Convolutional neural networks and image processing II

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About me

- Ph.D. in Natural Language Processing and Artificial Intelligence at Masaryk University
- 10 years at seznam.cz (last 8 years as Head Of Research)
- Founder and co-organizer of ML Prague
- Mentor at StartupYard
- ML Freelancer and consultant

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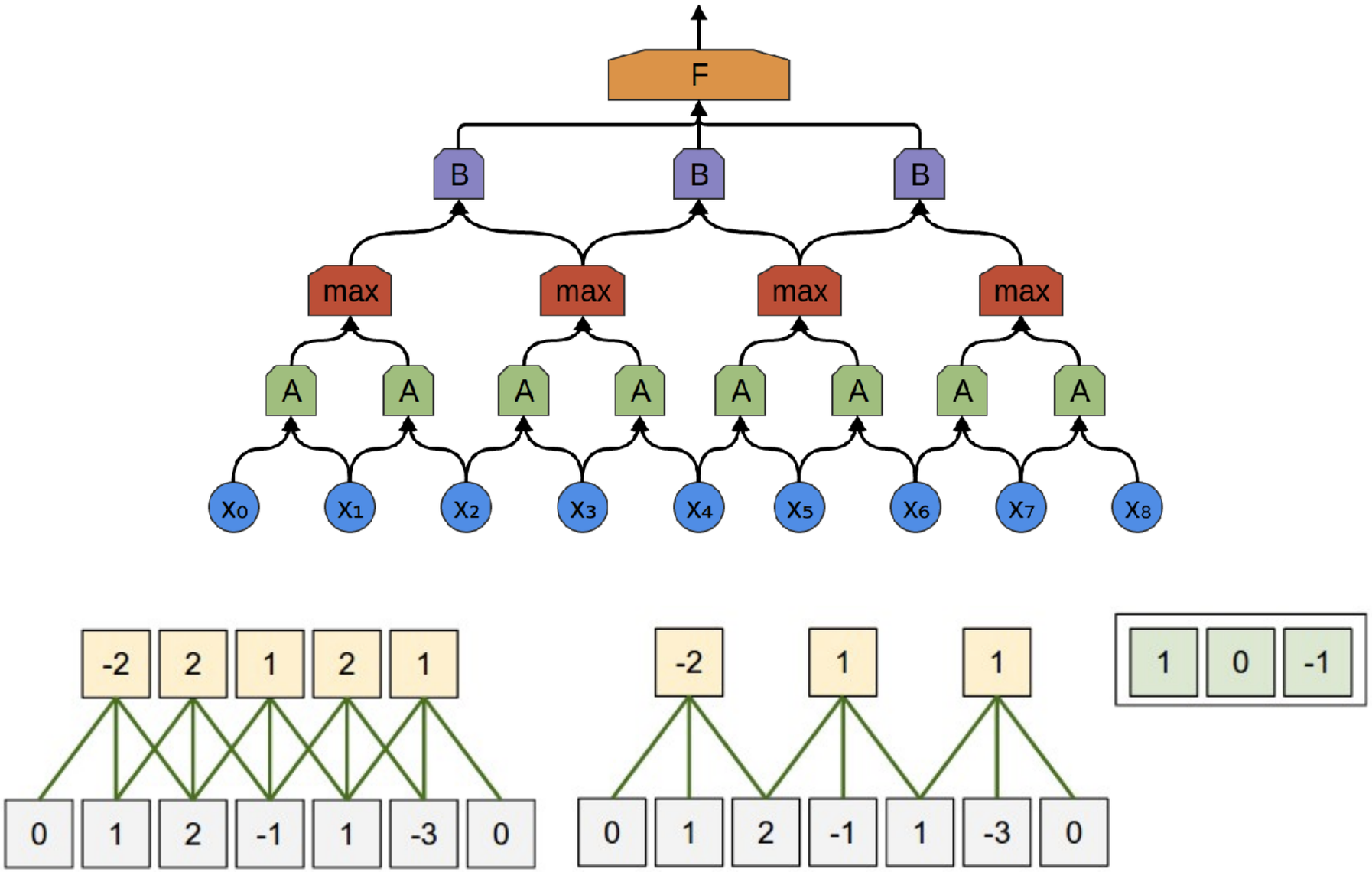
Outline

