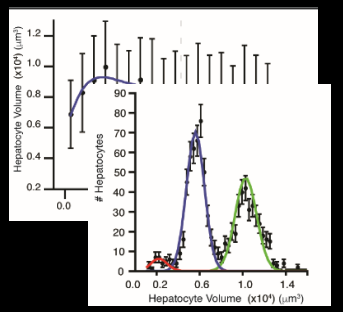
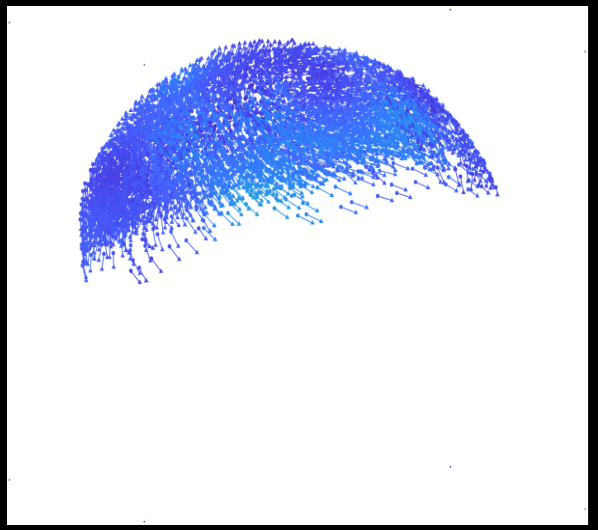
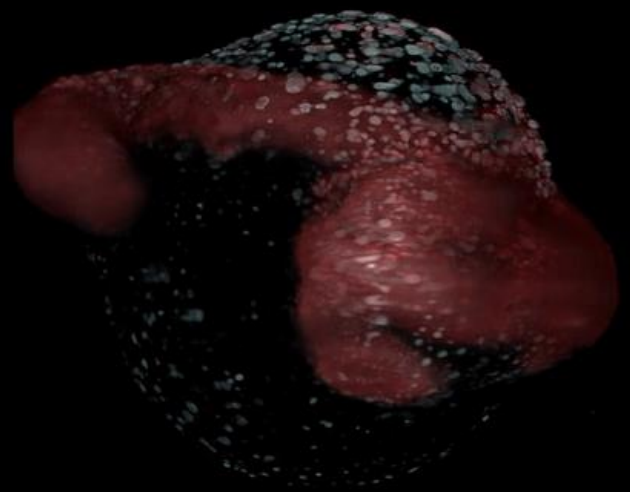
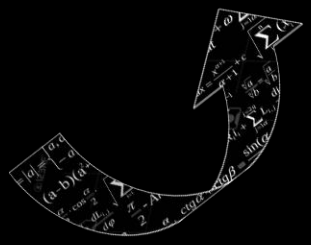
QUANTITATIVE ANALYSIS OF FLUORESCENT MICROSCOPY IMAGES





