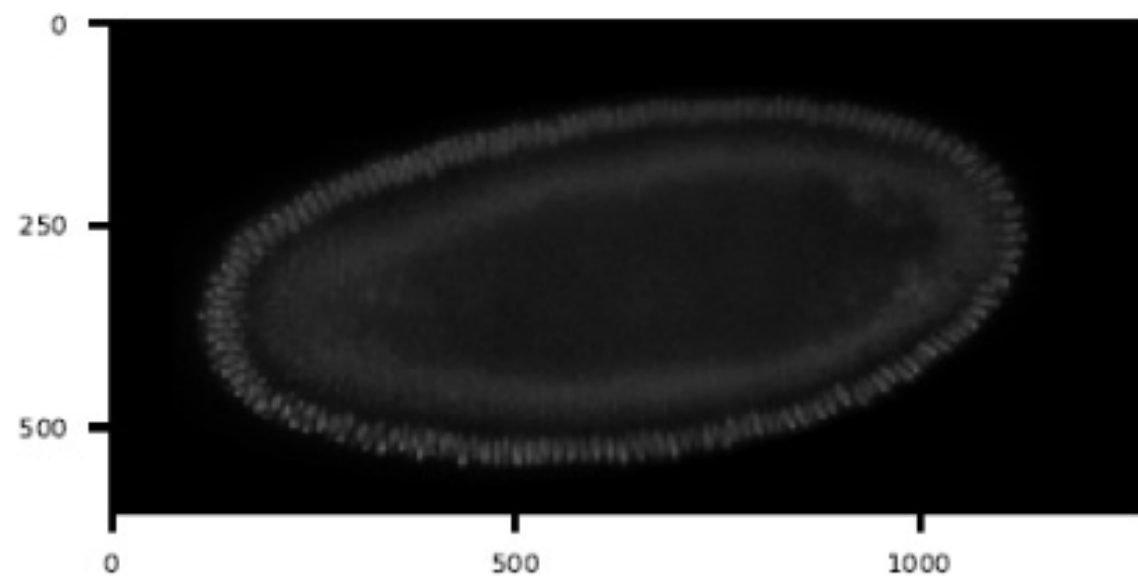
Mask



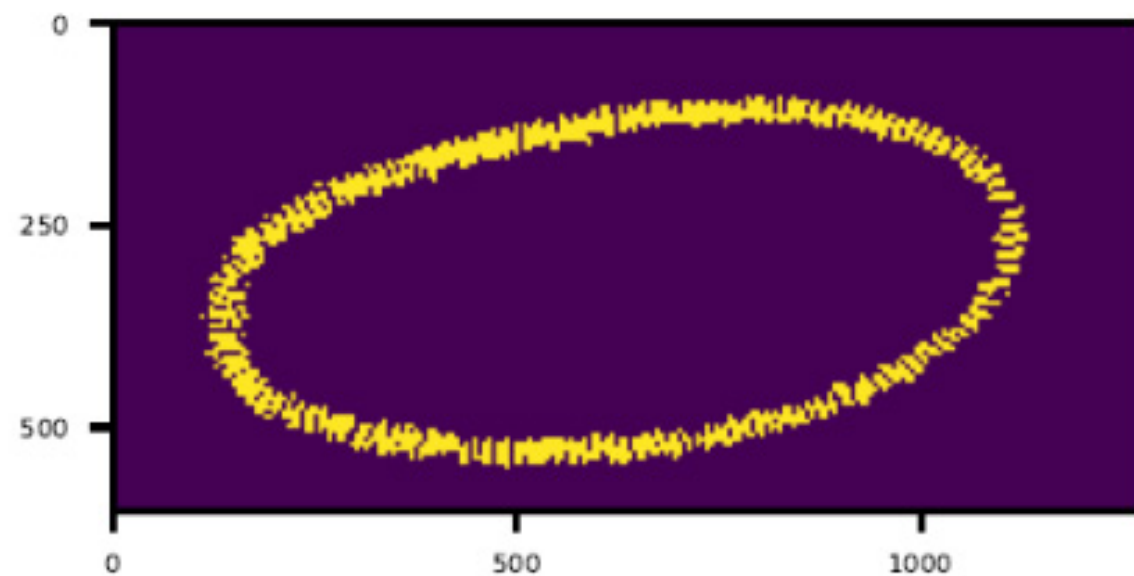
Input



Mask



Input

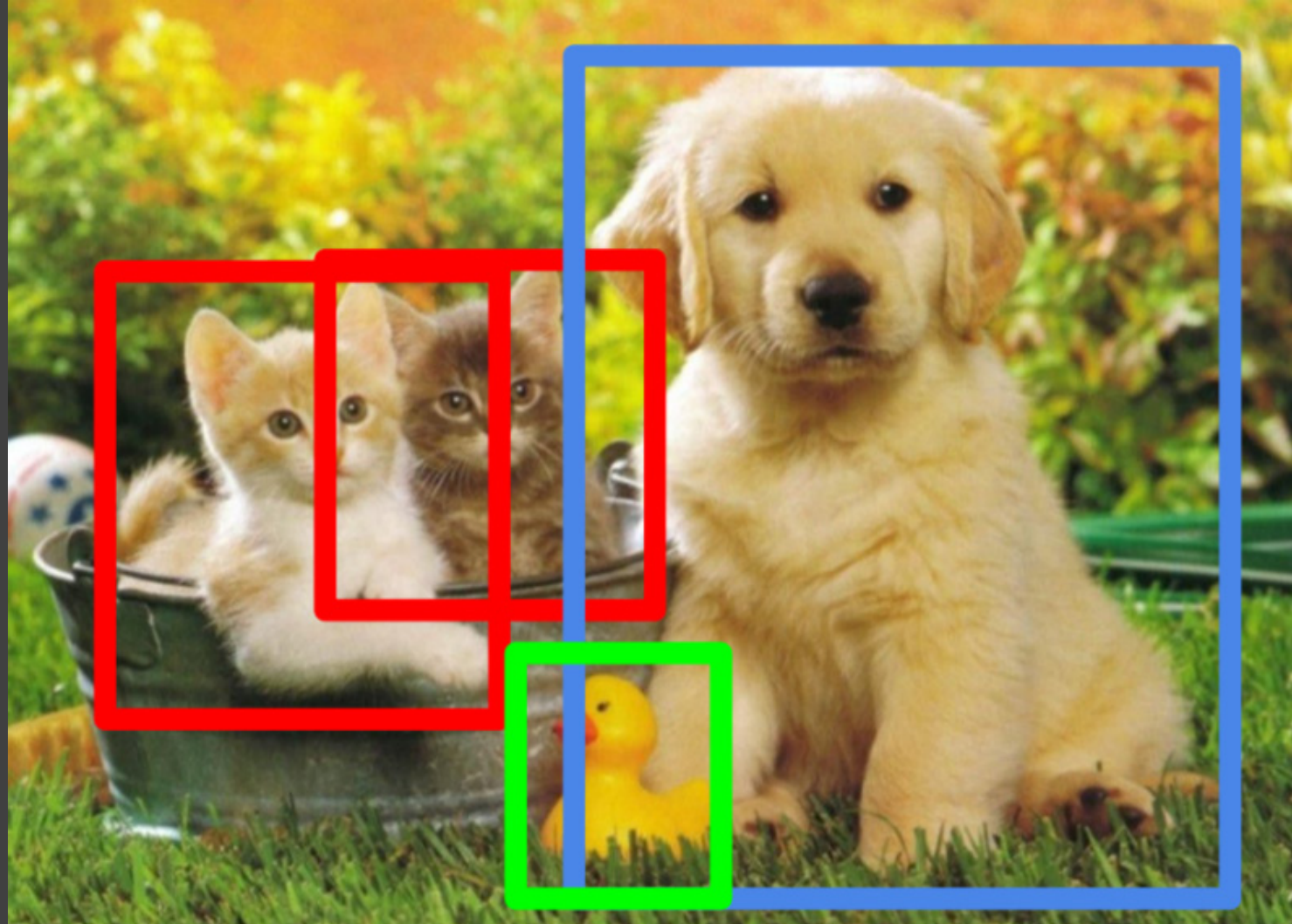


Mask