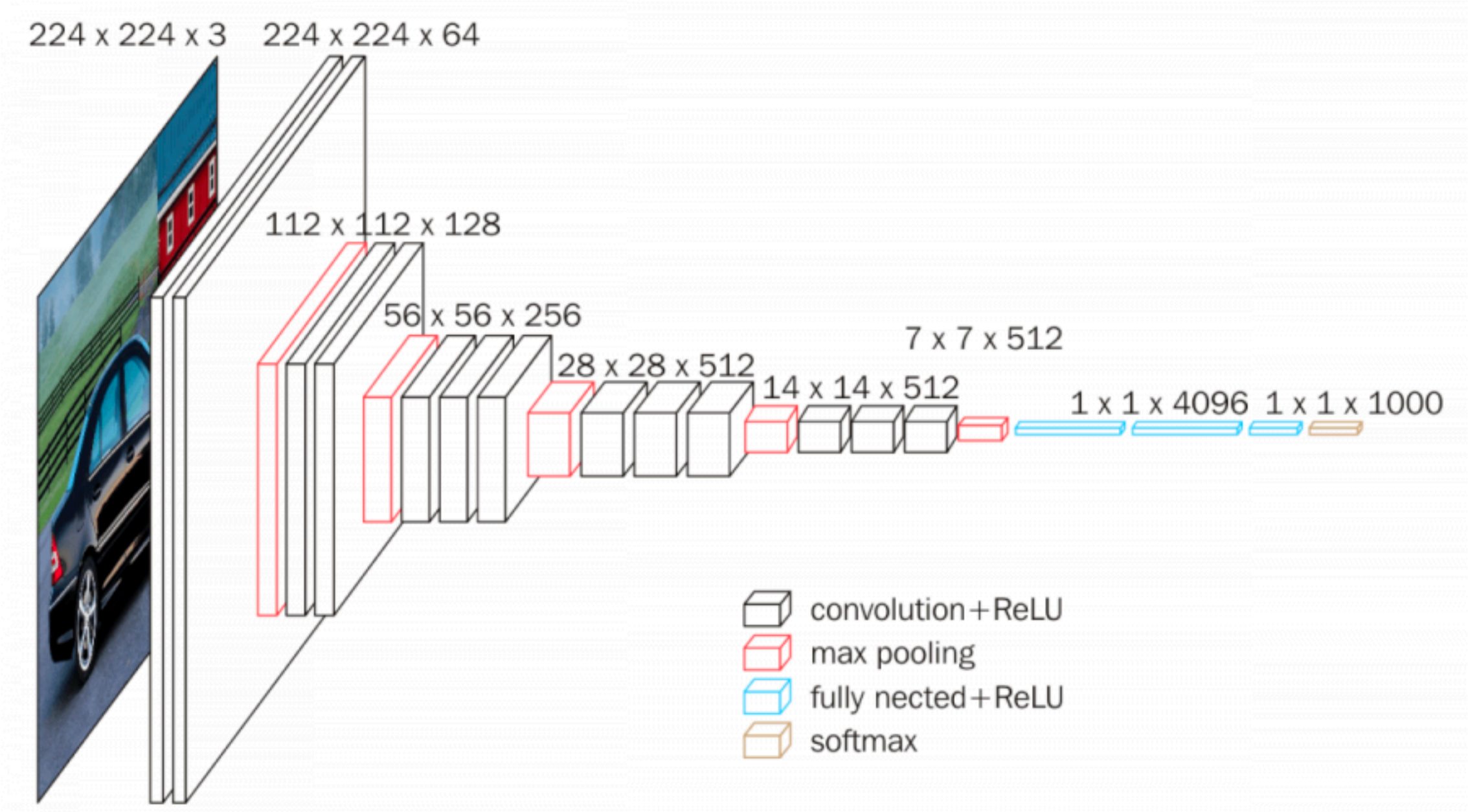
- Architectures of neural networks for image processing
- Big neural networks for image processing
- Image Segmentation
- Practical example of image segmentation
- Generative Adversarial Networks
- Practical example of image generation
- Superresolution using GANs
- Practical project on housing price prediction