Seeing is Believing



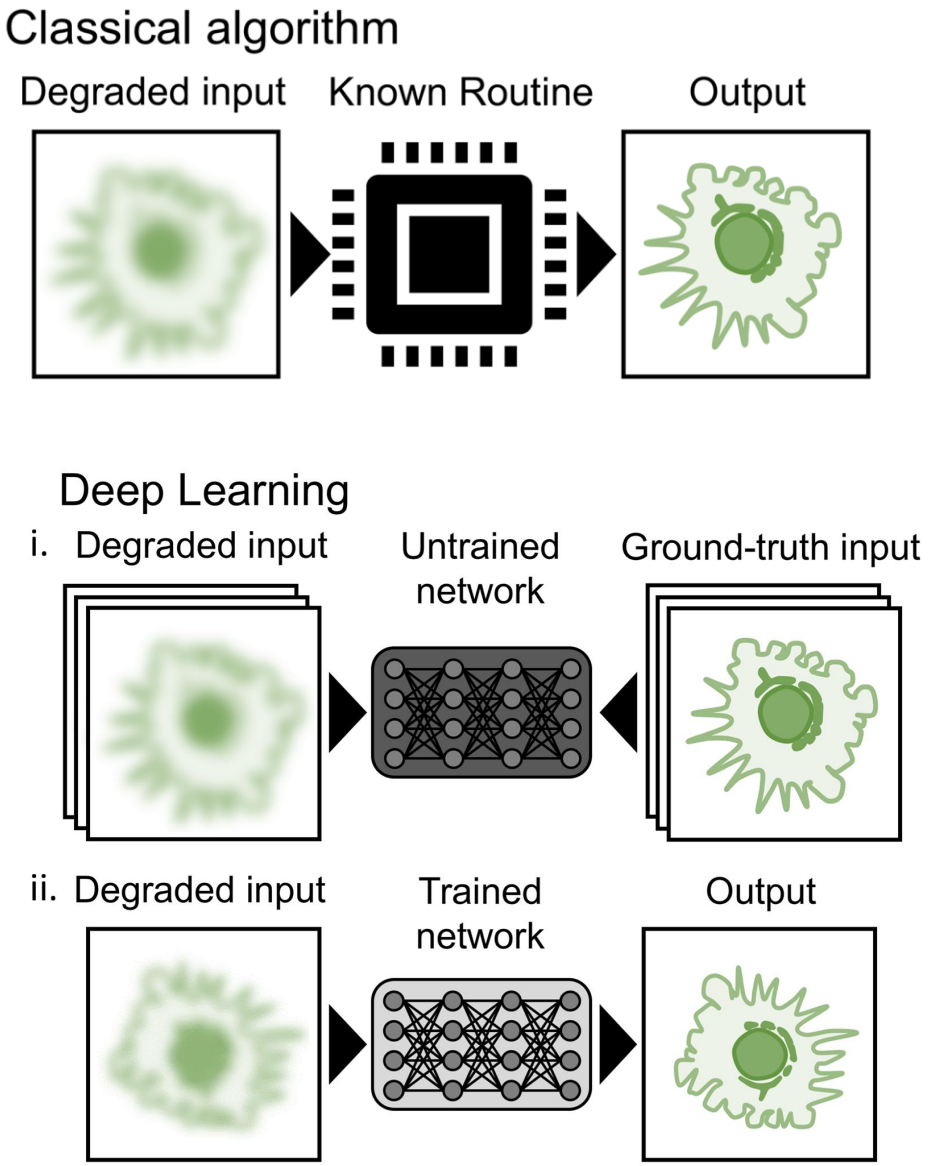


From Images to Knowledge

EPIC3
15.08.2023

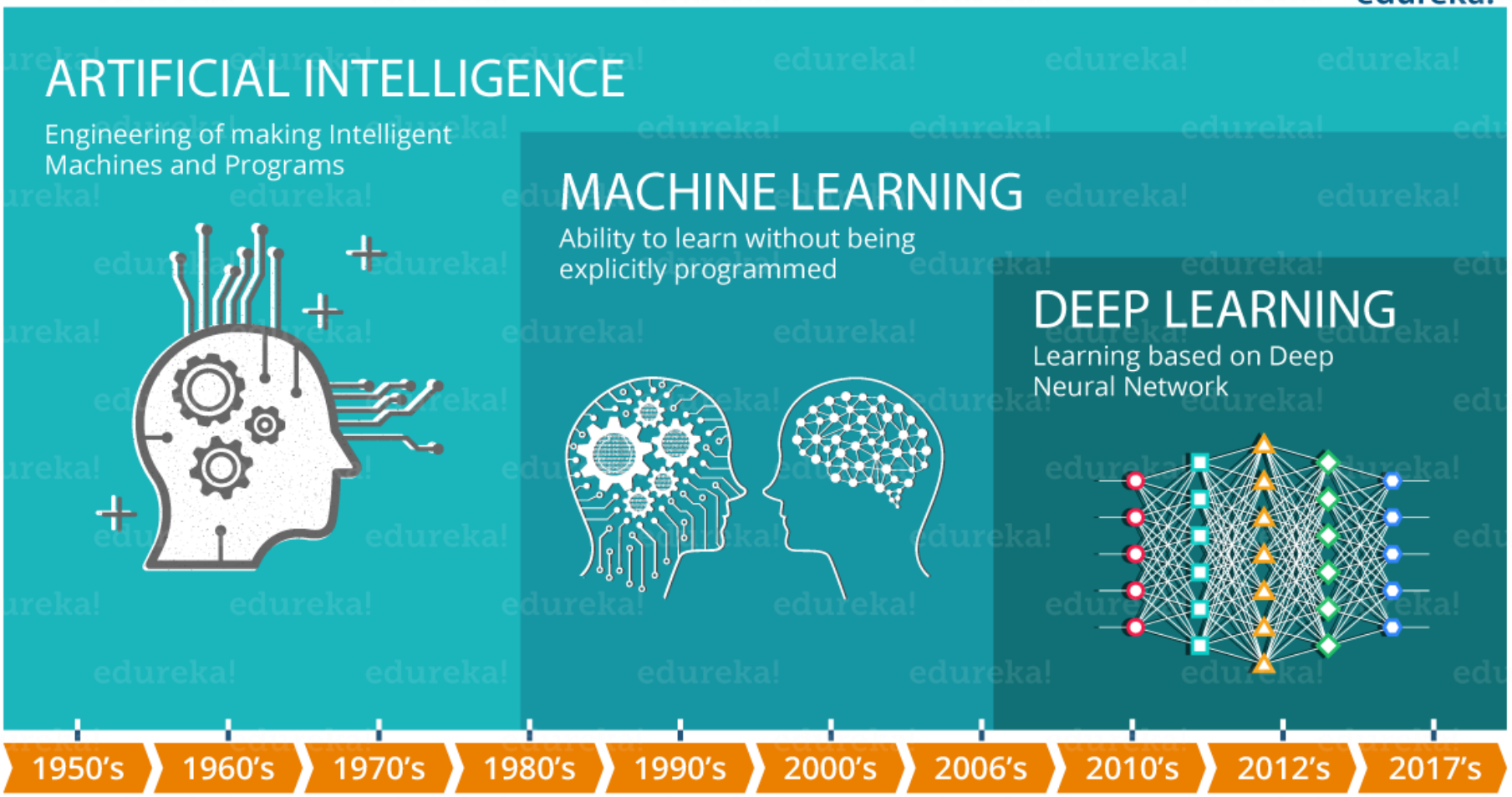
HERNÁN ANDRÉS MORALES-NAVARRETE

Deep learning vs classical algorithms

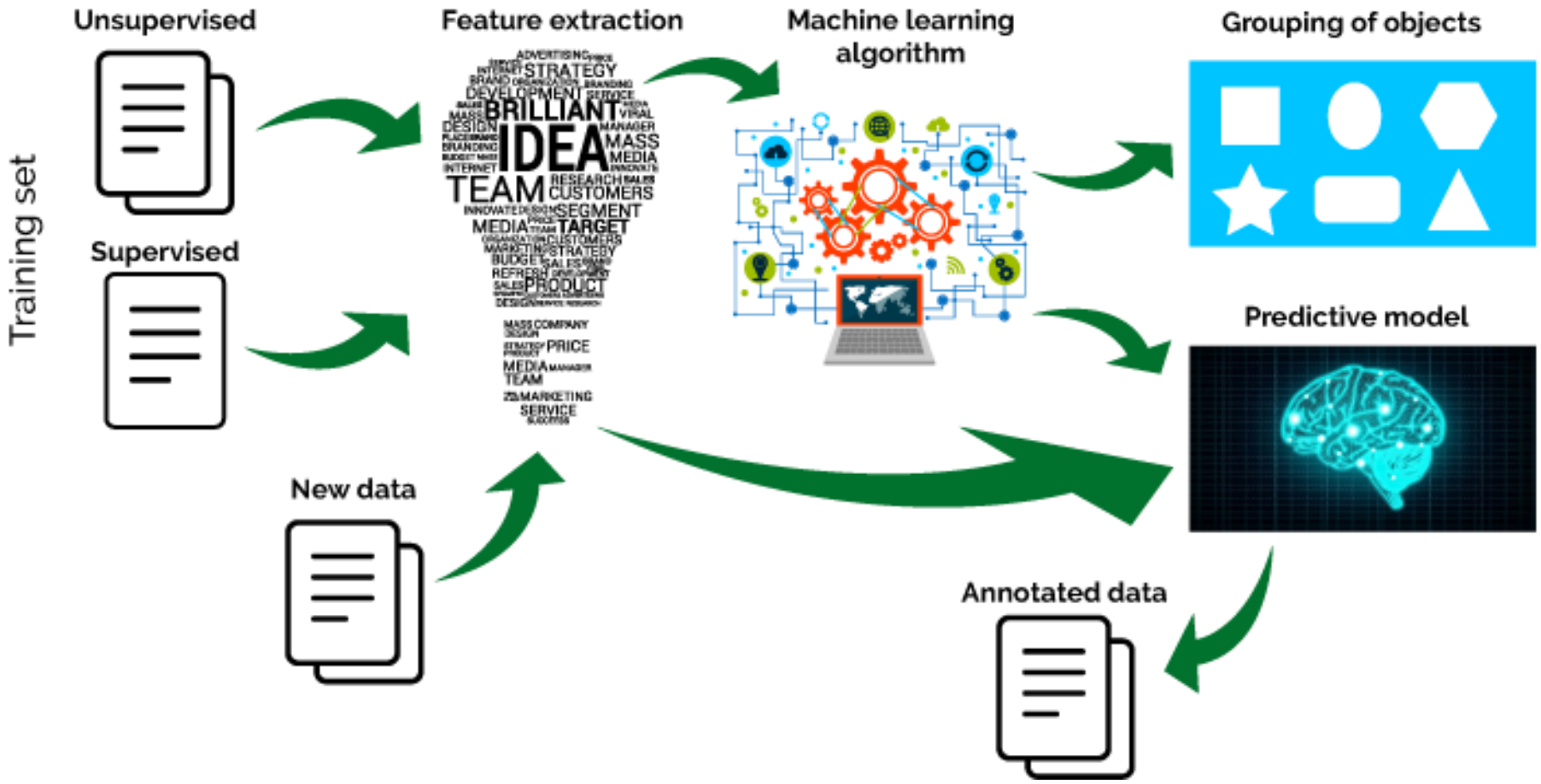


von Chamier, L. et al. Biochemical Society Transactions (2019) 47 1029–1040

