Deep Learning – 103

Deconvolution and more

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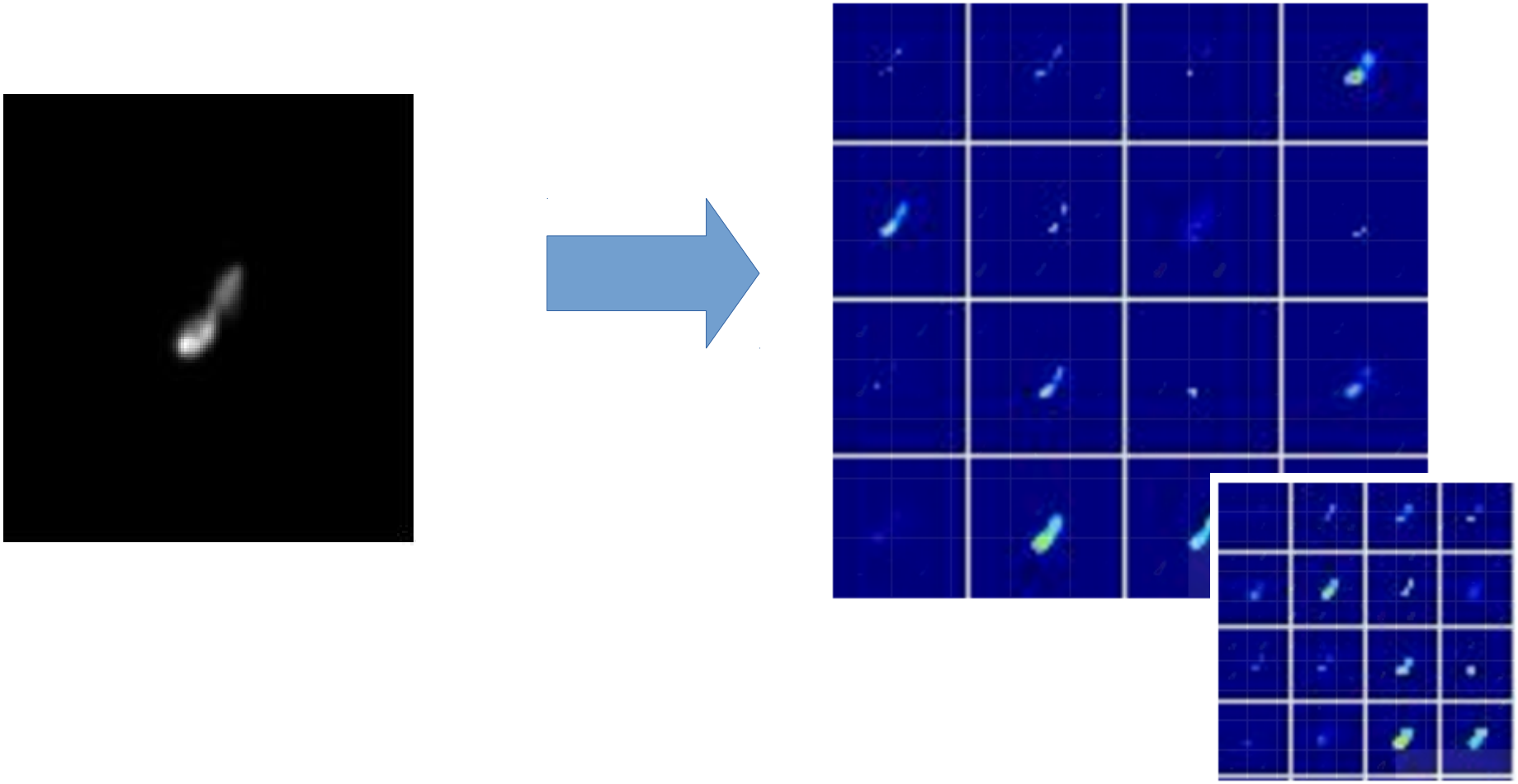
Convolutional Neural Network



Instead of predicting a class for an object in an image, can you classify each pixel in the image to which the object belongs ?