Convolution

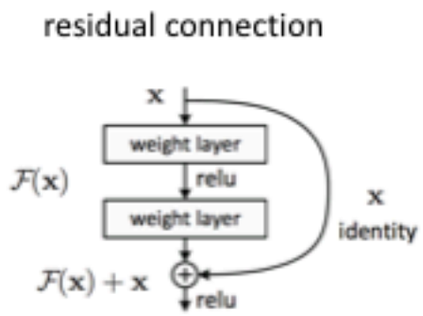


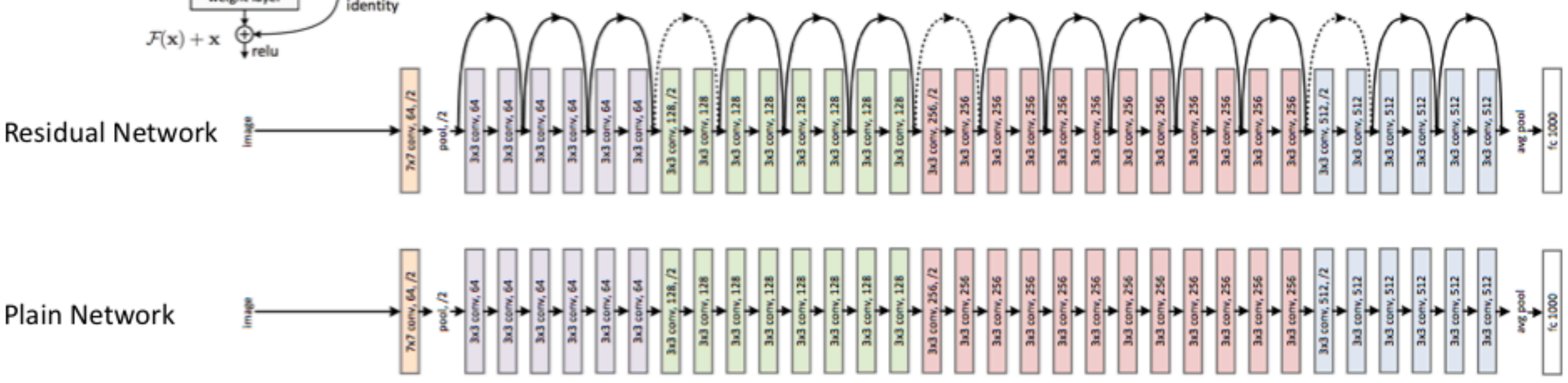
Source: https://www.tensorflow.org

VGG 16

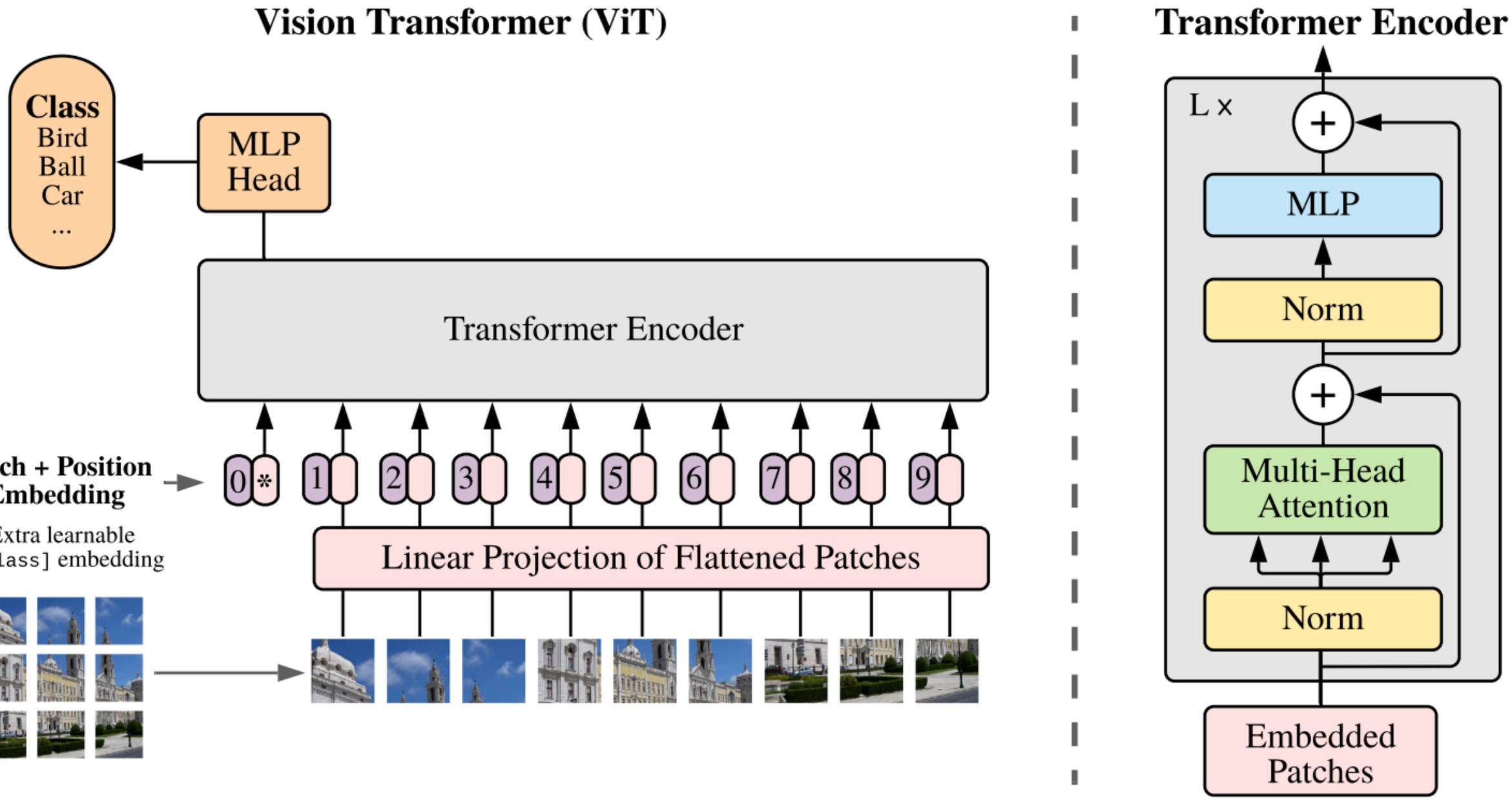

224 x 224 x 3
224 x 224 x 64
112 x 112 x 128
56 x 56 x 256
28 x 28 x 512
14 x 14 x 512
7 x 7 x 512
1 x 1 x 4096
1 x 1 x 1000
convolution+ReLU
max pooling
fully nected+ReLU
softmax