From Machine Learning to deep learning



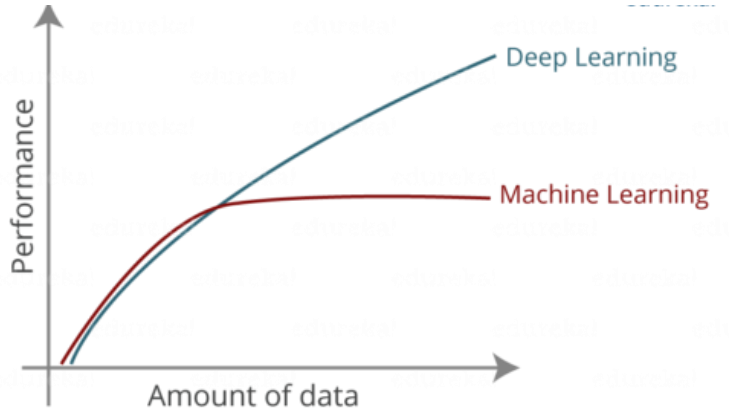
Machine Learning in a nutshell



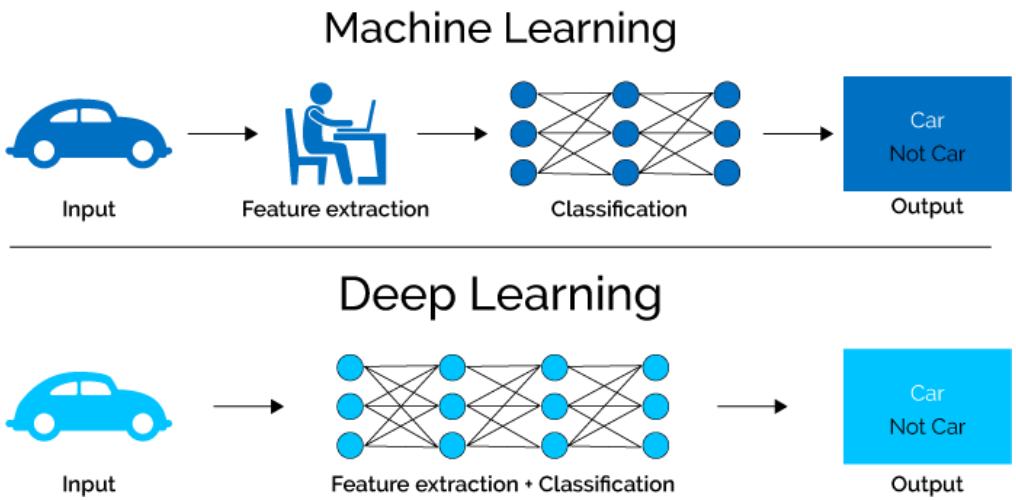
From : https://www.xenonstack.com

Limitations of Machine Learning: Deep Learning the rescue

- Not useful while working with high dimensional data