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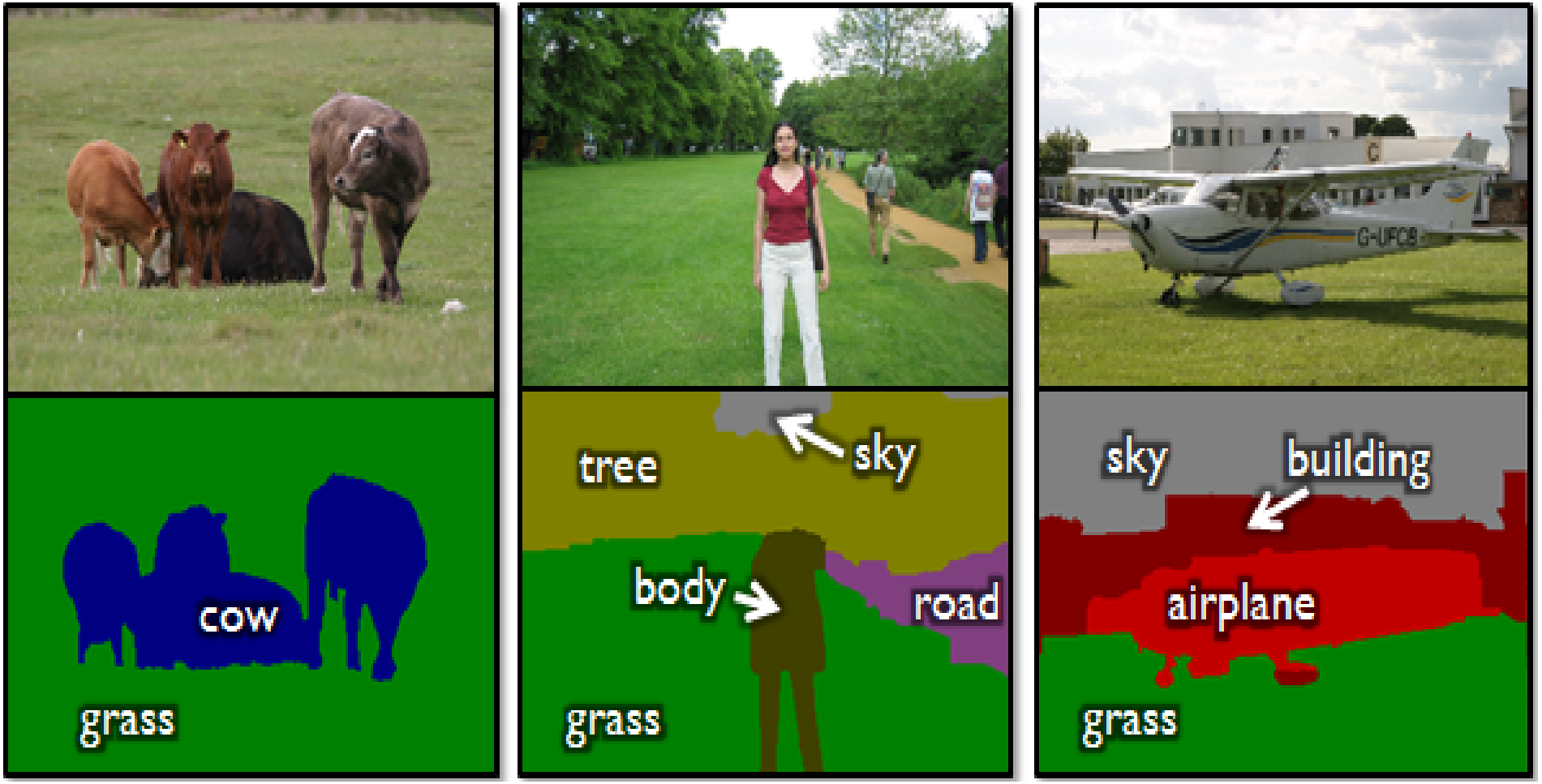
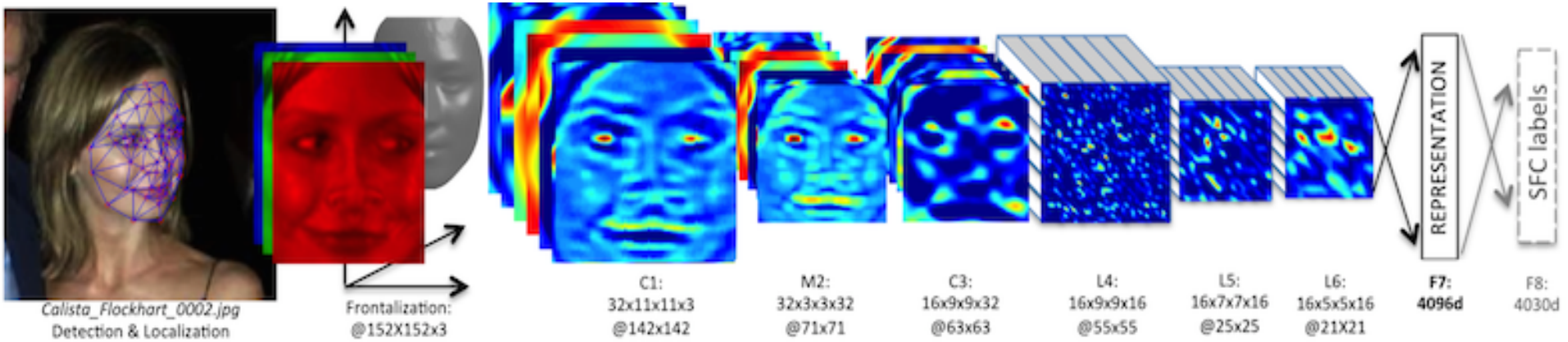
Semantic Segmentation

Semantic Segmentation



Semantic Segmentation

How to do it with ConvNets ?

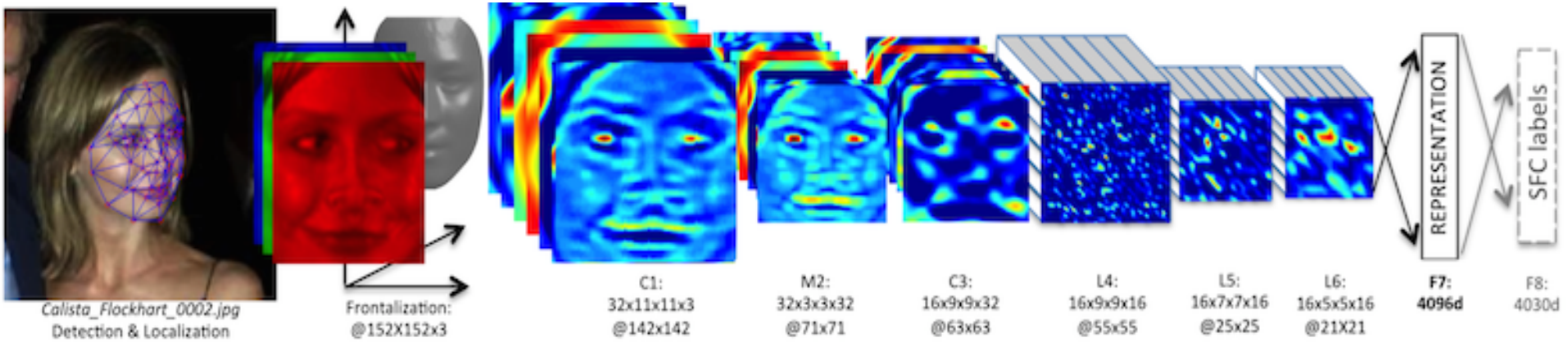


ConvNets maps your input into a lower dimensional space in the forward direction

Something like a downsampled version of your input in another dimension

Semantic Segmentation

How to do it with ConvNets ?



