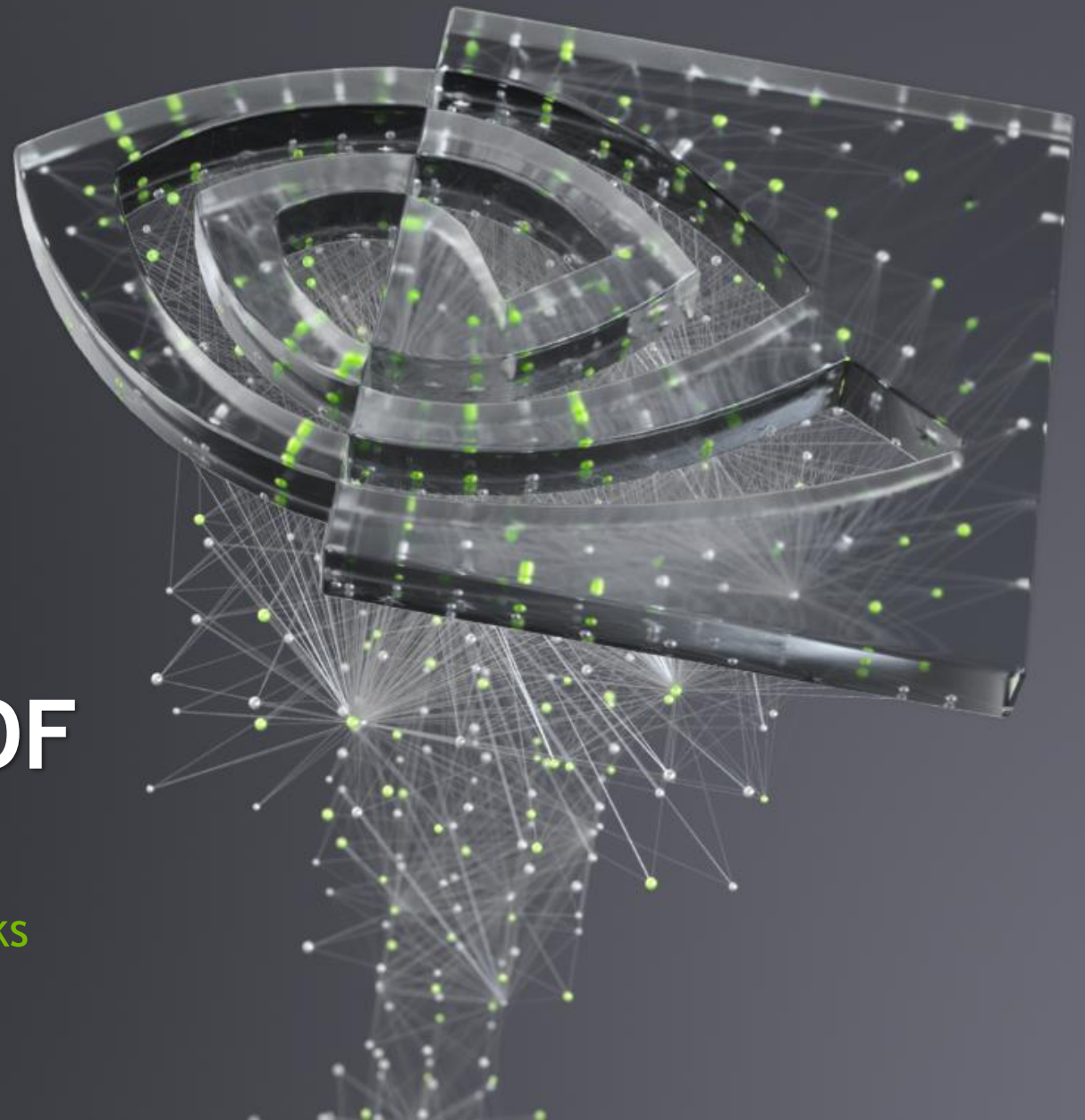


NVIDIA | DEEP LEARNING INSTITUTE

FUNDAMENTALS OF DEEP LEARNING

Part 3: Convolutional Neural Networks

AGENDA

- Part 1: An Introduction to Deep Learning
- Part 2: How a Neural Network Trains
- Part 3: Convolutional Neural Networks
- Part 4: Data Augmentation and Deployment
- Part 5: Pre-trained Models
- Part 6: Advanced Architectures

AGENDA – PART 3

- Kernels and Convolution
- Kernels and Neural Networks
- Other Layers in the Model

RECAP OF THE EXERCISE

- Trained a dense neural network model
- Training accuracy was high
- Validation accuracy was low
- Evidence of overfitting