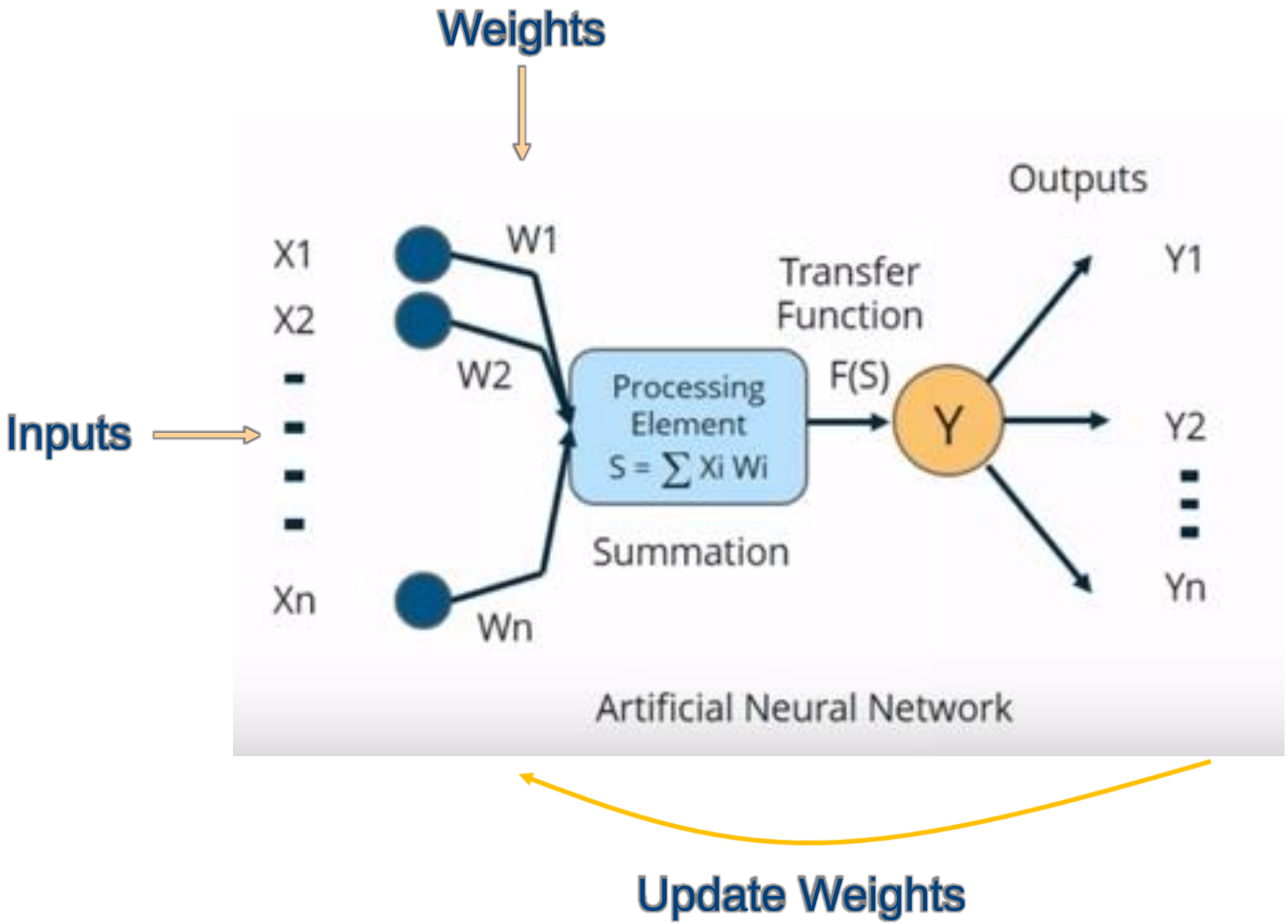


- Feature selection : challenging task



From : https://www.edureka.co
From : https://www.xenonstack.com

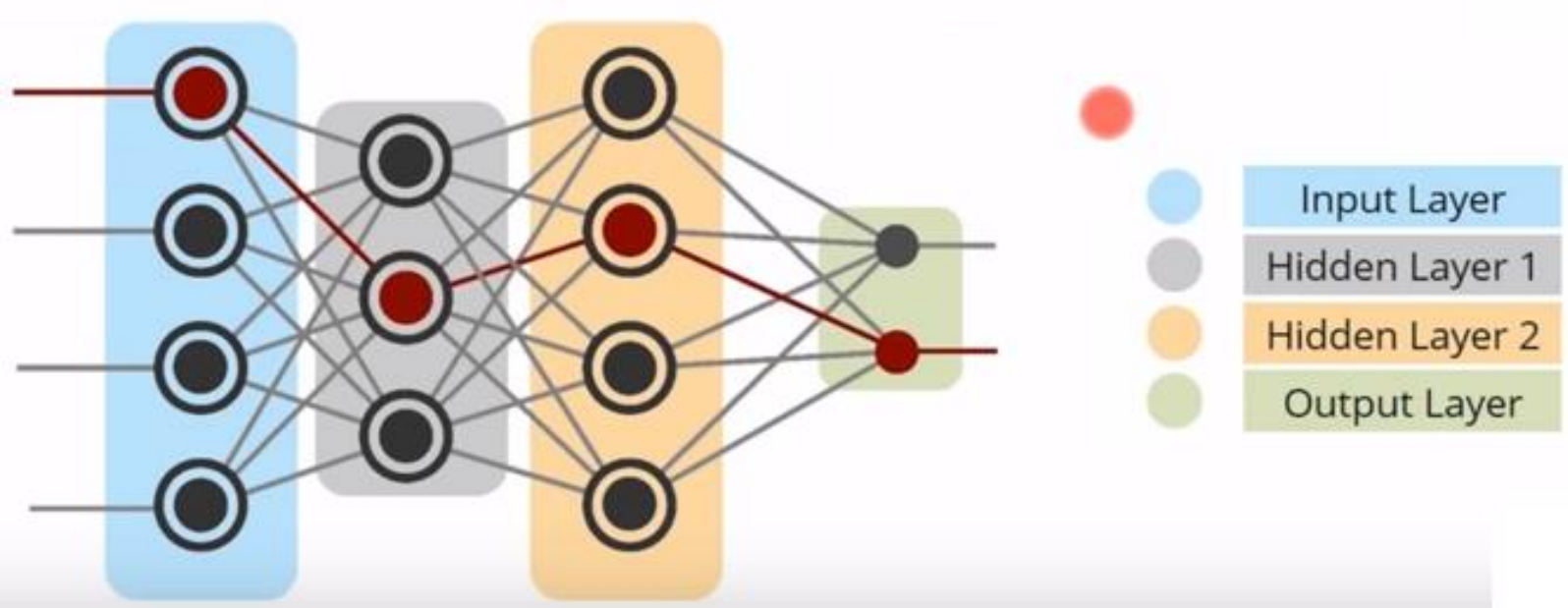
How does Deep Learning work?



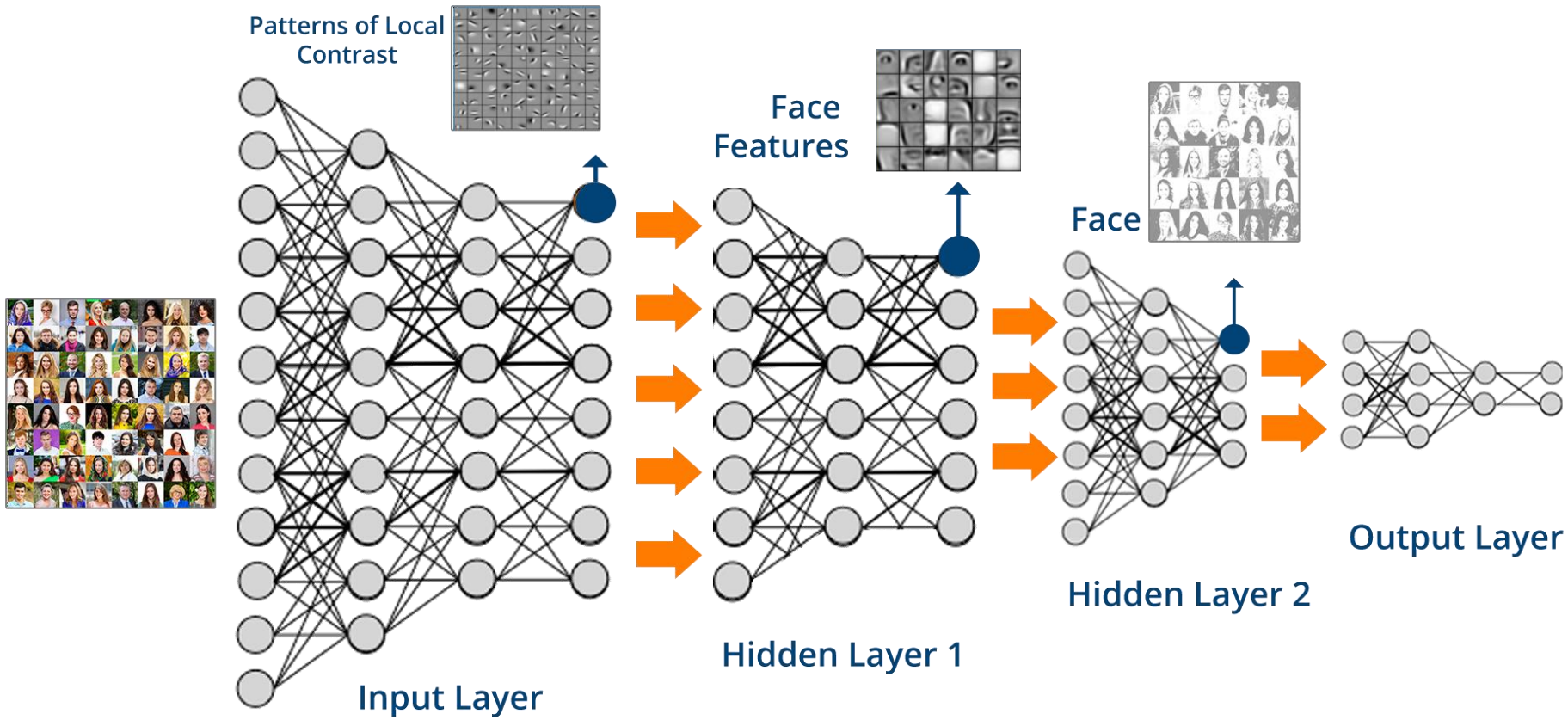
What is a deep network?