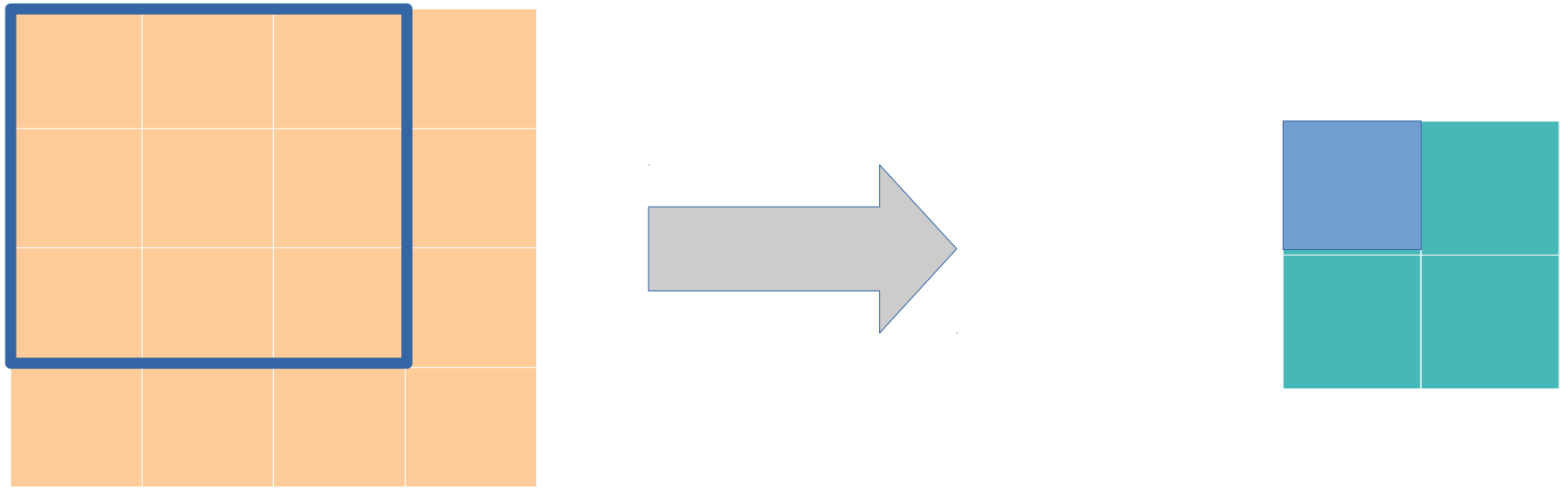
So what happens if you can do the reverse operation ?