ResNet

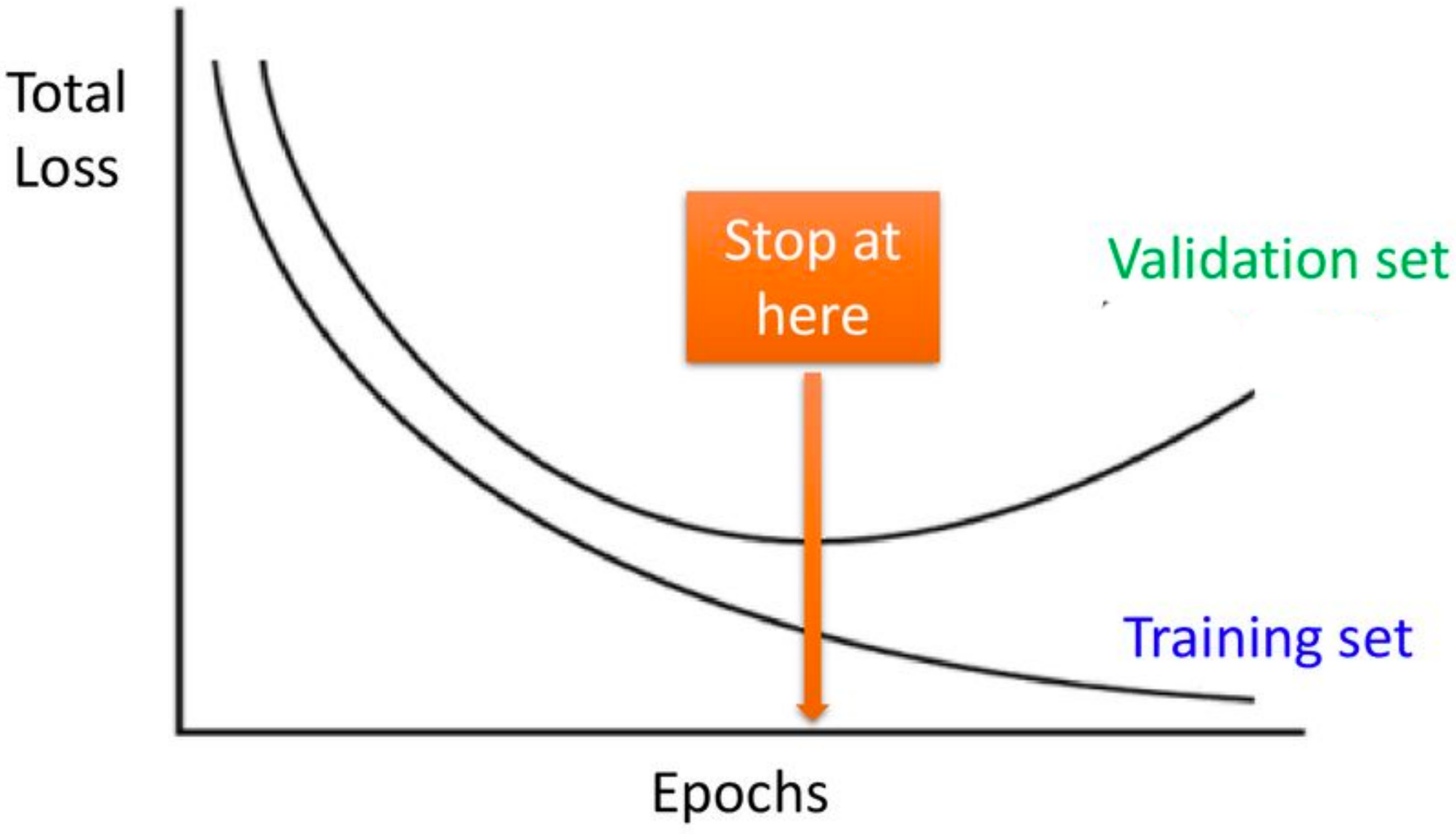

residual connection
x
weight layer
relu
weight layer
F(x)
x
identity
F(x) + x
relu


Residual Network
image
7x7 conv, 64, /2
pool, /2
3x3 conv, 64
3x3 conv, 128, /2
3x3 conv, 128
3x3 conv, 256, /2
3x3 conv, 256
3x3 conv, 512, /2
3x3 conv, 512
avg pool
fc 1000
Plain Network
image
7x7 conv, 64, /2
pool, /2
3x3 conv, 64
3x3 conv, 128, /2
3x3 conv, 128
3x3 conv, 256, /2
3x3 conv, 256
3x3 conv, 512, /2
3x3 conv, 512
avg pool
fc 1000