- Deep networks are Neural networks with hidden layers:

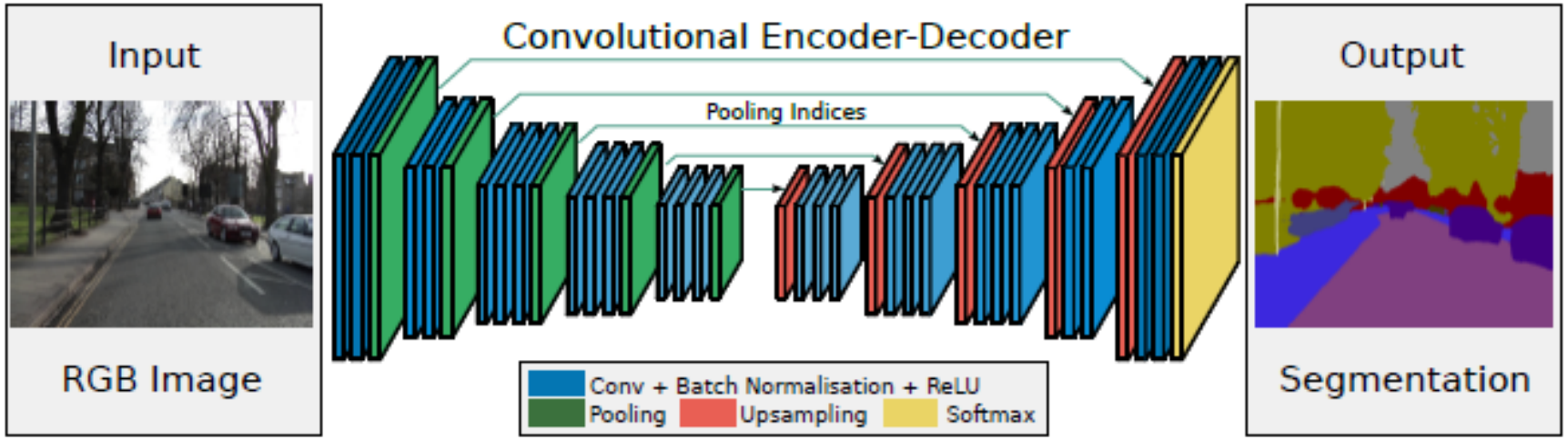
  Learn features hierarchies



Deep Learning = Learning Hierarchical Representations



SegNet: A Deep Convolutional Encoder-Decoder Architecture for Image Segmentation



Encoder-decoder architecture: pixel-wise classification

Neural networks and microscopy

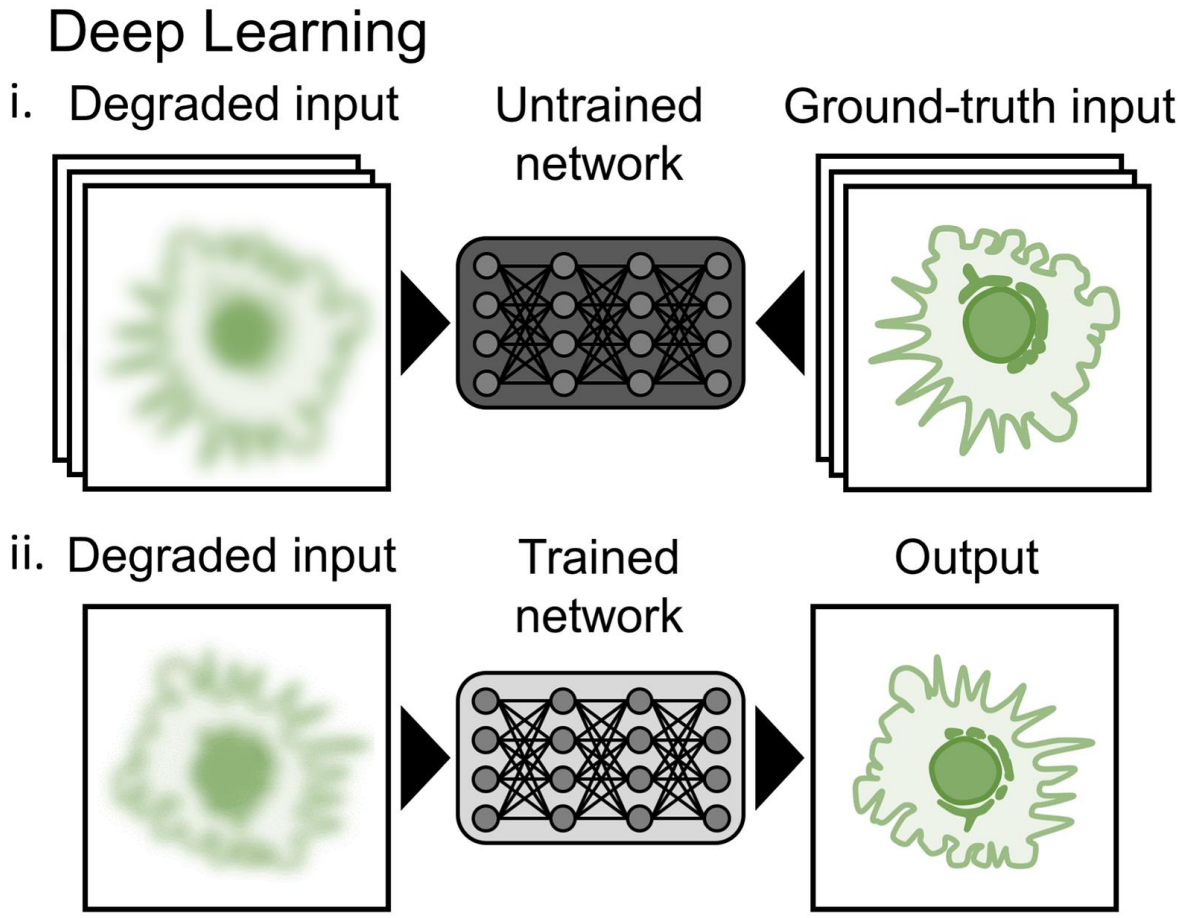
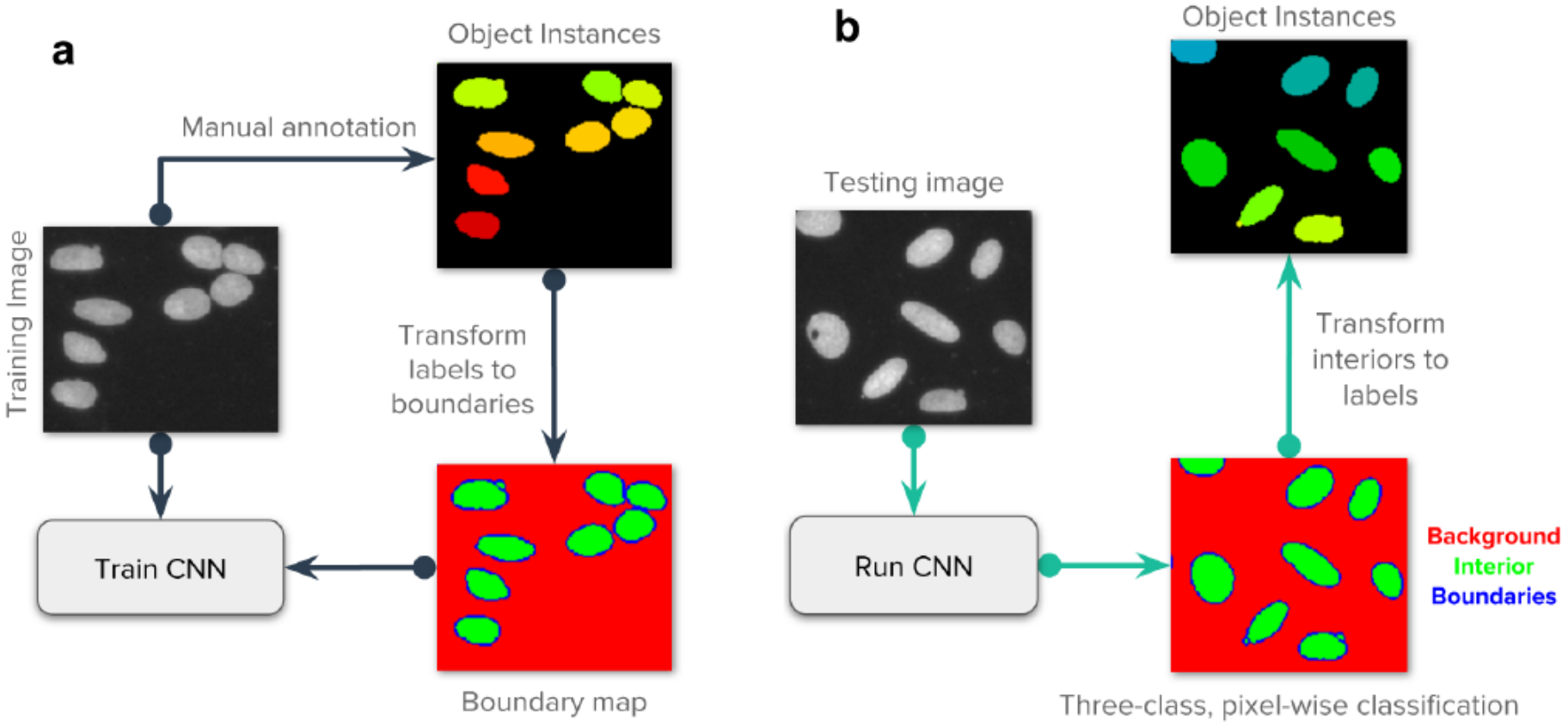