Inverse Convolution

Learnable Upsampling

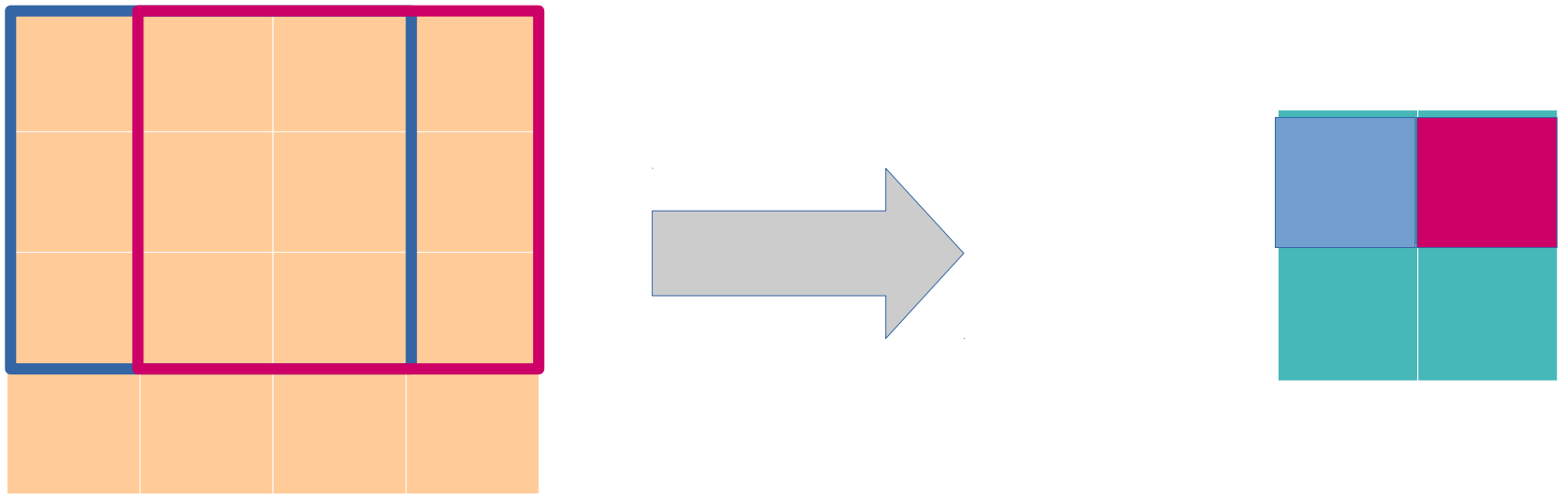
Inverse Convolution

Convolution revisited



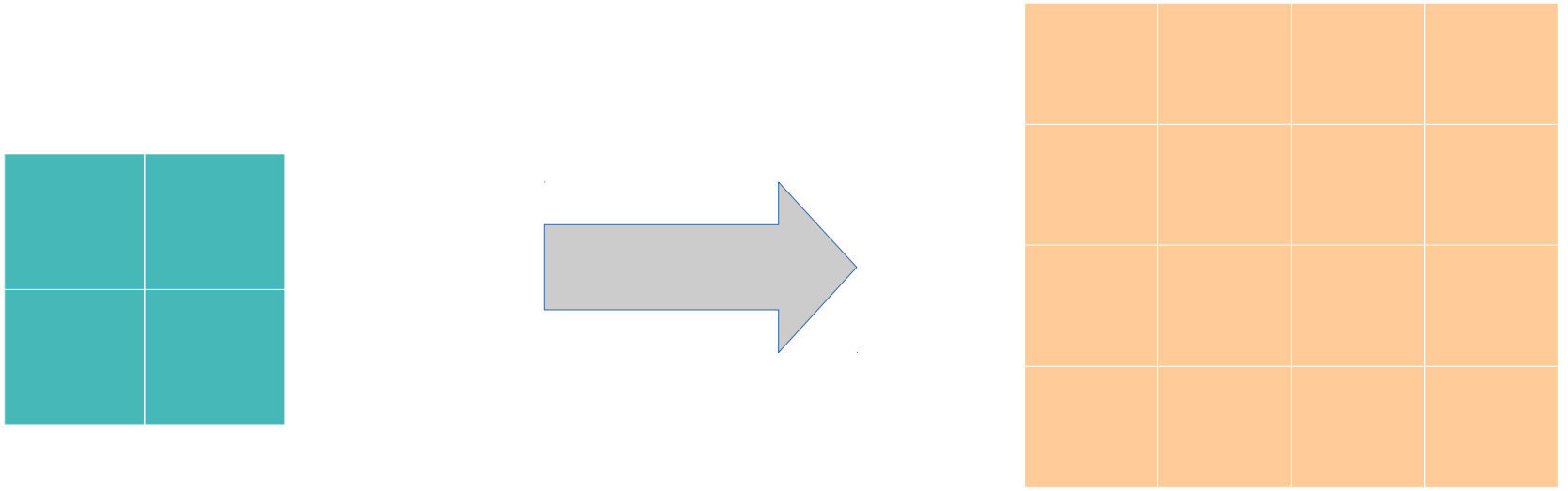
Inverse Convolution

Convolution revisited



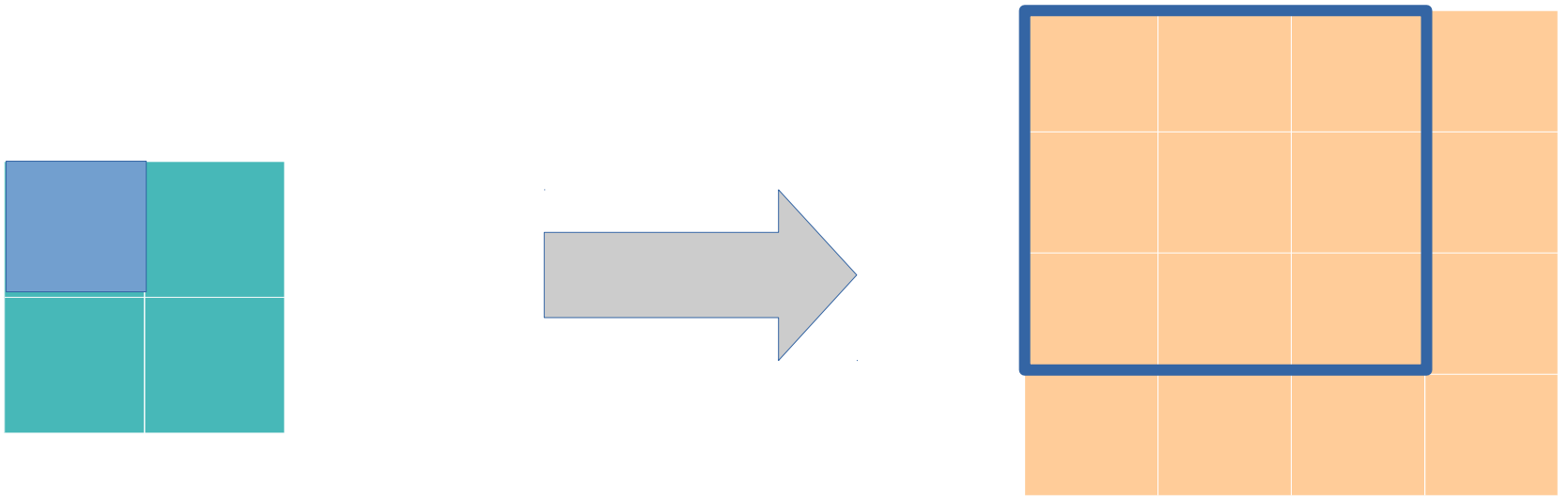