Image Classification



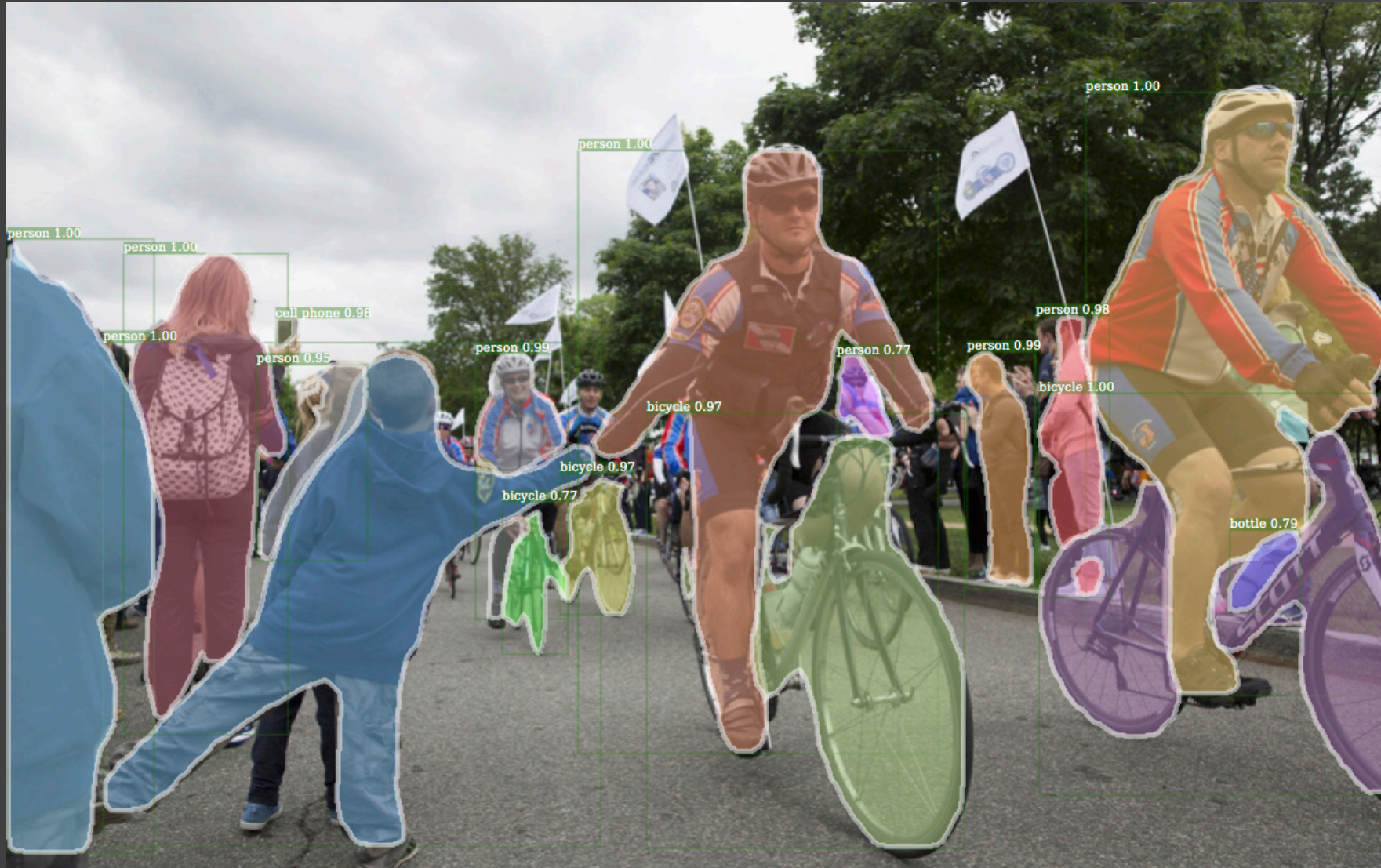
Object Detection



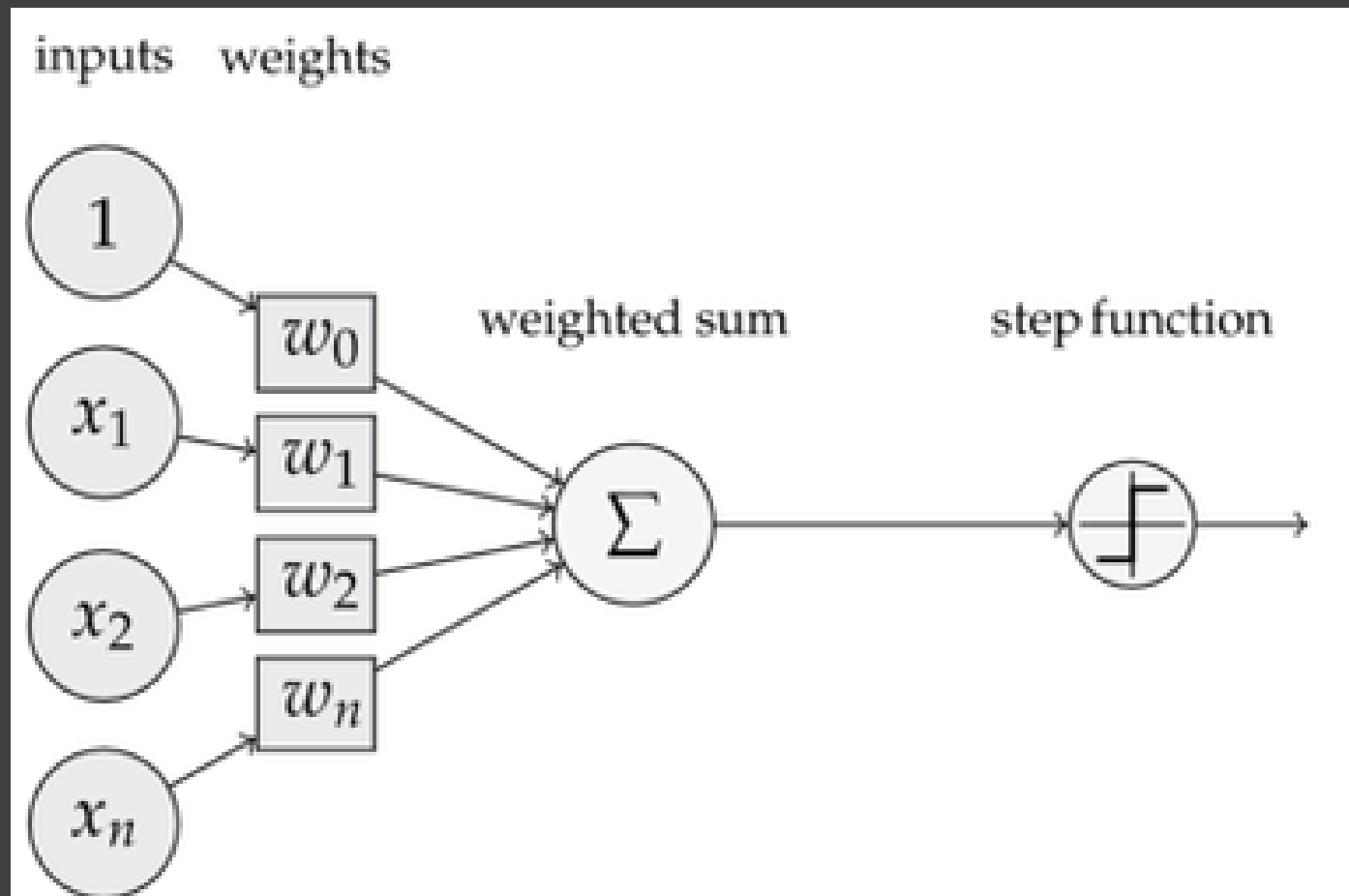
Semantic Segmentation



Instance Segmentation