KERNELS AND CONVOLUTION

KERNELS AND CONVOLUTION

Original Image

Blur

Sharpen

Brighten

Darken

KERNELS AND CONVOLUTION

Original Image

Blur

.06	.13	.06
.13	.25	.13
.06	.13	.06

Sharpen

0	-1	0
-1	5	-1
0	-1	0

Brighten

0	0	0
0	1.5	0
0	0	0

Darken

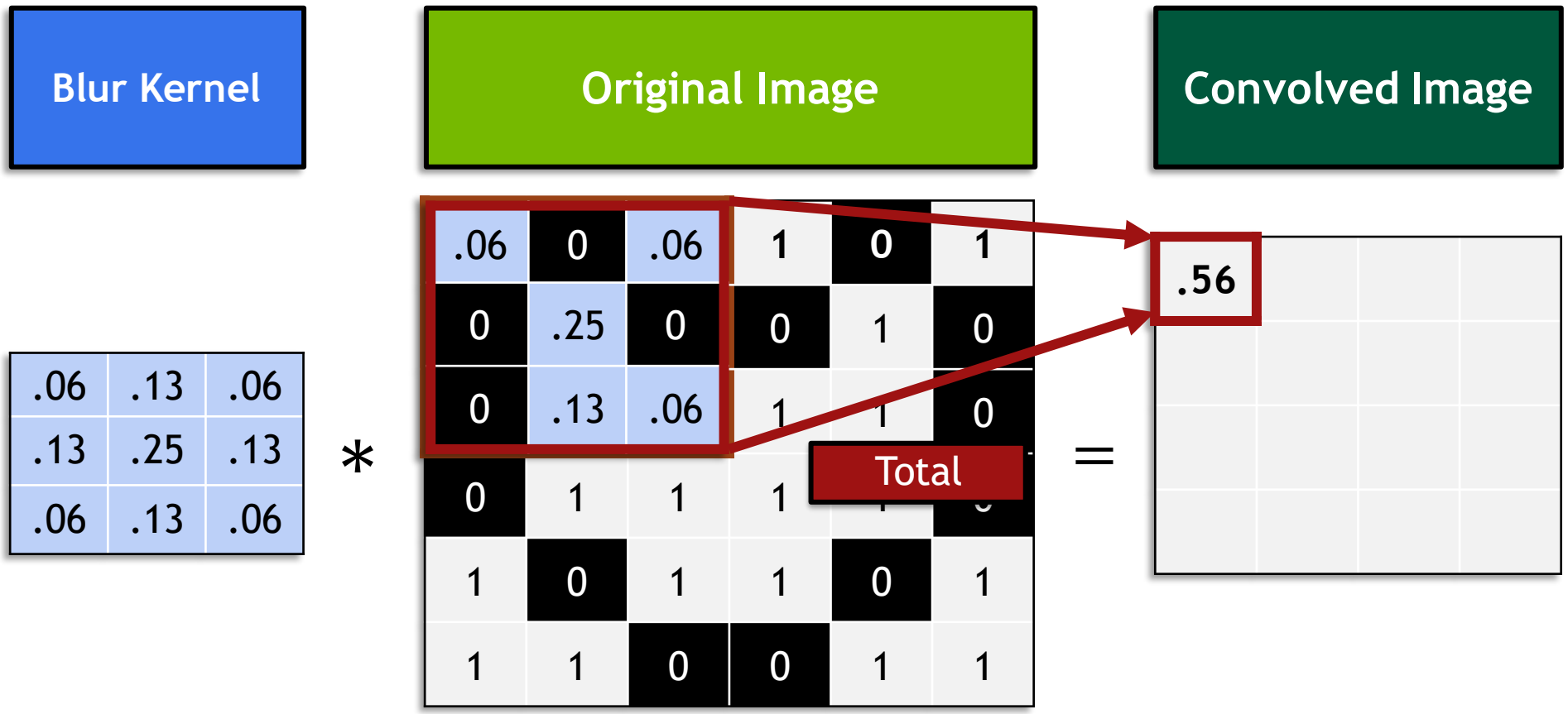
0	0	0
0	0.5	0
0	0	0