3 x 3 Convolution, Stride 1, Pad 0

Inverse Convolution



3 x 3 Convolution, Stride 1, Pad 0

Inverse Convolution



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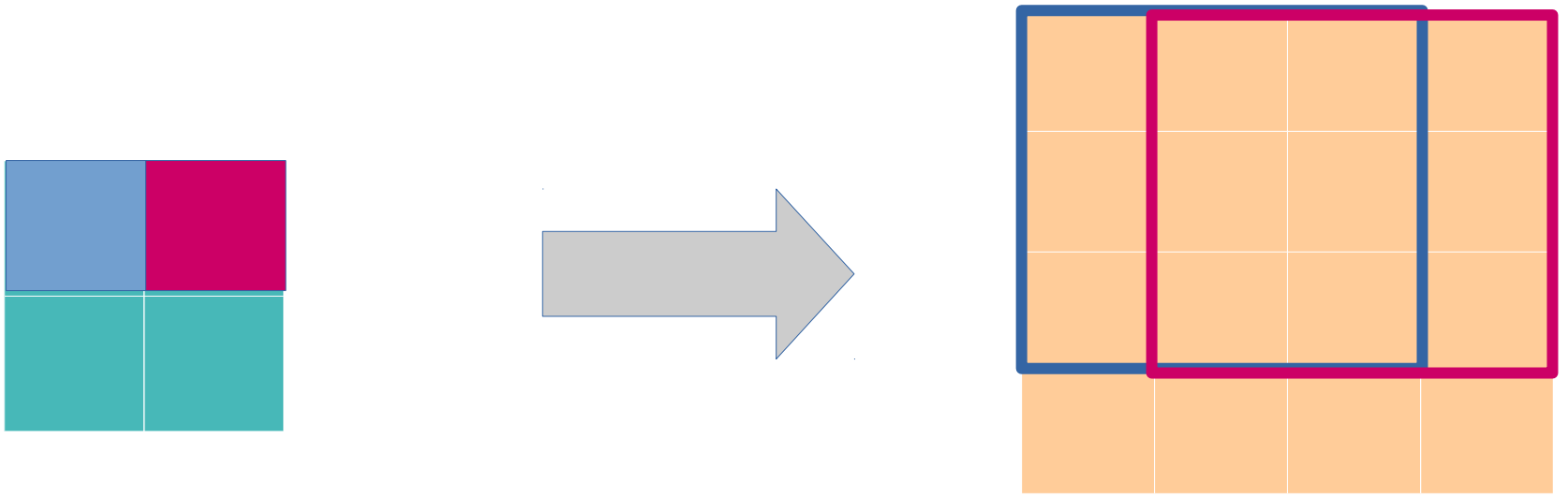
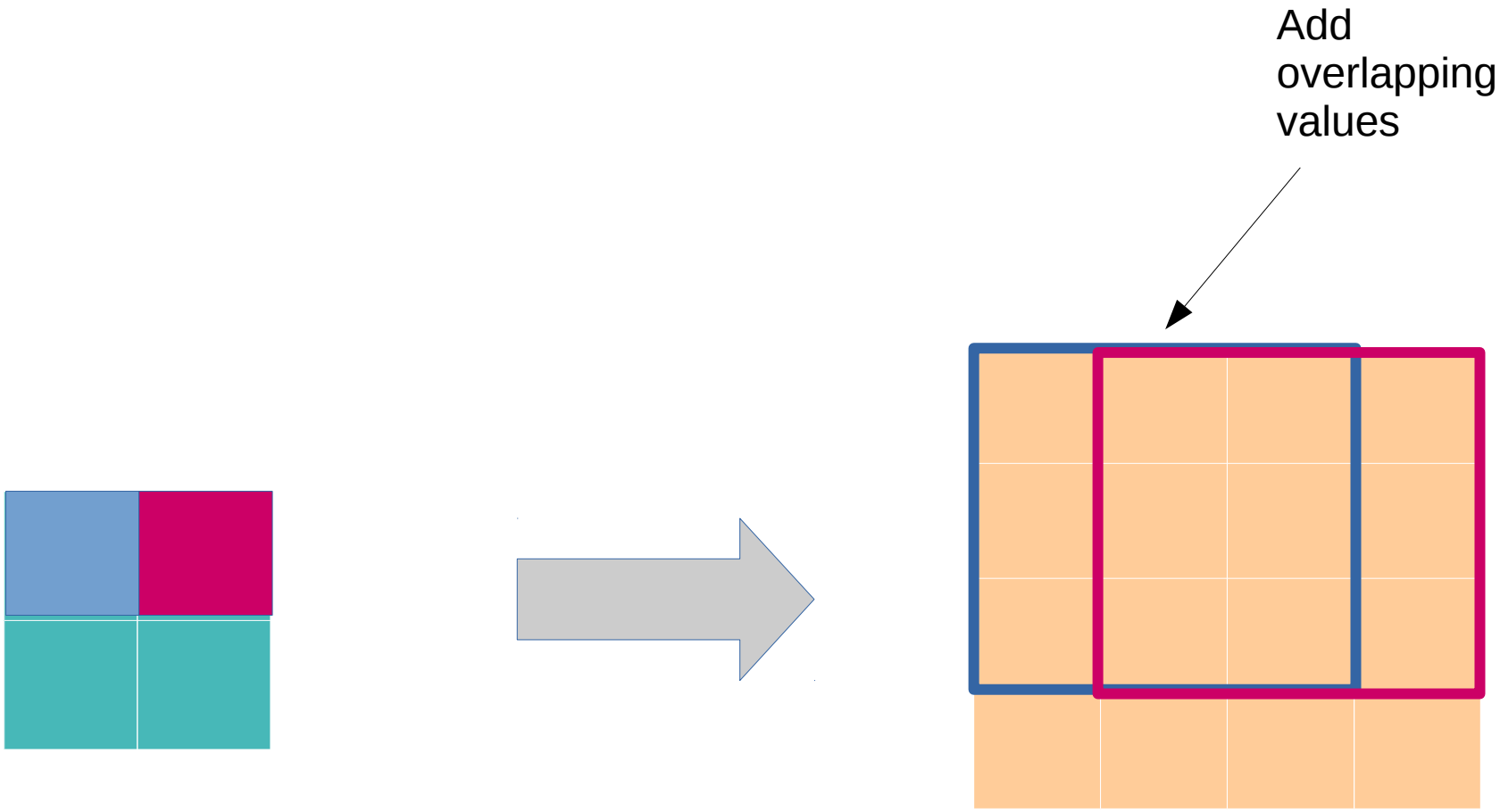
Inverse Convolution