Image segmentation

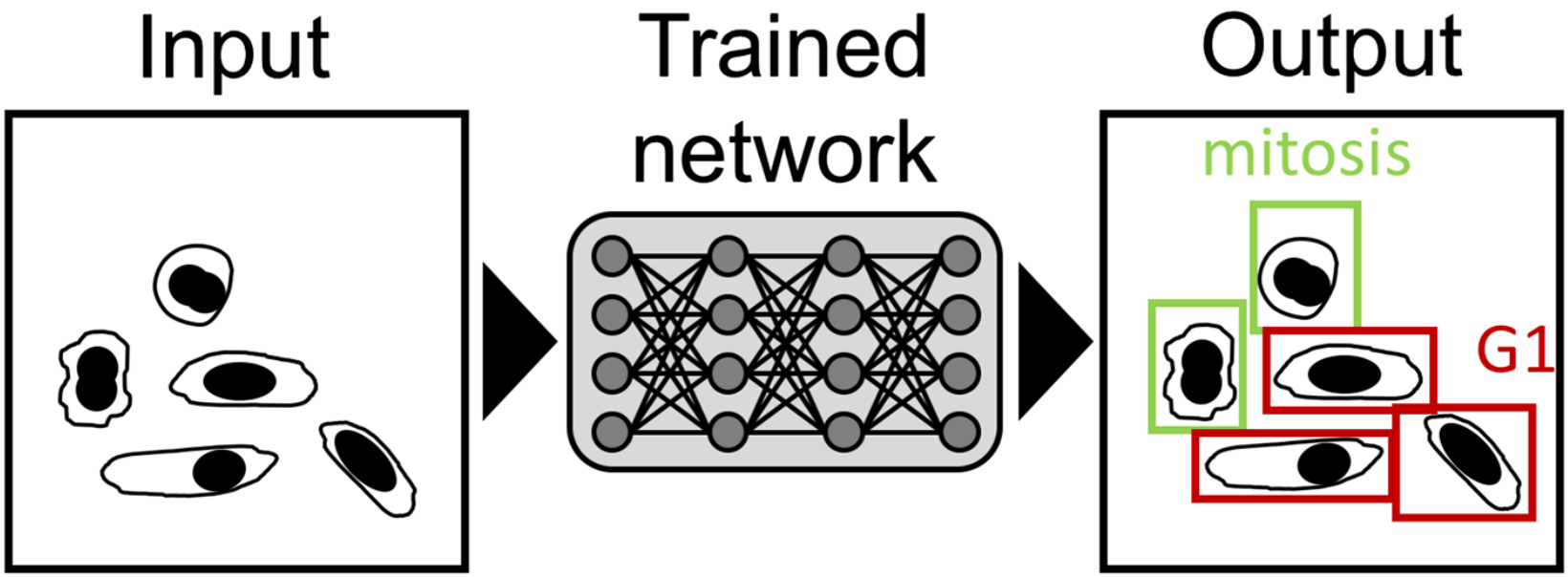
Training

Application to new images



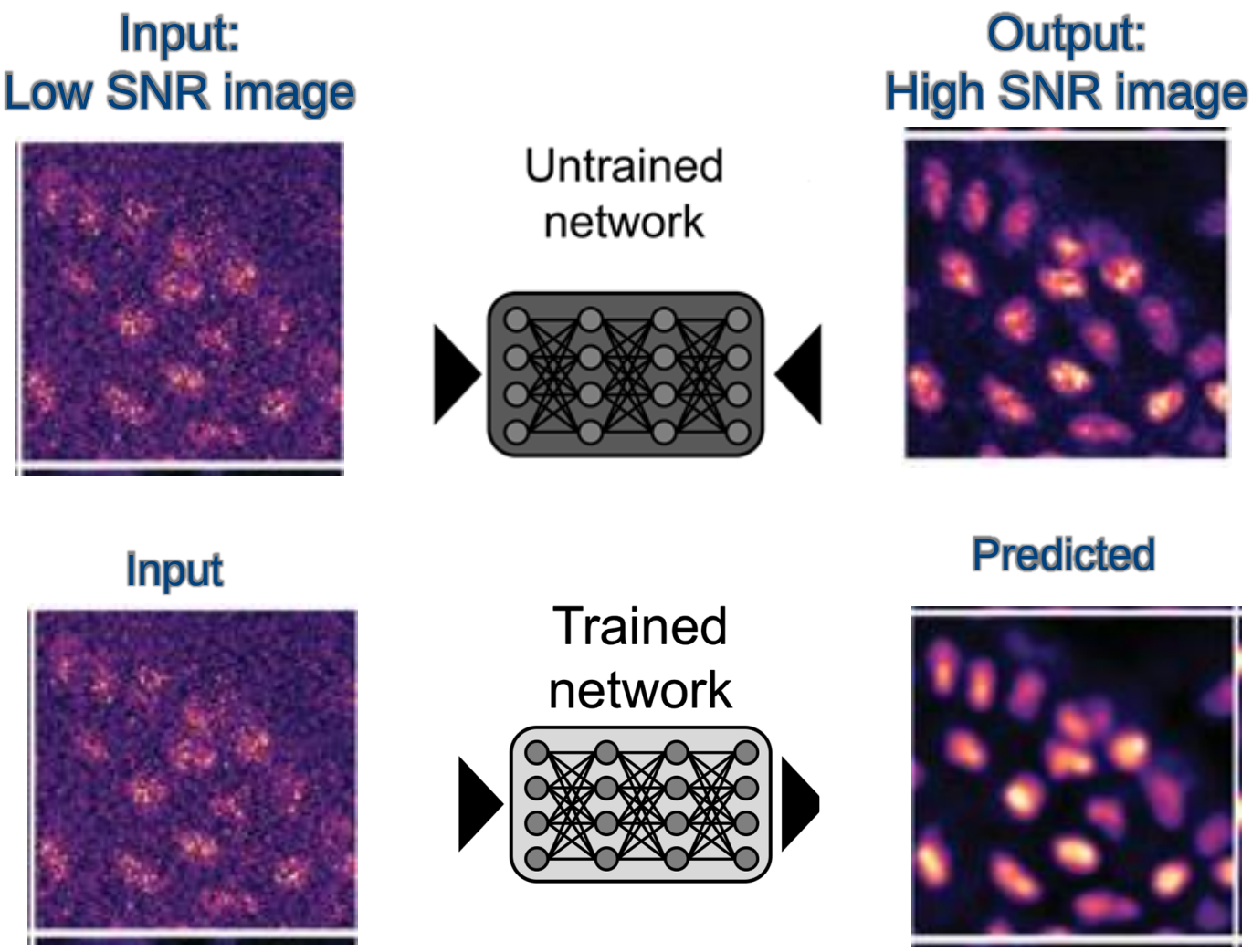
Caicedo, J. et al. Evaluation of Deep Learning Strategies for Nucleus Segmentation in Fluorescence Images. BioRxiv . 2019