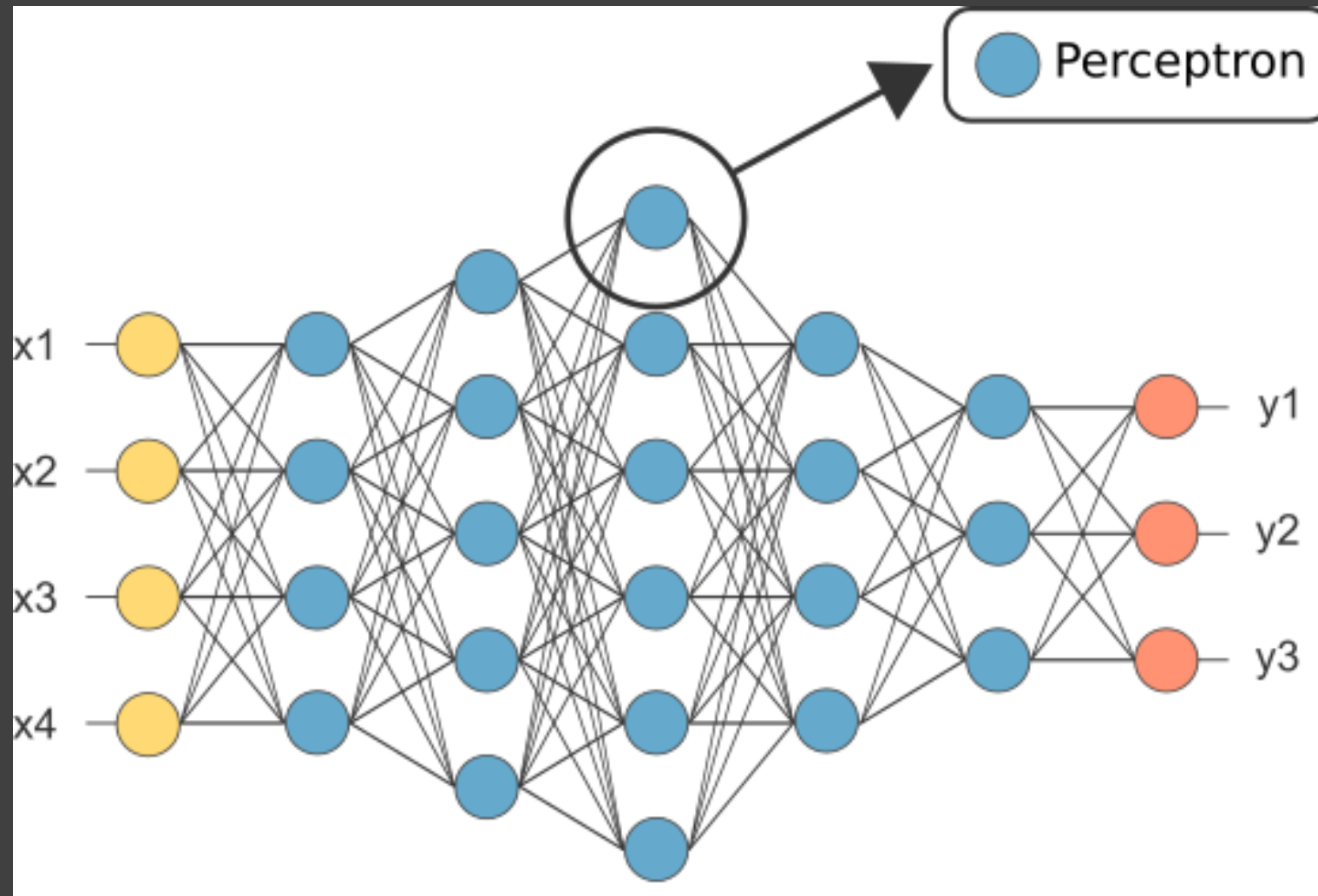


Perceptron - (Frank Rosenblatt)





Rete neurale



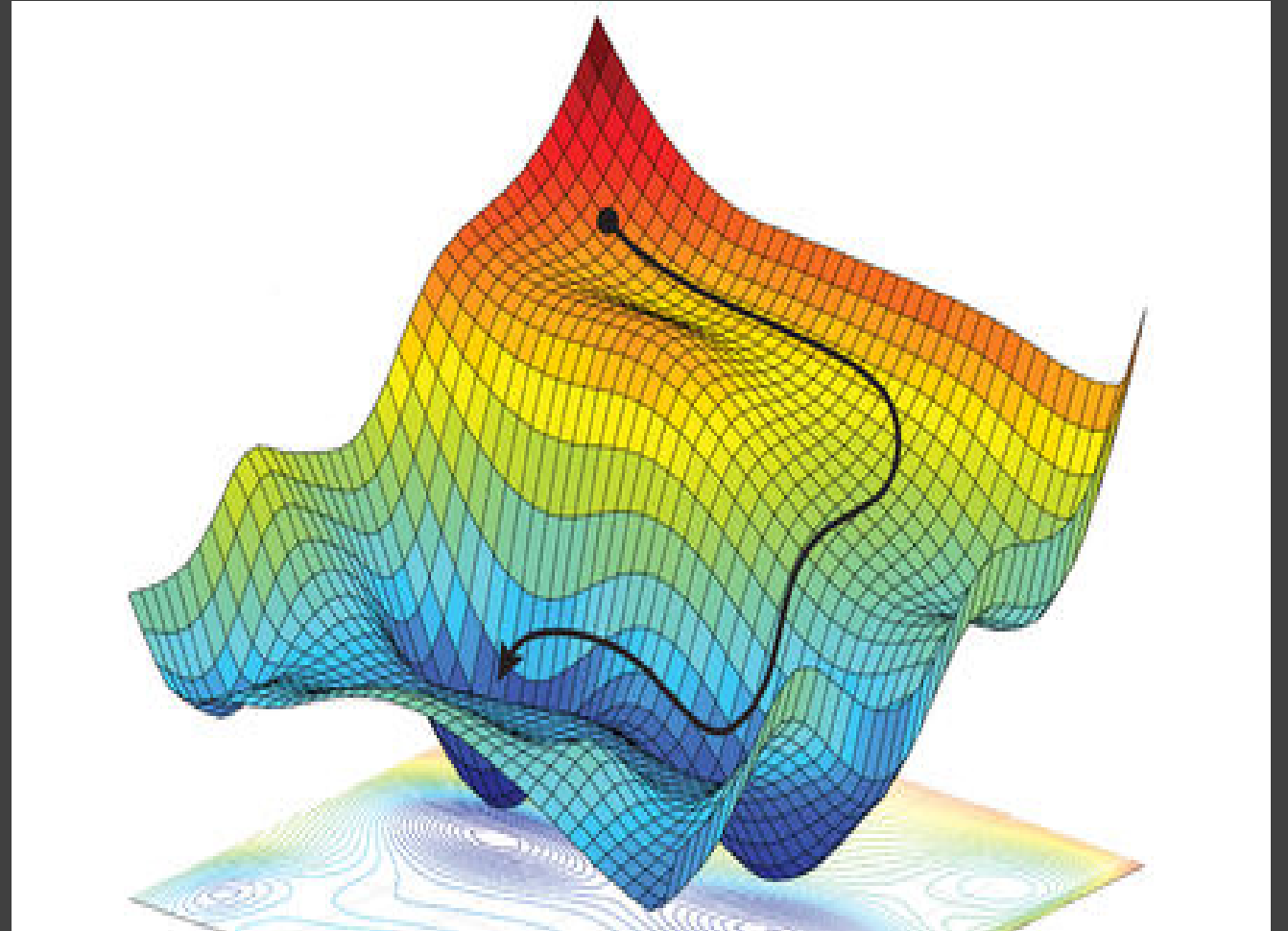
Learning: Gradient Descent + Backpropagation