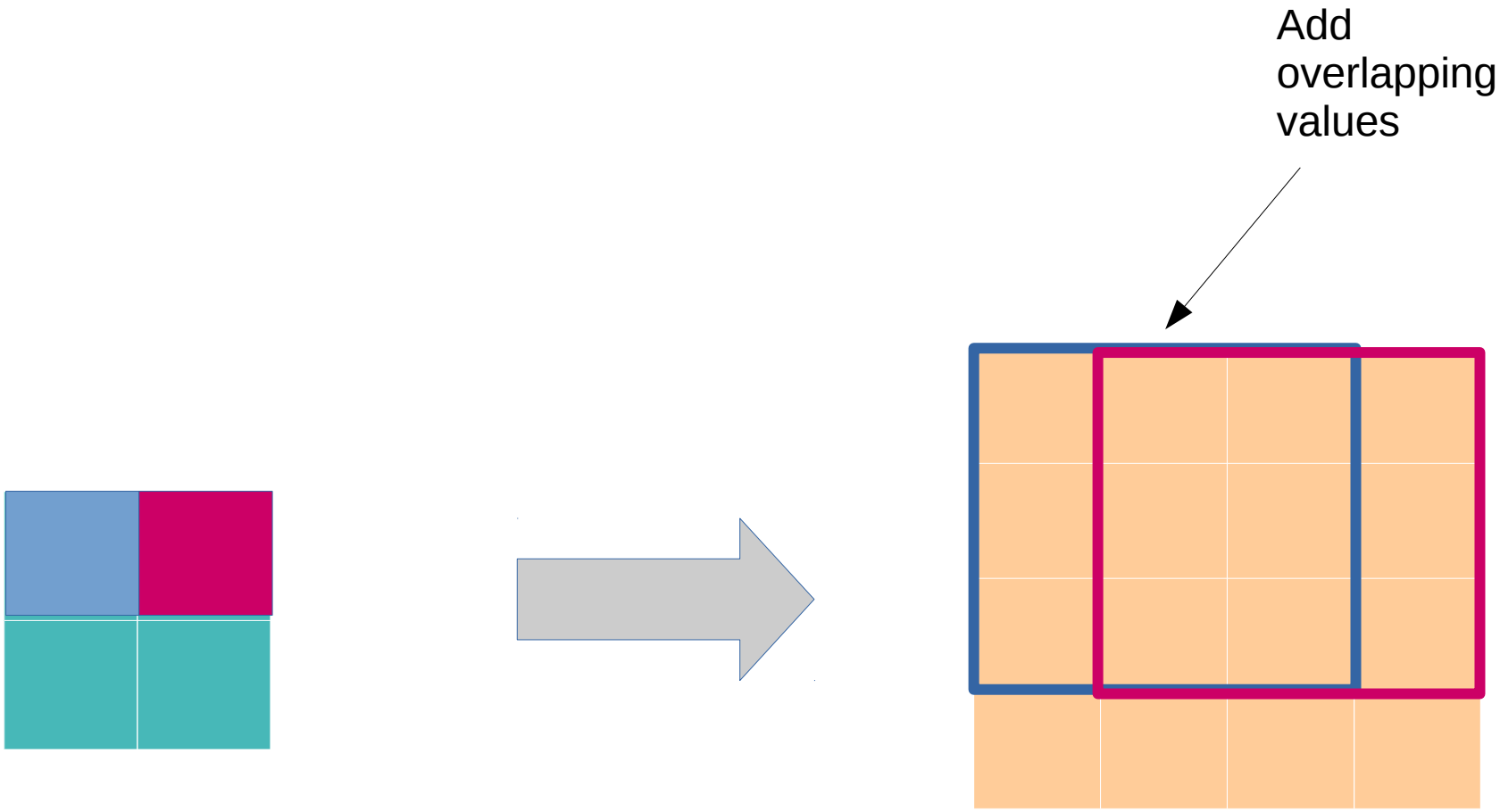
3 x 3 Convolution, Stride 1, Pad 0

Inverse Convolution



3 x 3 Convolution, Stride 1, Pad 0

Inverse Convolution



3 x 3 Convolution, Stride 1, Pad 0

Learn the weights using backpropagation

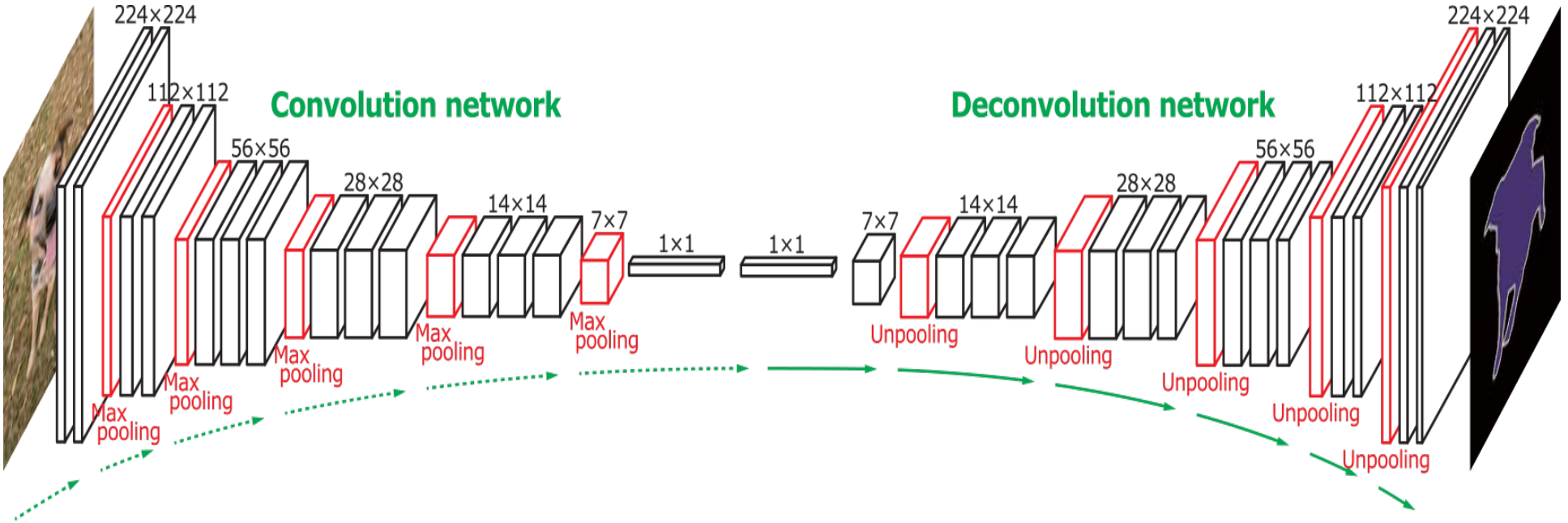
Learnable Upsampling

How do you learn ?