Vision Transformer

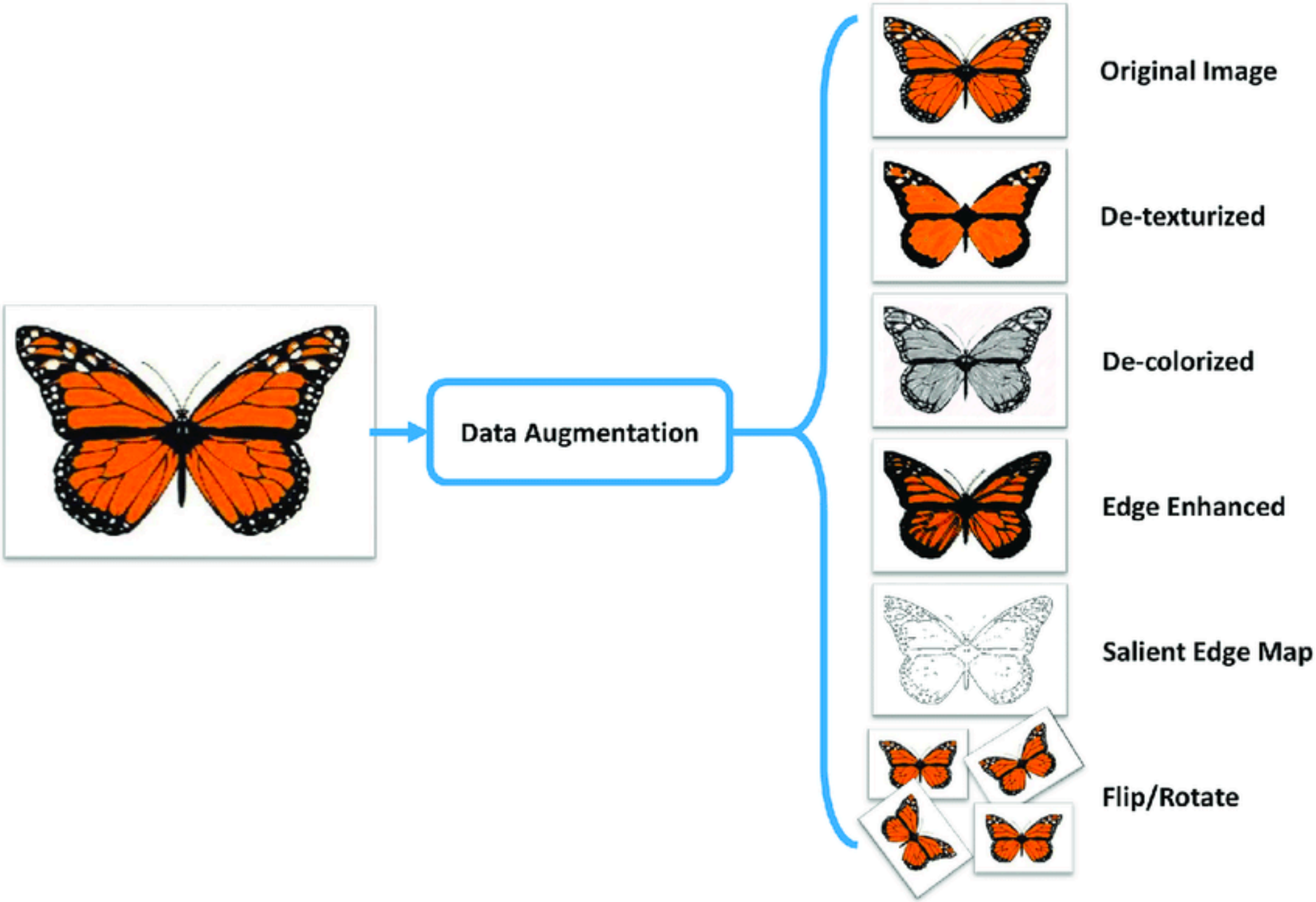


Early stopping



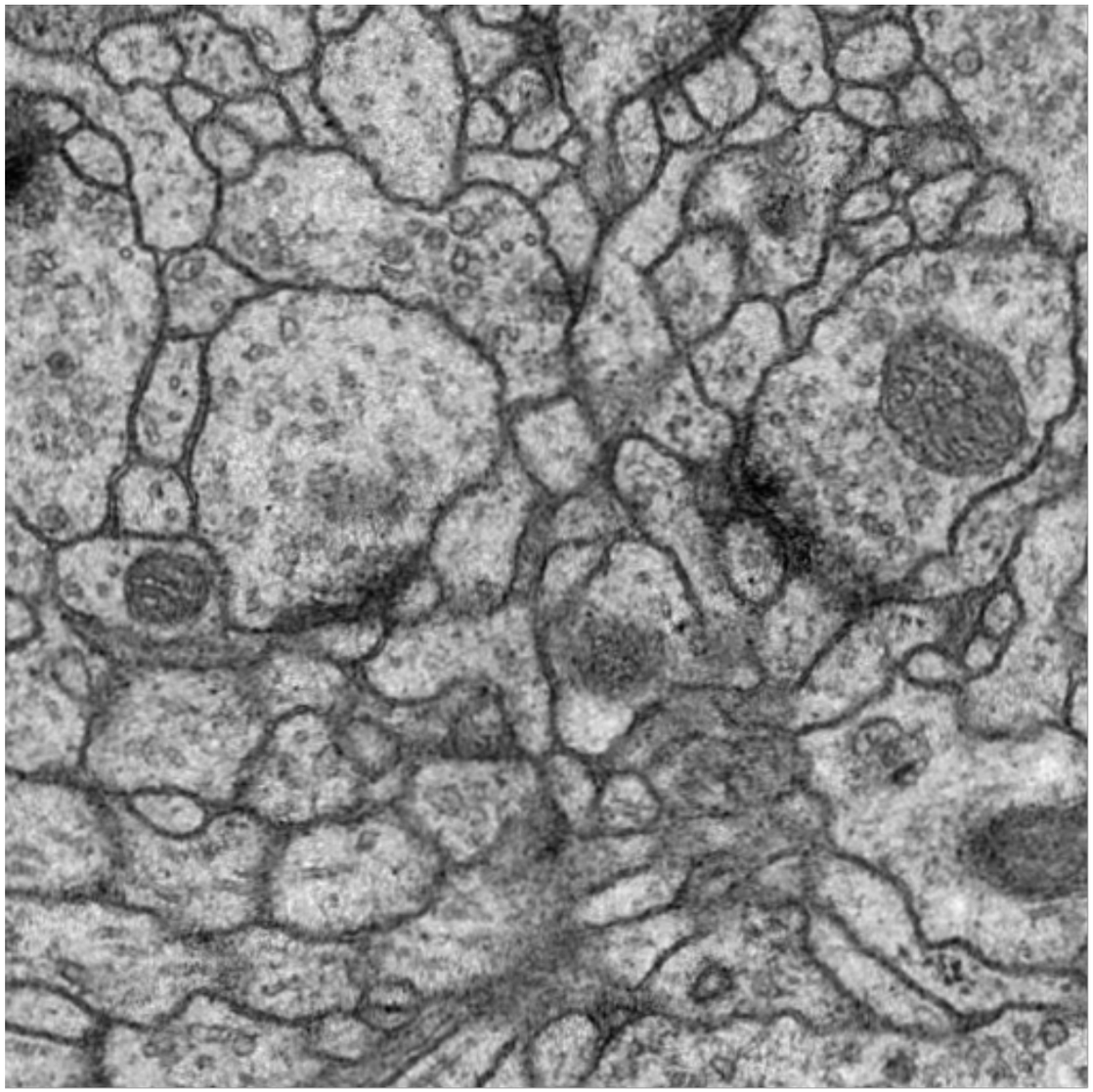
https://keras.io/getting_started/intro_to_keras_for_engineers/