KERNELS AND CONVOLUTION

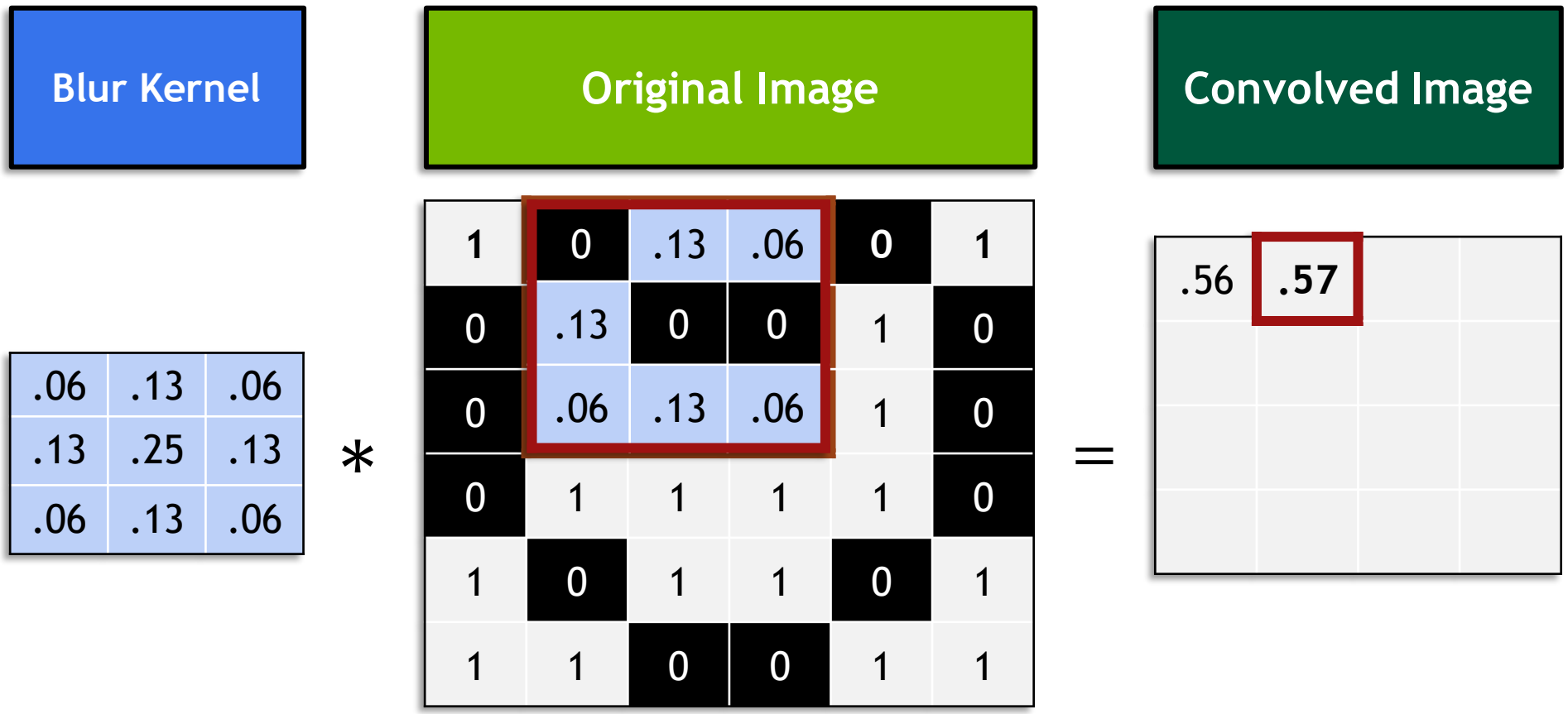
KERNELS AND CONVOLUTION

KERNELS AND CONVOLUTION

KERNELS AND CONVOLUTION

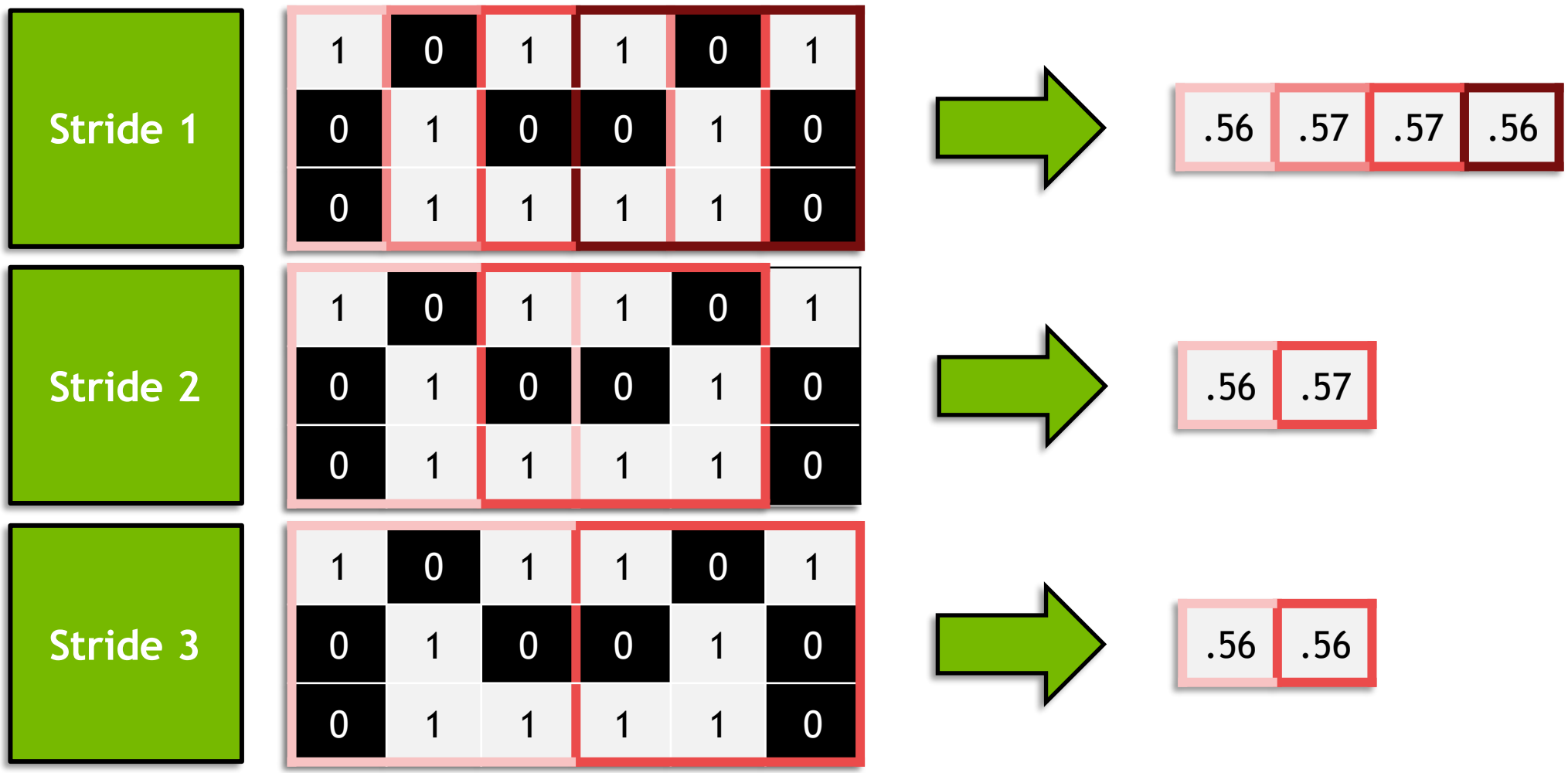


KERNELS AND CONVOLUTION



KERNELS AND CONVOLUTION

STRIDE



PADDING

Original Image

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

Zero Padding