TL;DR

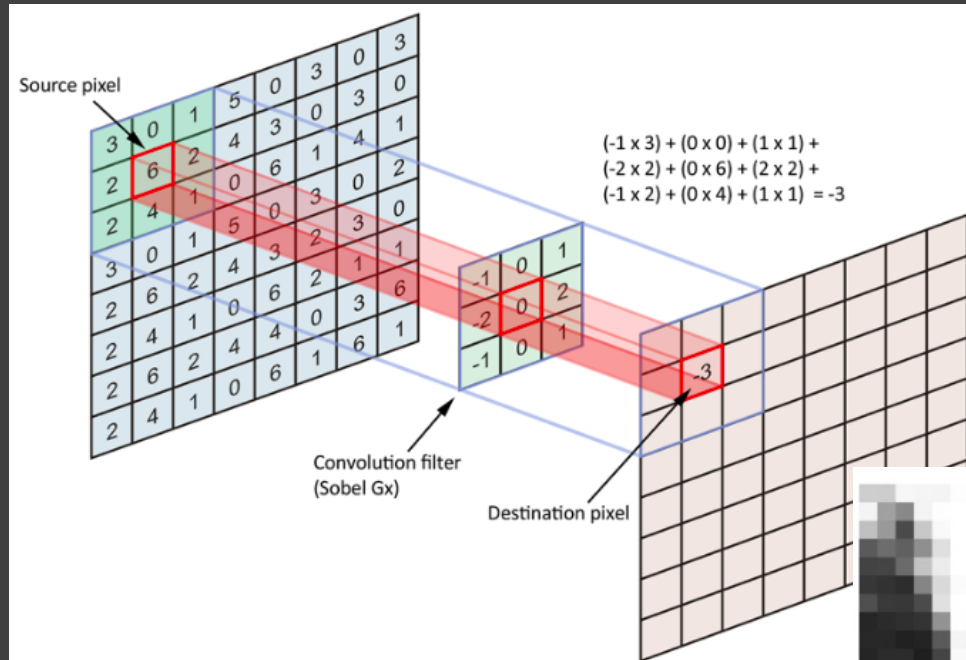
Modificare iterativamente
parametri



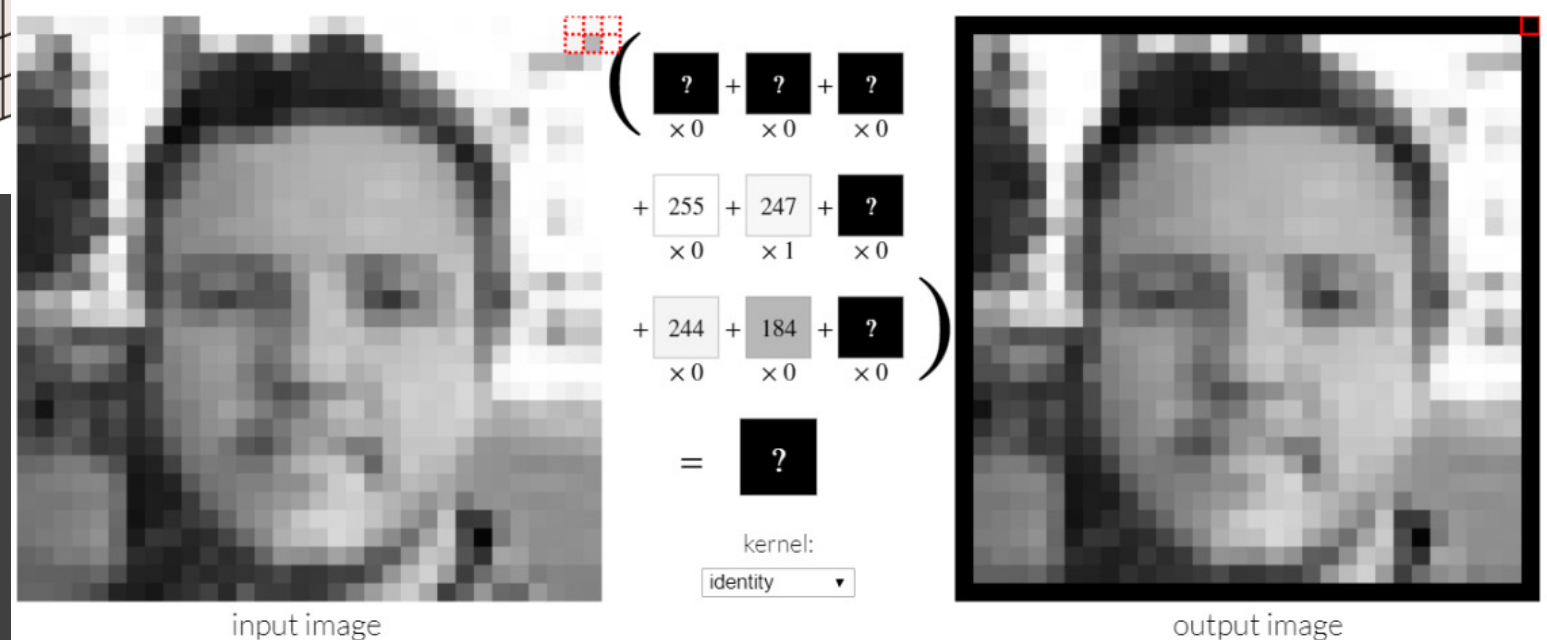
Migliorare risultati
algoritmo



Convolutional Filter



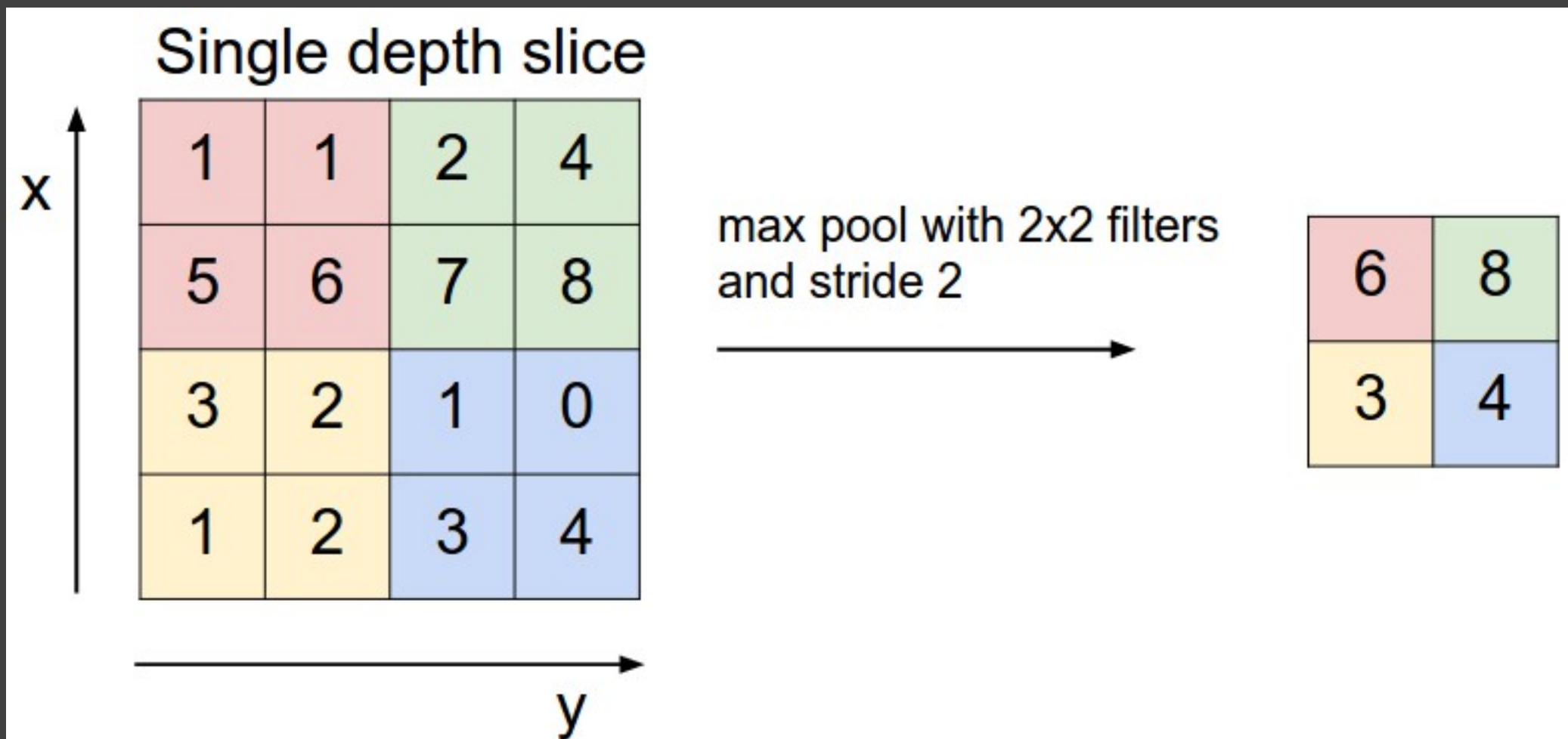
Explained Visually (<http://setosa.io/ev/image-kernels/>)