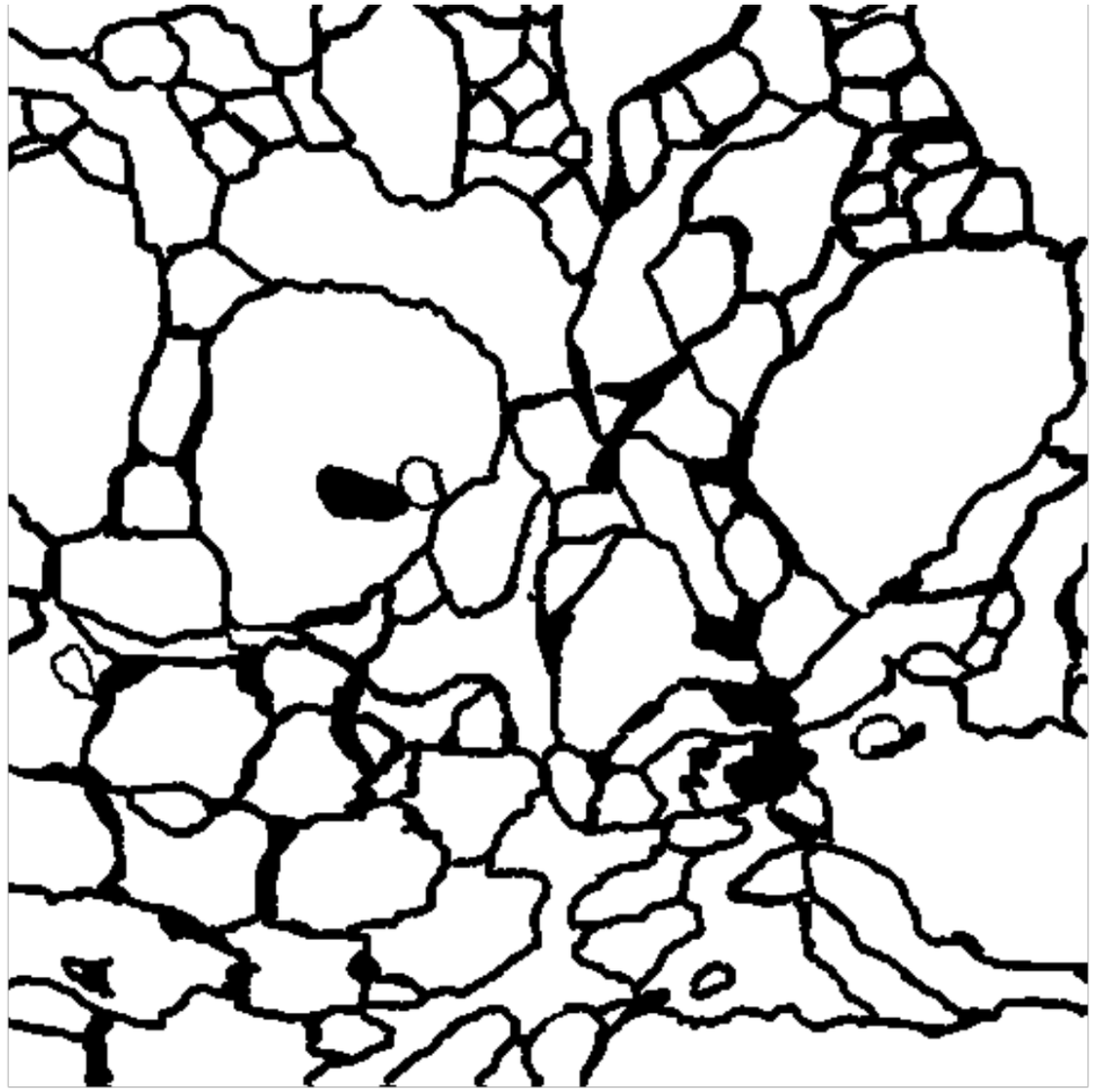
Data augmentation



https://medium.com/secure-and-private-ai-writing-challenge/data-augmentation-increases-accuracy-of-your-model-but-how-aa1913468722