Object detection and classification



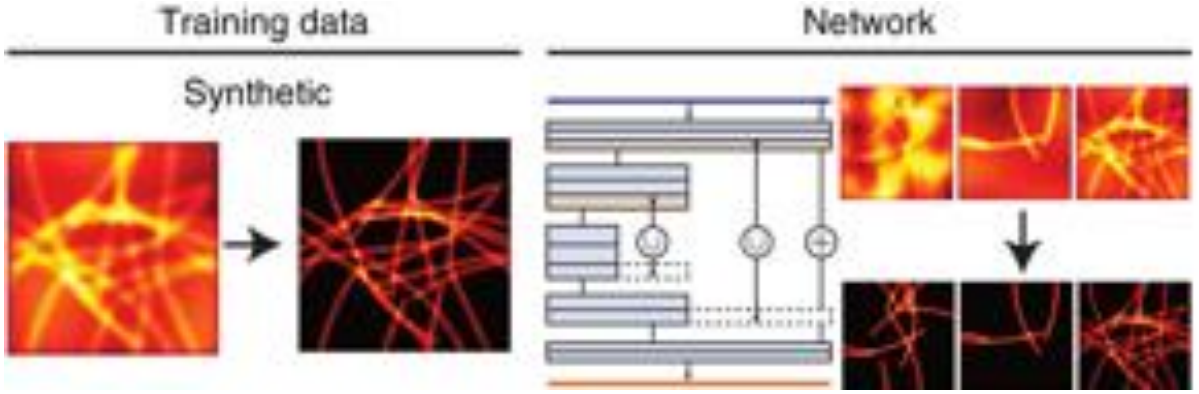
von Chamier, L. et al. Biochemical Society Transactions (2019) 47 1029–1040

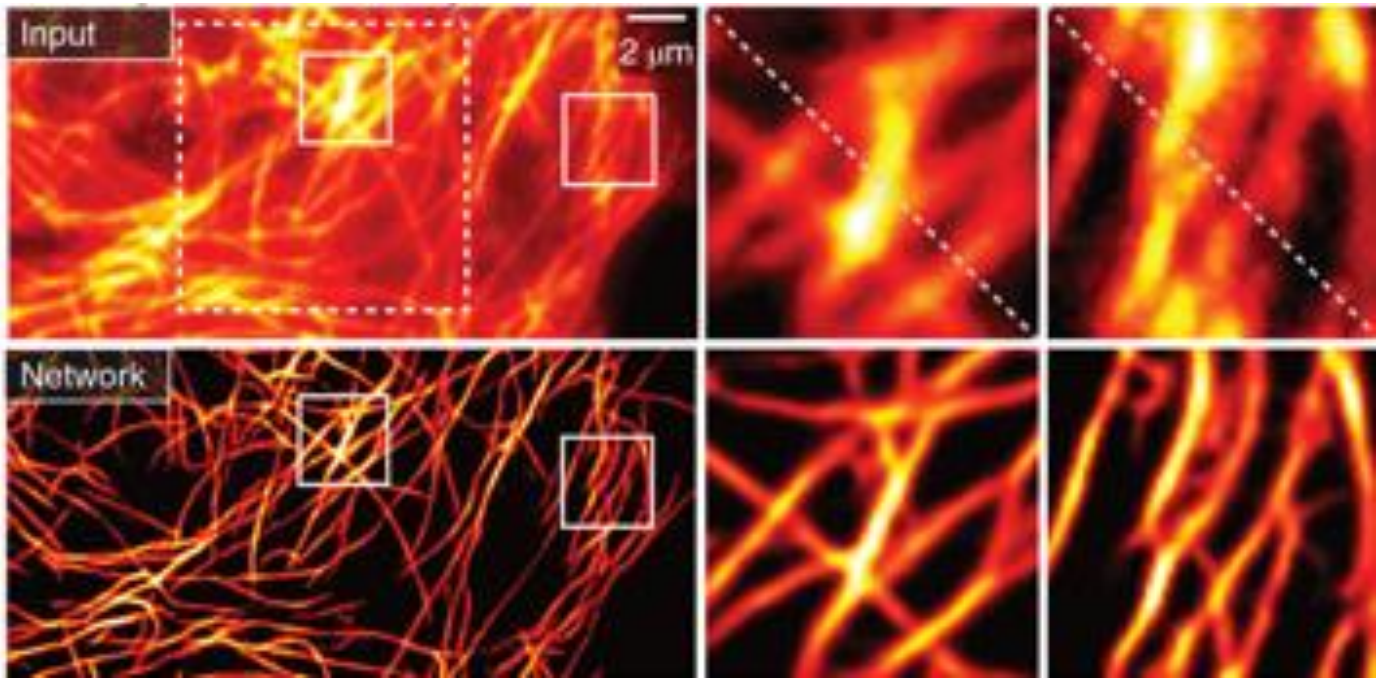
Image restoration



Weigert, M. et al. Nature Methods volume 15, pages1090–1097 (2018)