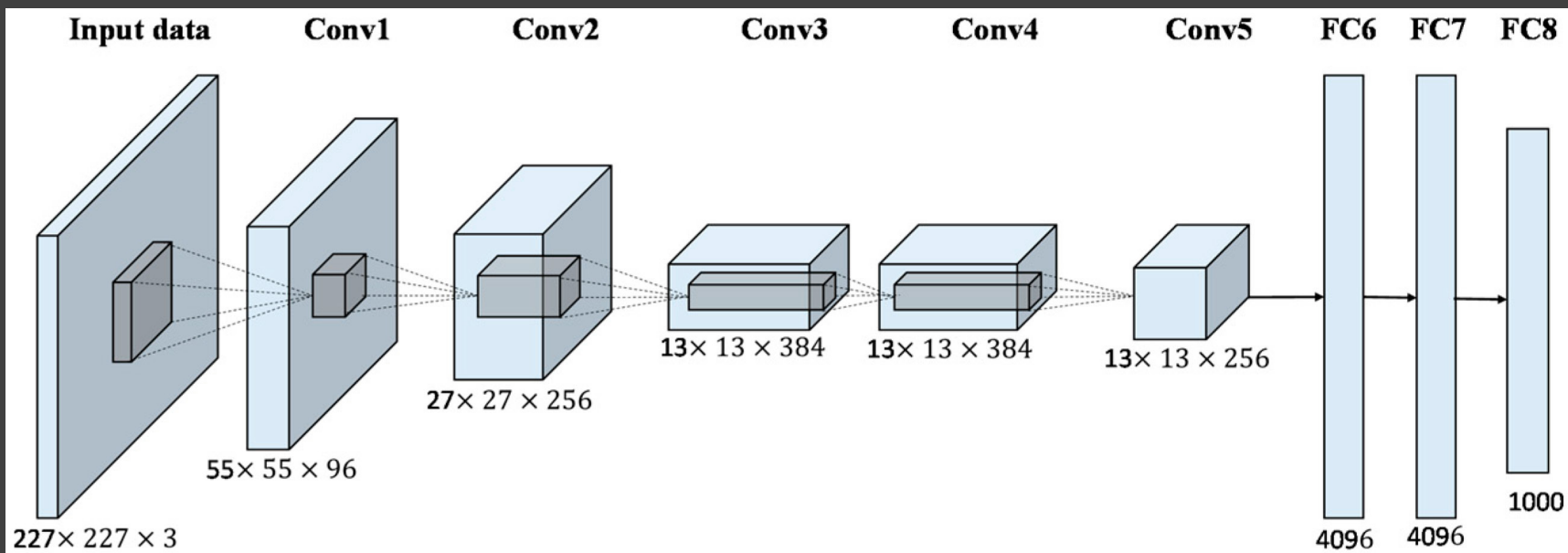
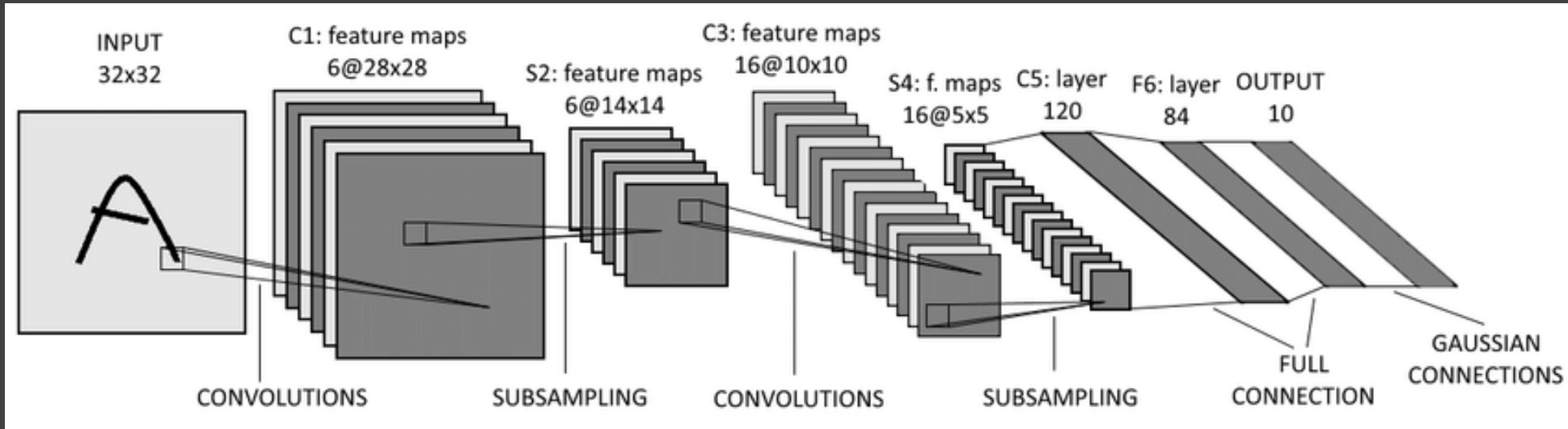
Esempio filtri



Pooling

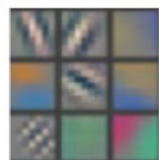


LeNet-5 (Yann LeCun) - AlexNet (Alex Krizhevsky)

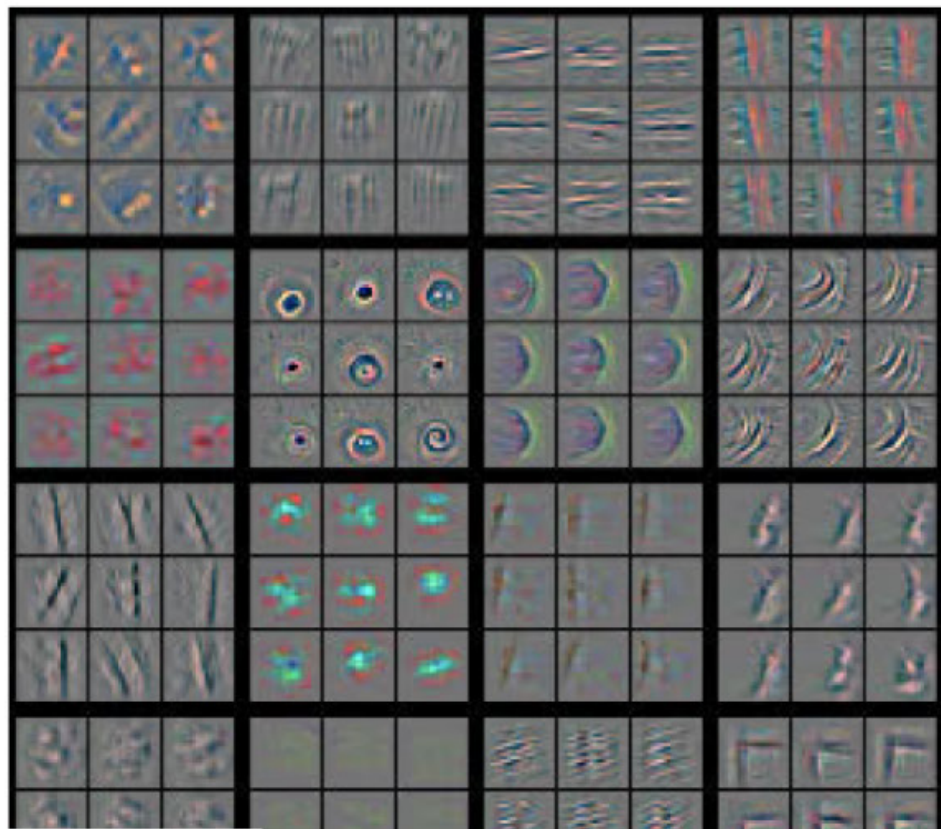
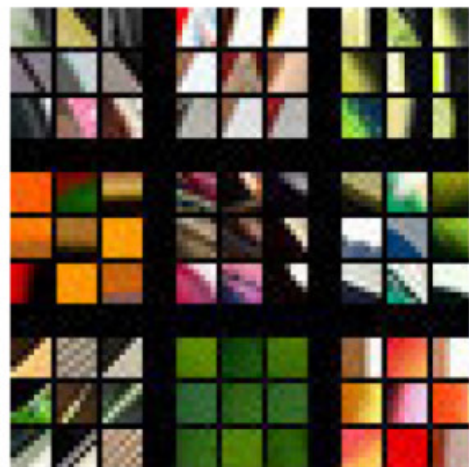