Input is actual image is output is the pixel labels (mask)

Learnable Upsampling

How do you learn ?



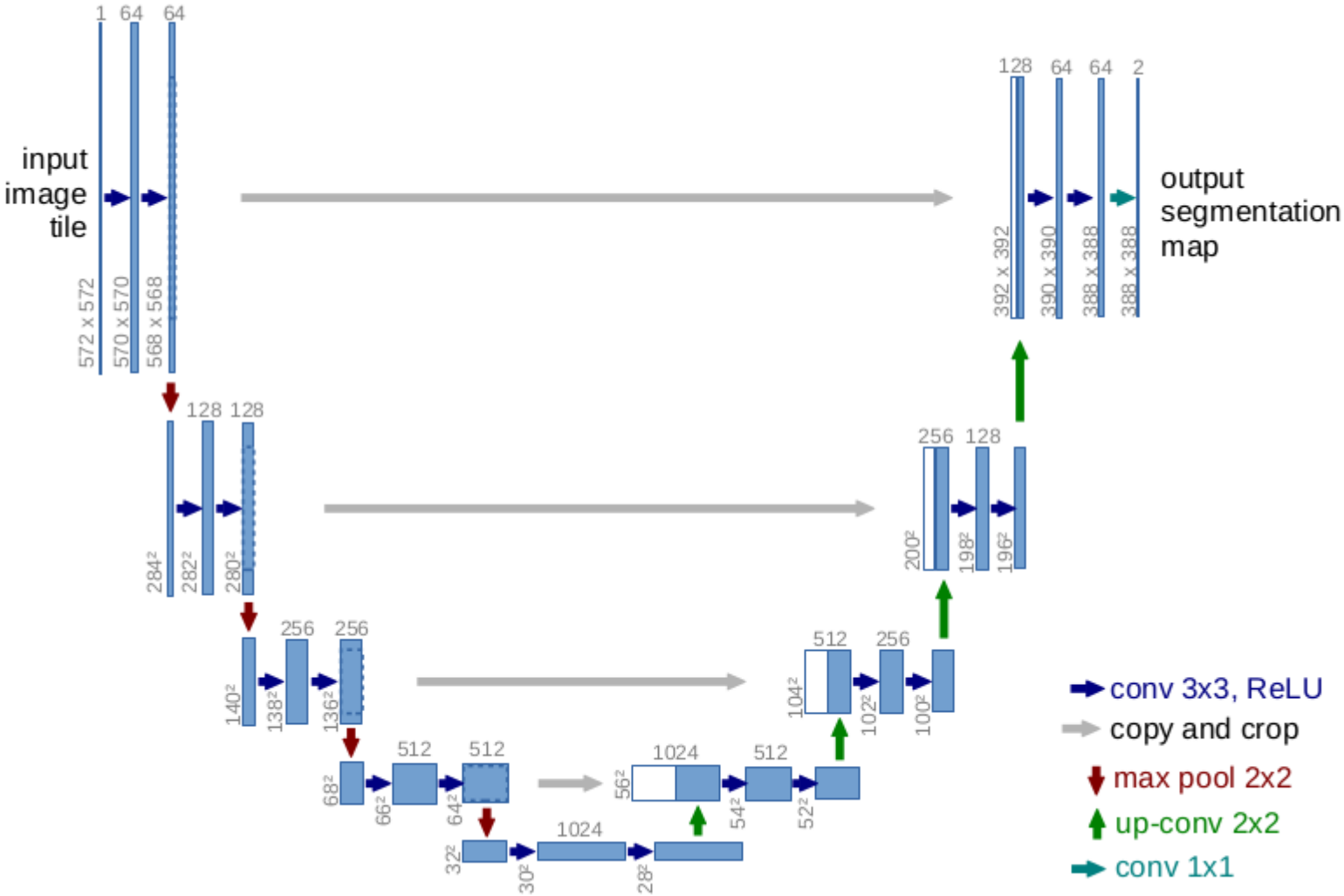
Just mirror image your input convolutional layers and optimize for the masked output