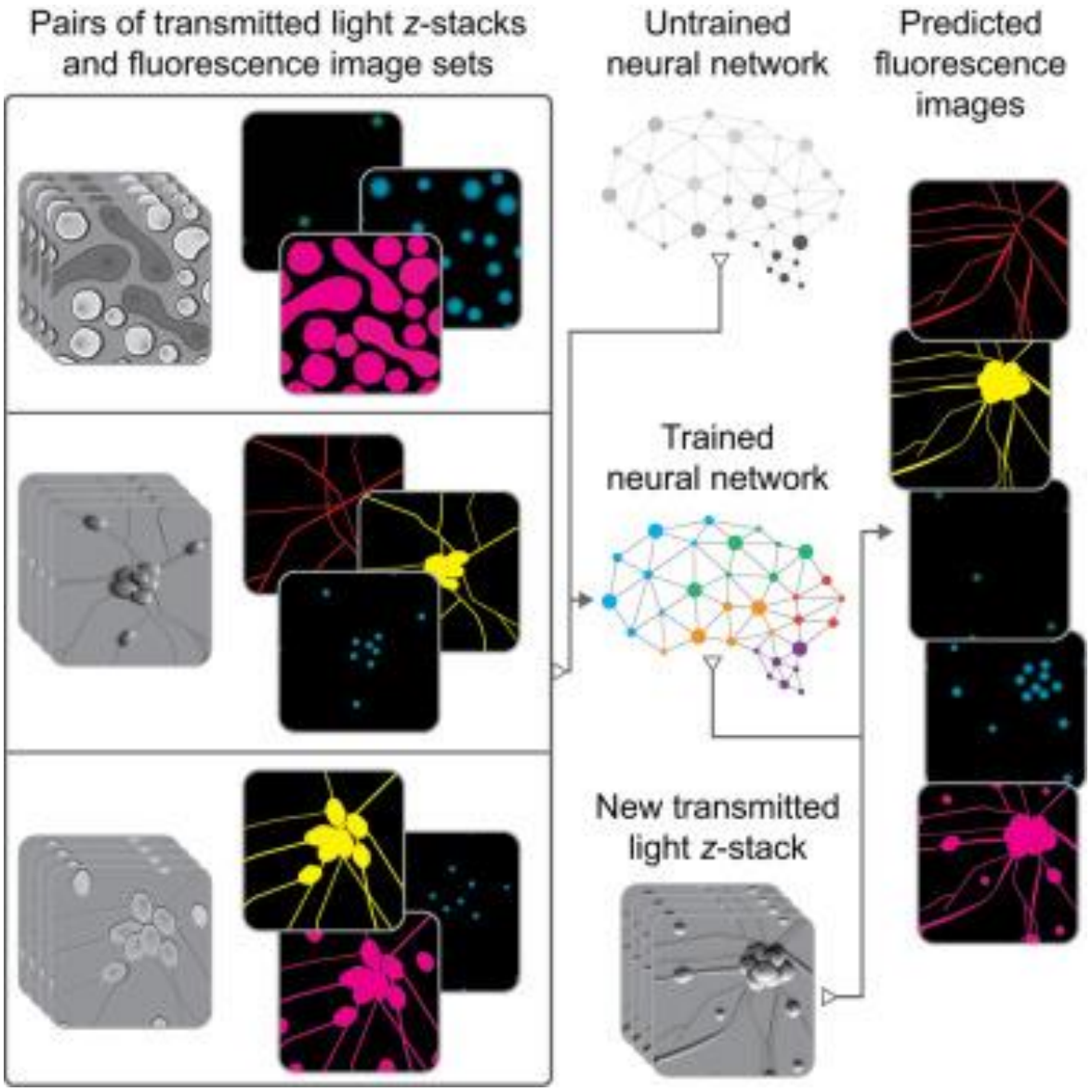
Resolving sub-diffraction structures





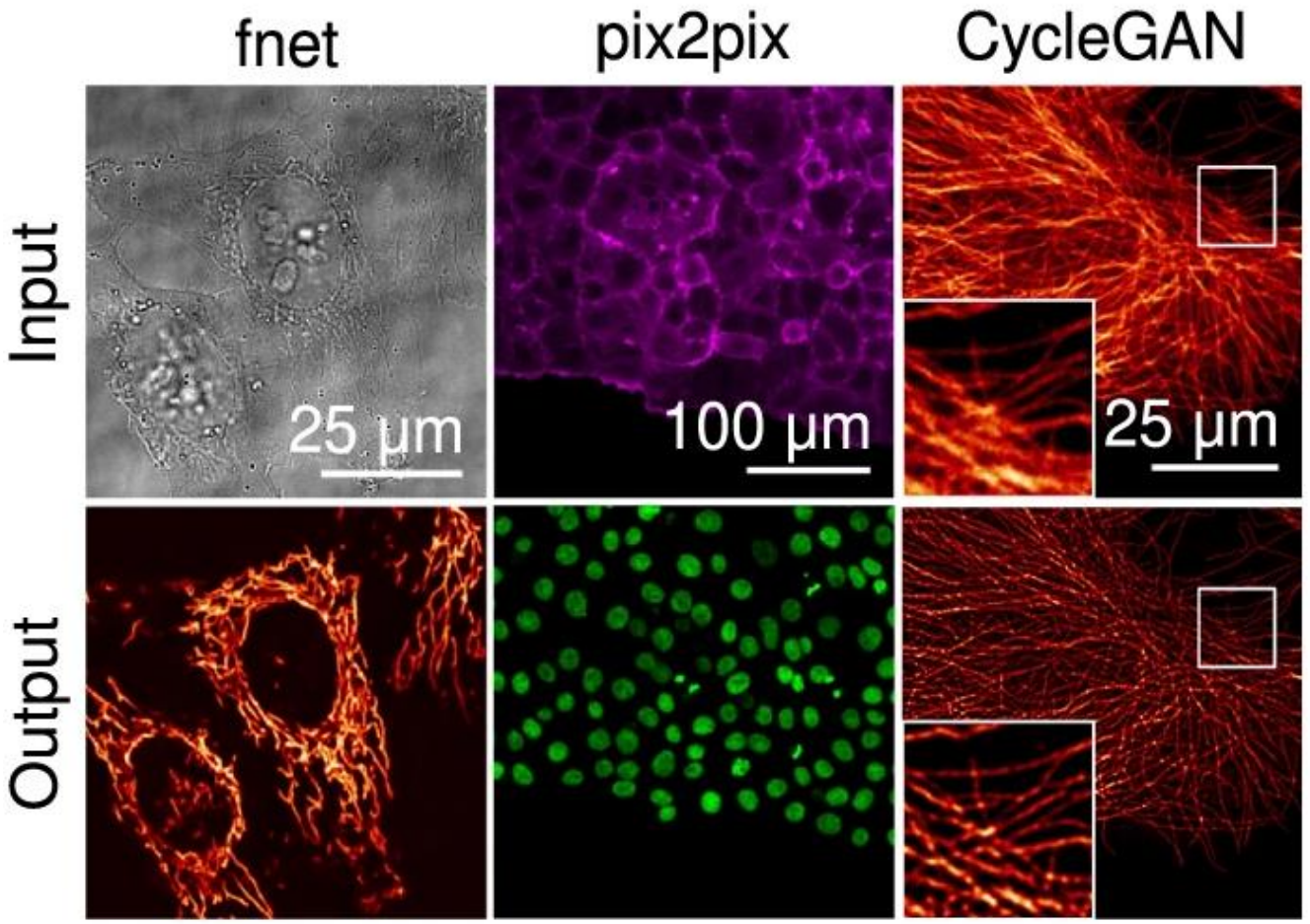
Weigert, M. et al. Nature Methods volume 15, pages1090–1097 (2018)

Artificial labelling



Christiansen et al. 2018 Label Prediction in fixed and live cells
Ounkomol et al. 2018 3D label prediction in live-cell, IF and EM images

Image-to-image translation



Chamier, J., et al (2021). Democratising deep learning for microscopy with ZeroCostDL4Mic. Nature Communications (12): 2276