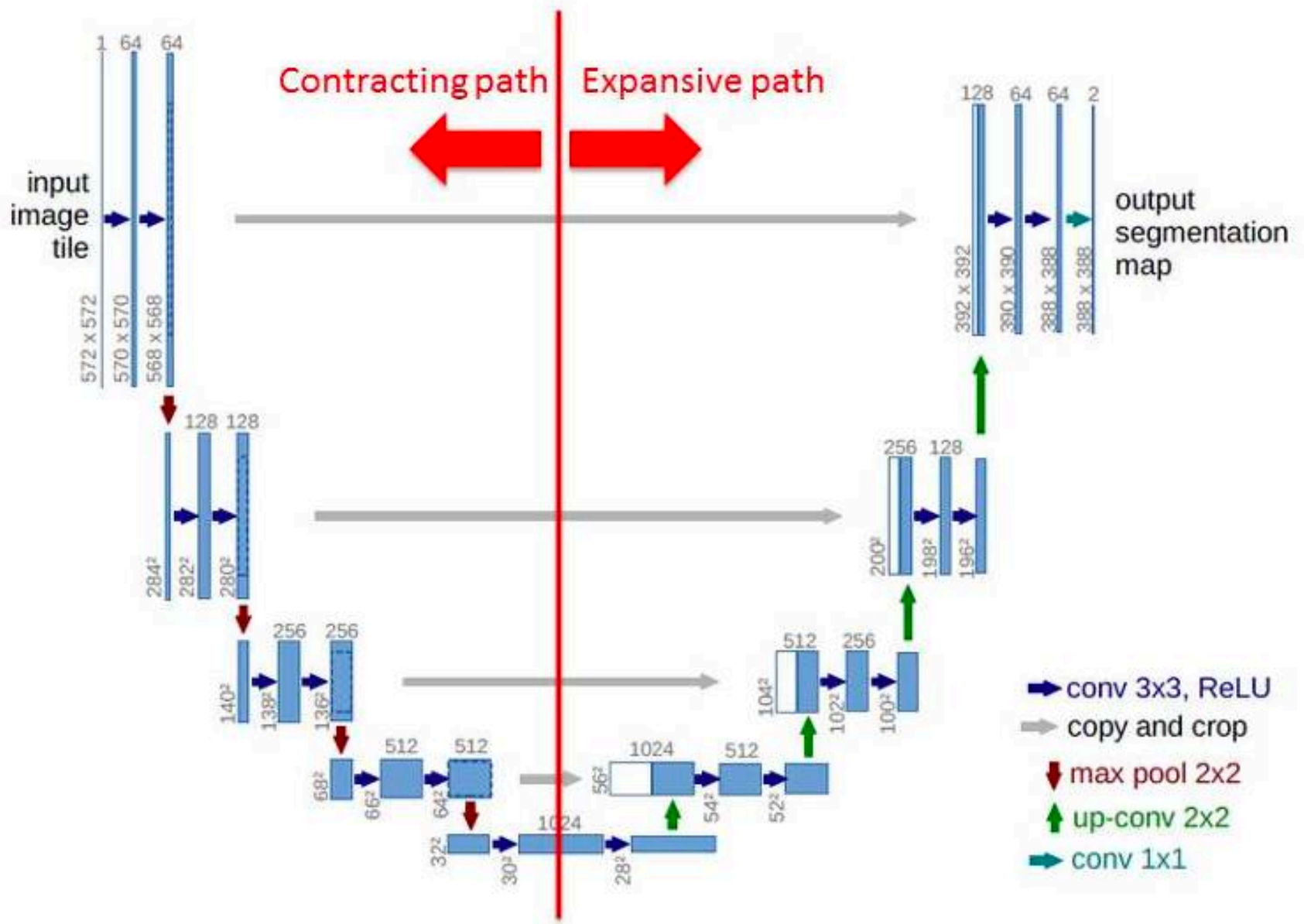
Image segmentation





U-Net

Network Architecture



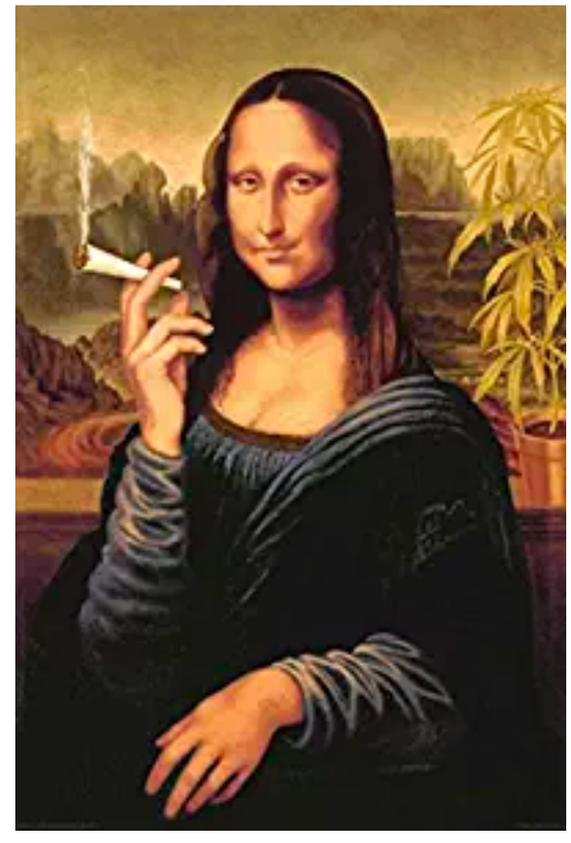
U-Net segmentation example

01-Segmentation.ipynb

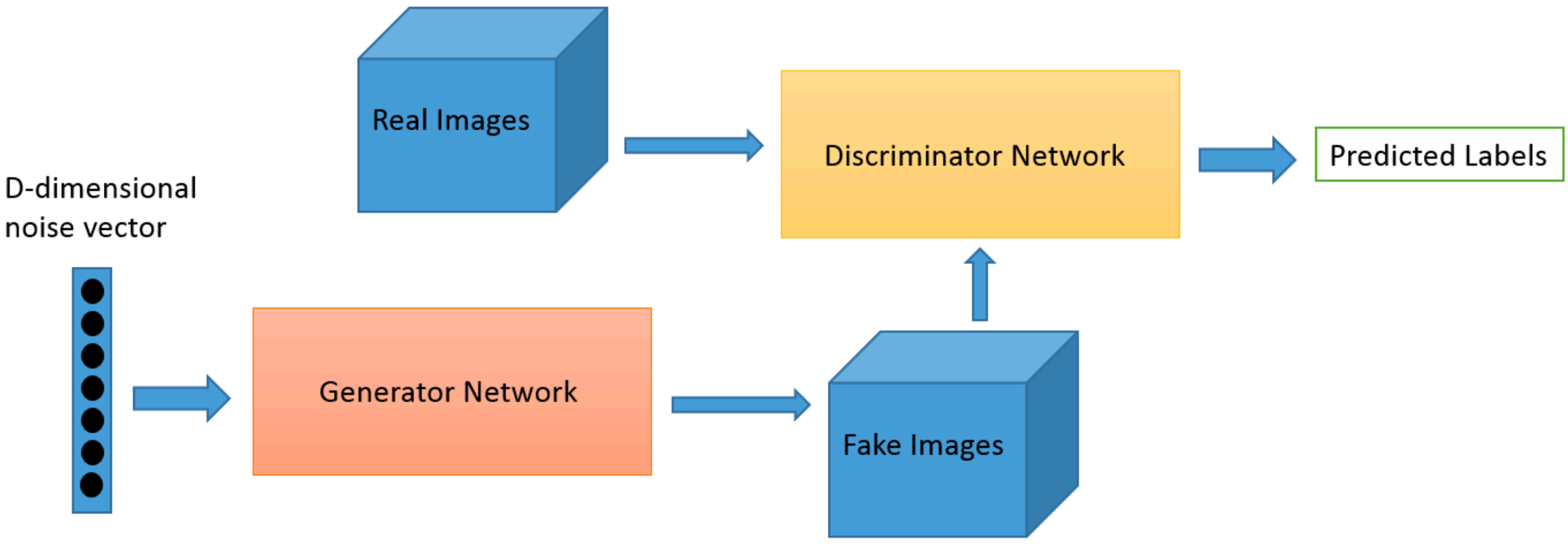
Generative models with neural networks

Random noice

Artificial Neural network



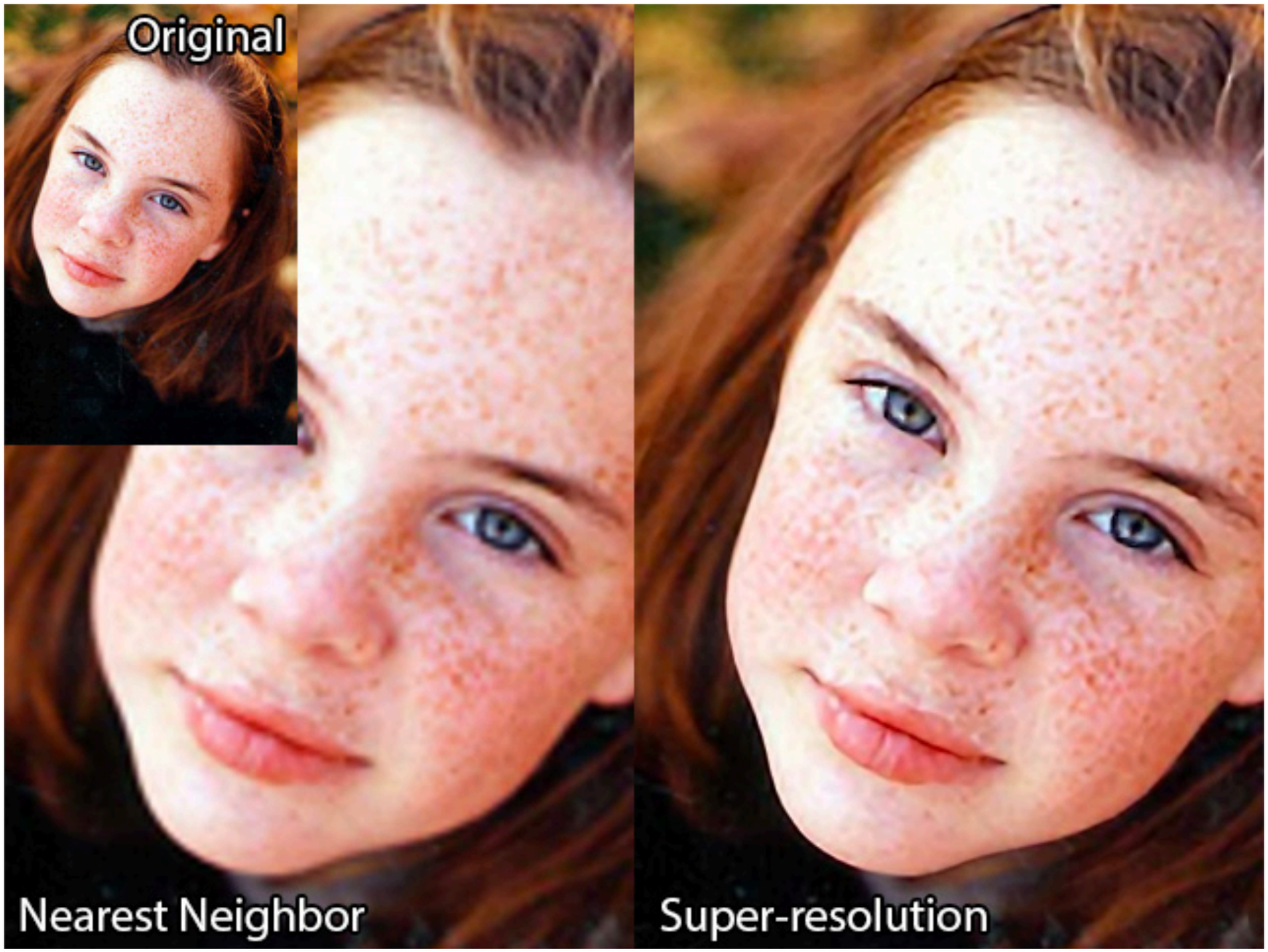
Generative Adversarial Networks



DC-GAN for generating images

02-DC-GAN.ipynb

Superresolution



SR-GAN

03_SR-GAN.ipynb

Practical project on housing price prediction using the combination of tabular and image data

04-House_pricing_prediction.ipynb

Thank you for your attention

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