Visualizing and Understanding Convolutional Networks

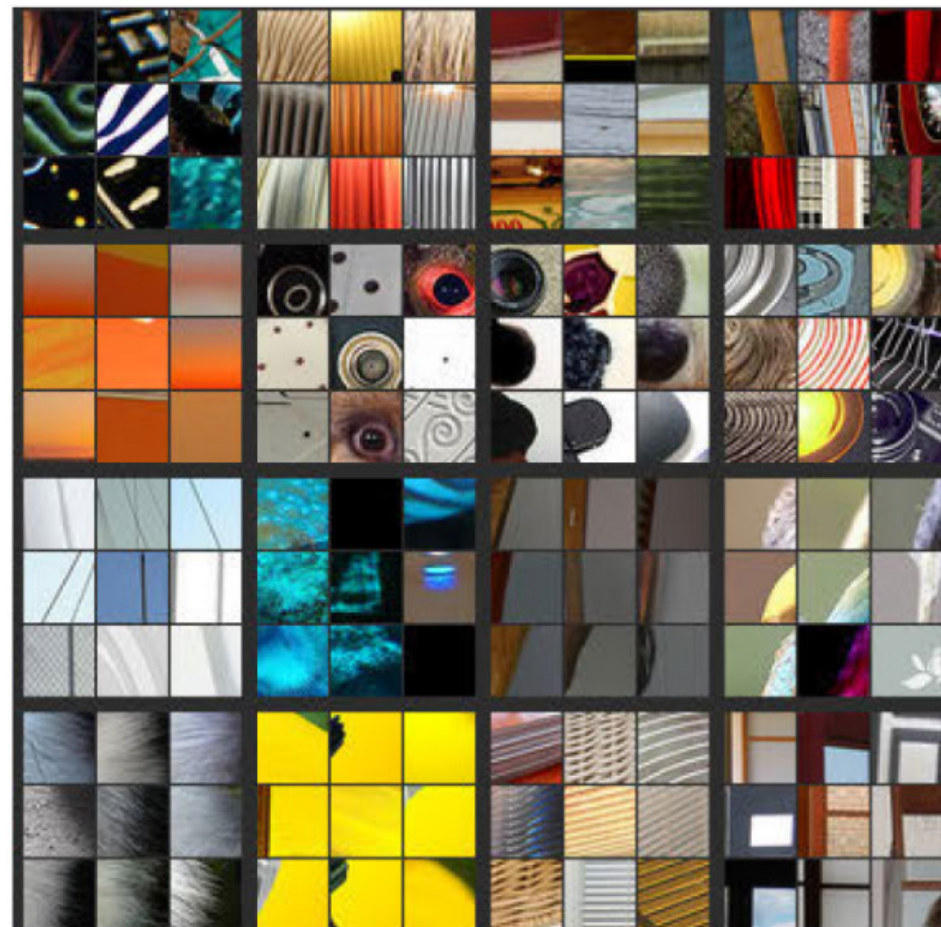
(<https://arxiv.org/abs/1311.2901>)



Layer 1



Layer 2



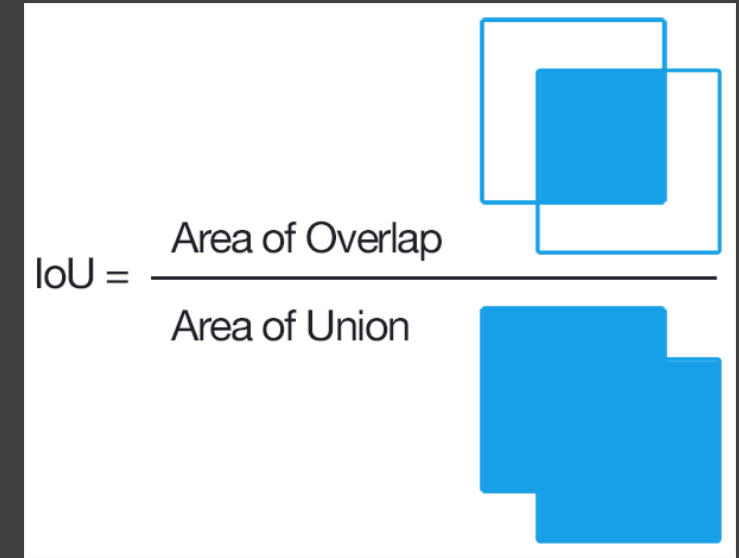
si parte!!

Comprensione del problema

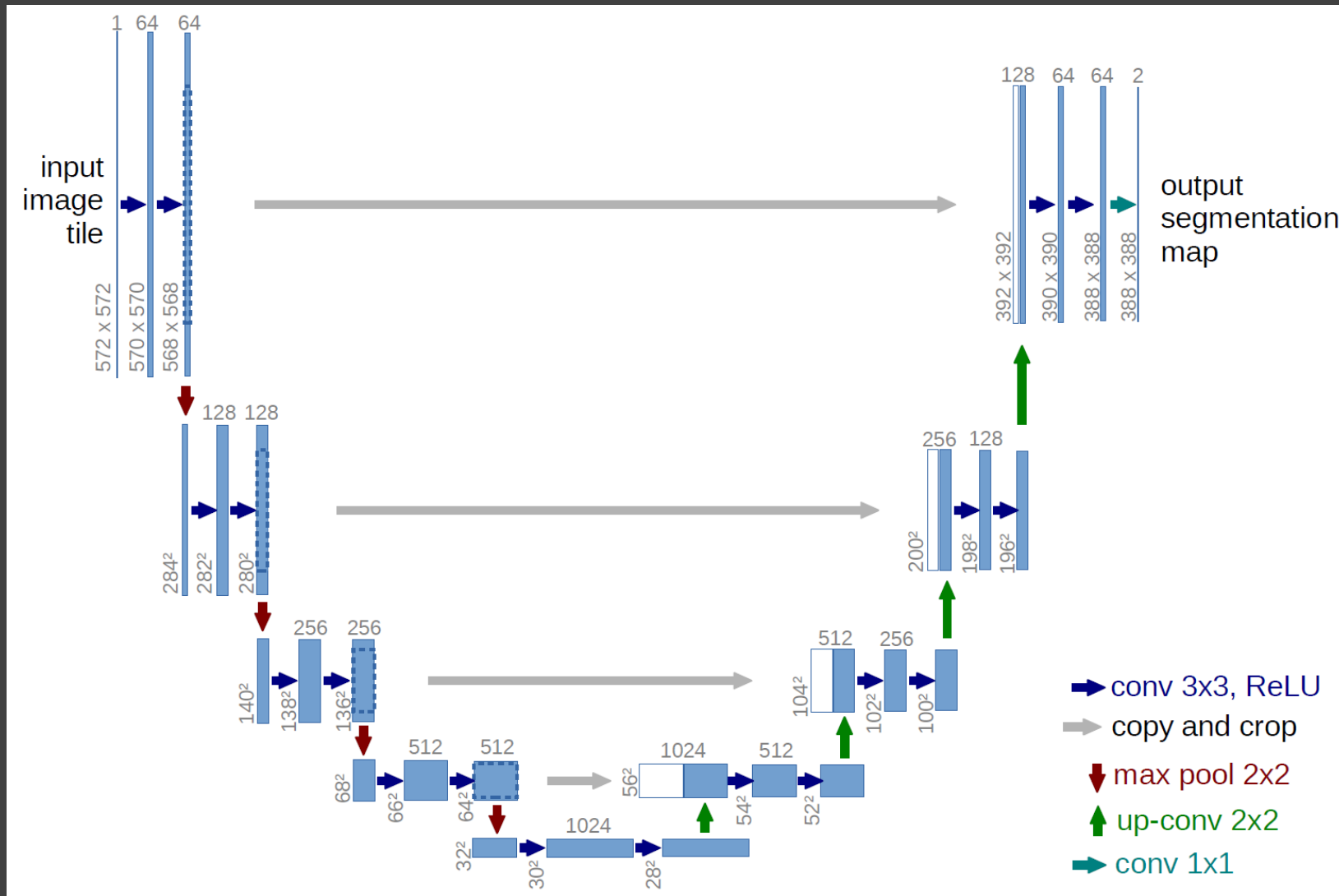
- Criterio di valutazione:
 - Intersection over Union (IoU)
 - Soglie (0.5 - 0.95)