Semantic Segmentation

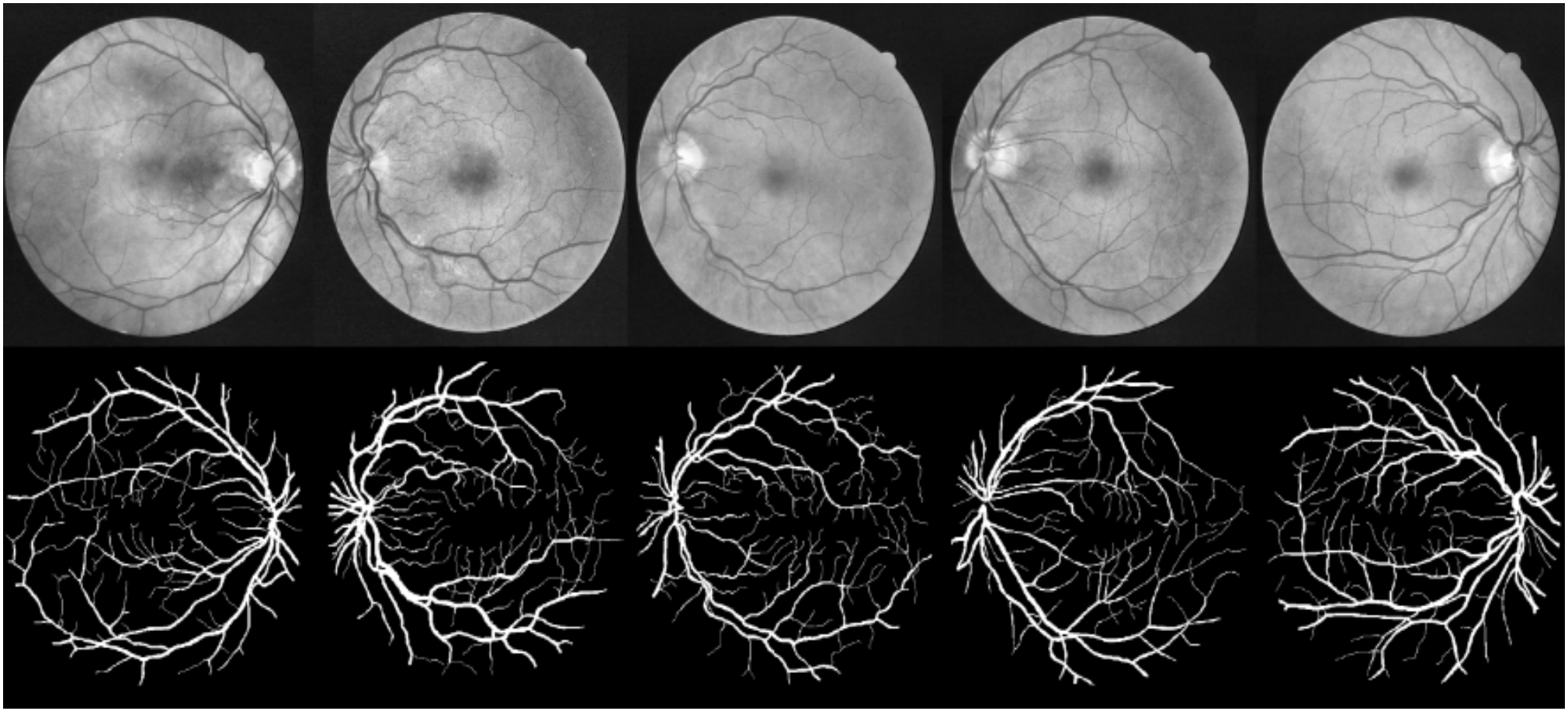
U-Net for Segmentation

Olaf Ronneberger, Philipp Fischer, and Thomas Brox

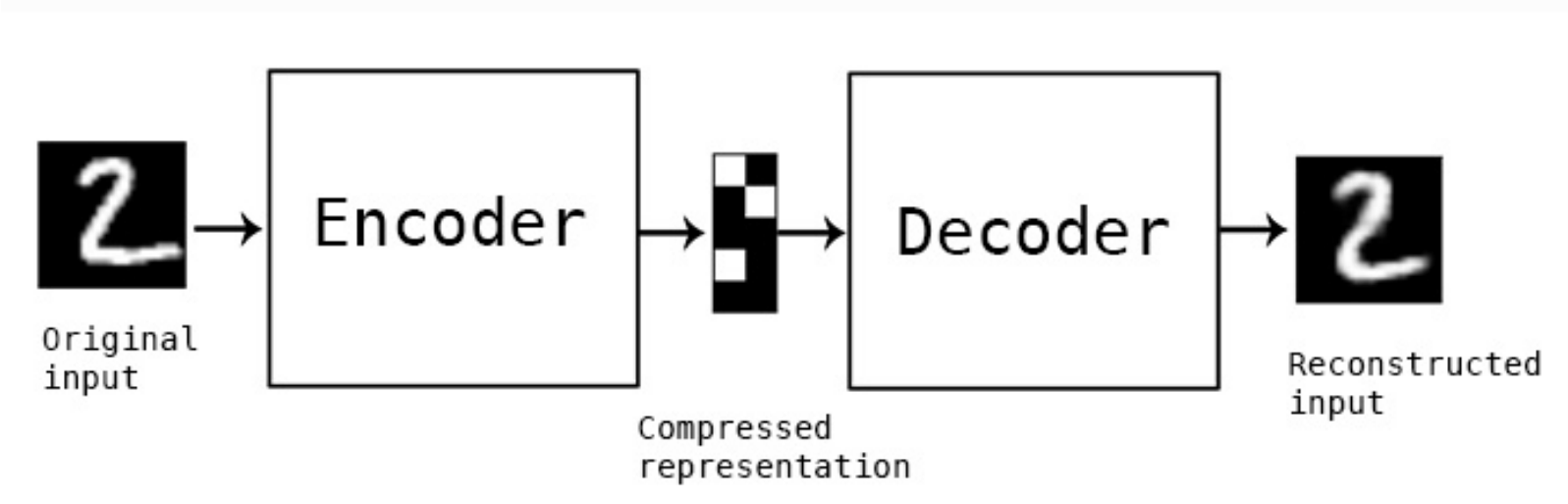
Computer Science Department and BIOSS Centre for Biological Signalling Studies,



U-Net for Segmentation



Autoencoders



Choosing the right Deep Net

LSTMs

Restricted Boltzmann Machine

Deep Belief Nets

Recurrent Networks

Deep Q networks

AutoEncoders

ConvNets

Choosing the right Deep Net

Supervised Learning

1. Convolutional Neural Networks [Text, Images, Time Series]
2. Recurrent Nets [Time Series, Text data, Speech data]
3. Deep Belief Networks (DBN) [Images]
4. Recurrent Neural Tensor Network (RNTN) [Text]

Choosing the right Deep Net

Unsupervised Learning , Feature Extraction

1. Autoencoders

2. Restricted Boltzmann Machines (RBM)

Choosing the right Deep Net

Reinforcment Learning

1. Deep Q Networks (DQN)