$$\frac{1}{|thresholds|} \sum_t \frac{TP(t)}{TP(t) + FP(t) + FN(t)}$$

- Strategia di validazione



U-Net (2015) (<https://arxiv.org/abs/1505.04597>)



R-CNN (2014) (<https://arxiv.org/abs/1311.2524>)

R-CNN: *Regions with CNN features*

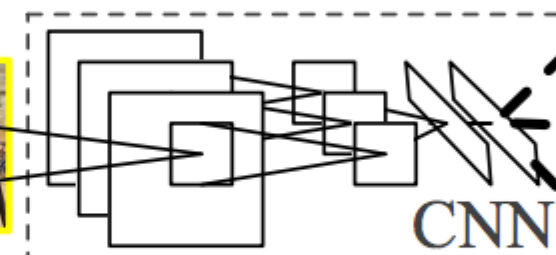


1. Input image

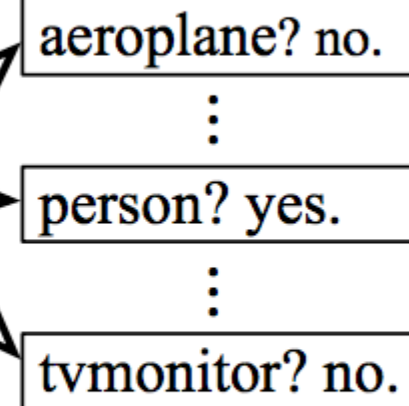


2. Extract region proposals (~2k)

warped region

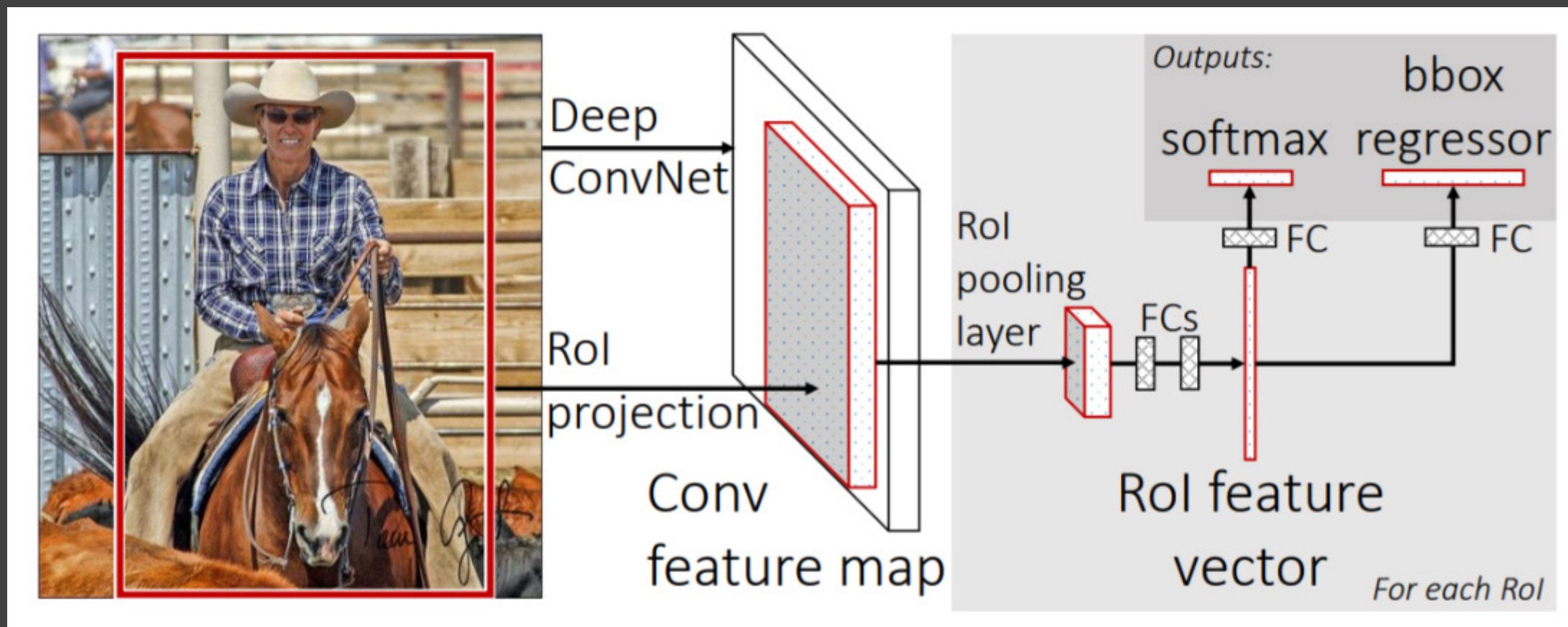


3. Compute CNN features

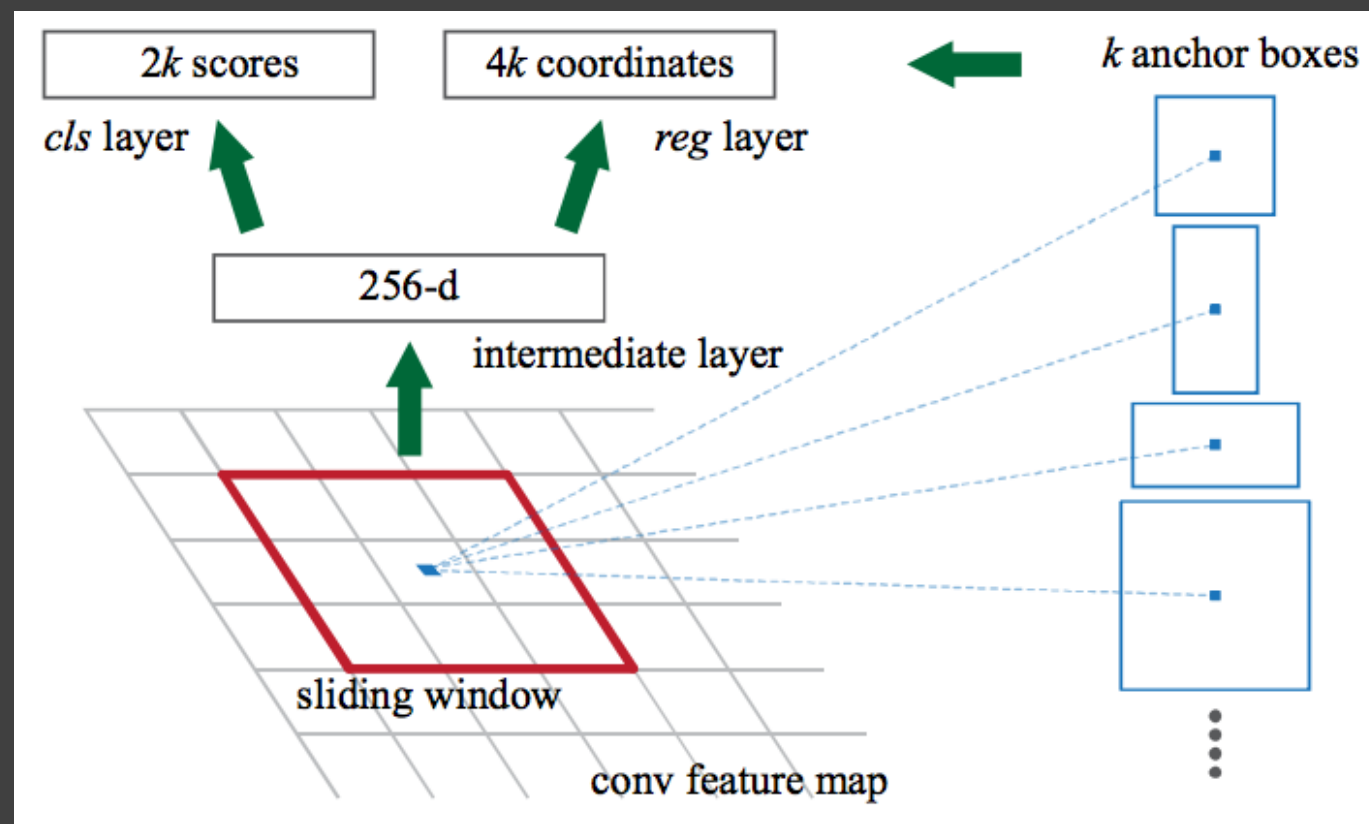
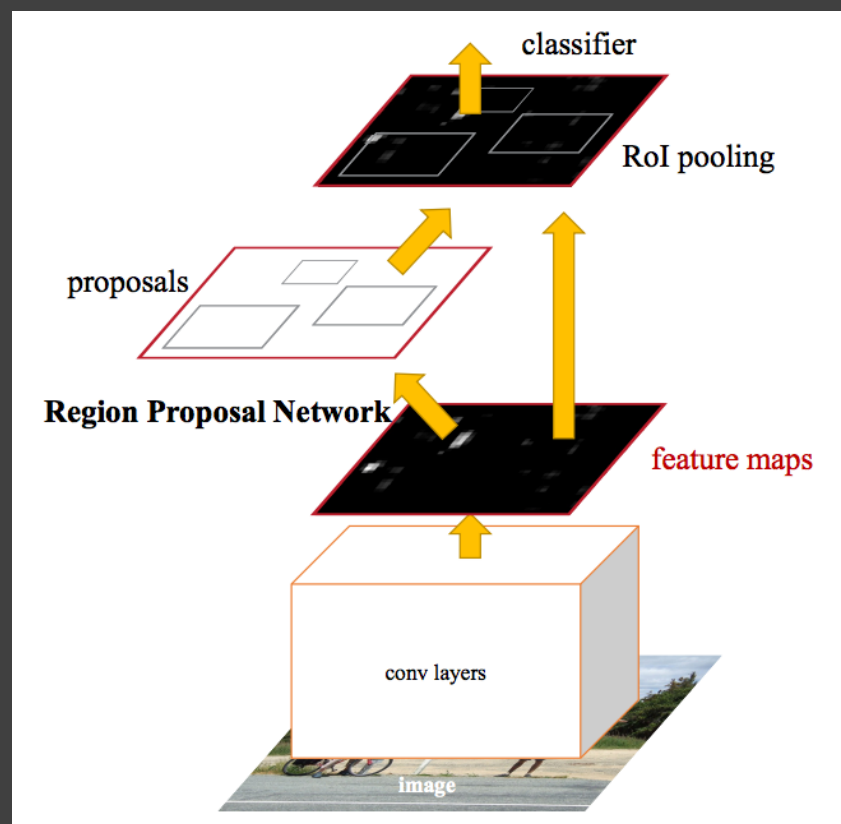


4. Classify regions

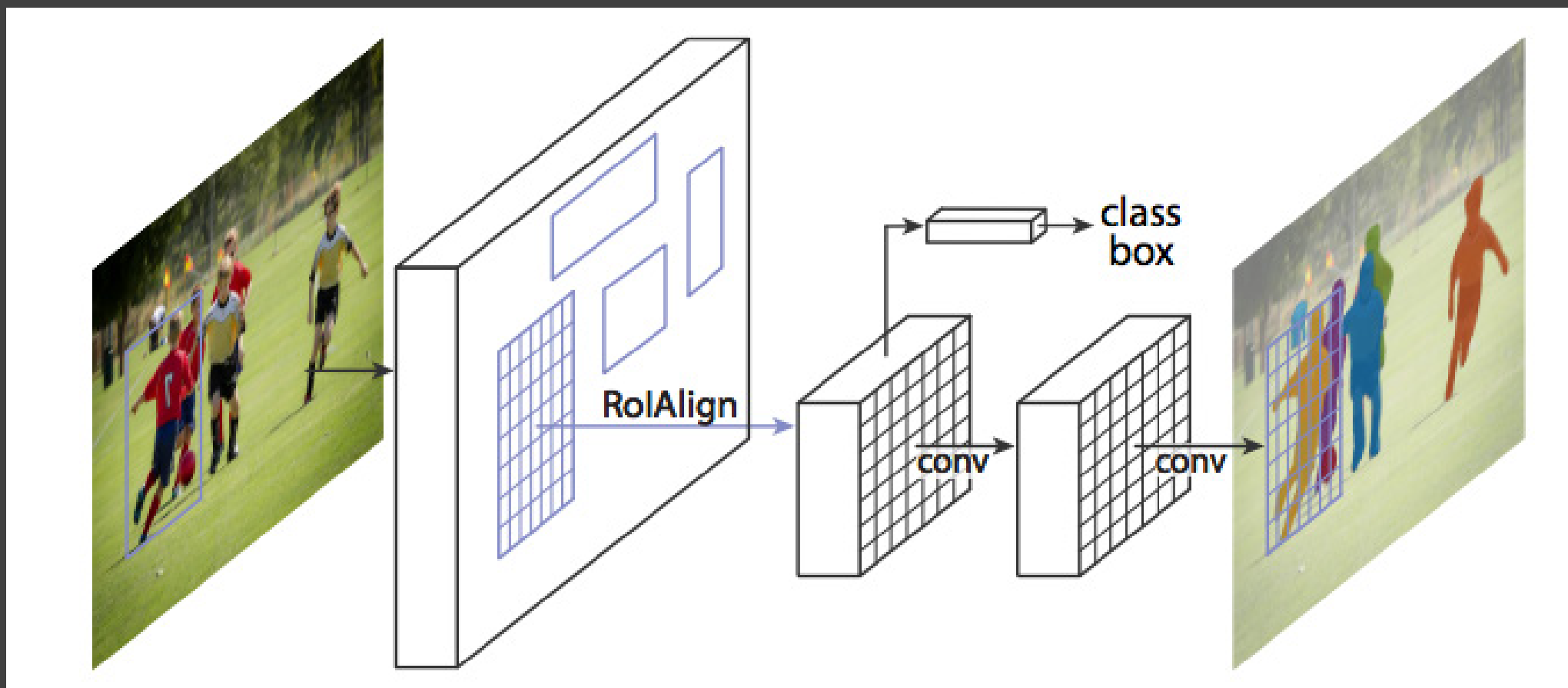
Fast R-CNN (2015) (<https://arxiv.org/abs/1504.08083>)



Faster R-CNN (2015) (<https://arxiv.org/abs/1506.01497>)



Mask R-CNN (2017) (<https://arxiv.org/abs/1703.06870>)



Induzione





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