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

PADDING

Original Image

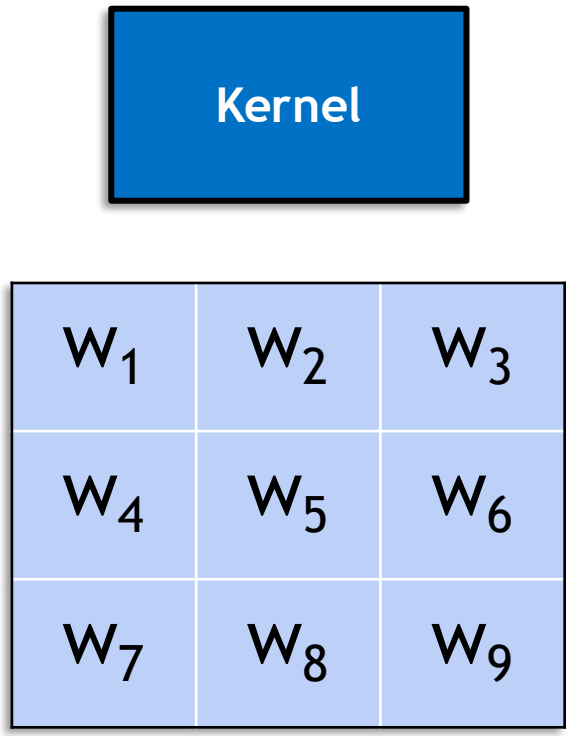
1	0	1	1	0	1
0	1	0	0	1	0
0	1	1	1	1	0
0	1	1	1	1	0
1	0	1	1	0	1
1	1	0	0	1	1

Mirror Padding

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

KERNELS AND NEURAL NETWORKS

KERNELS AND NEURAL NETWORKS

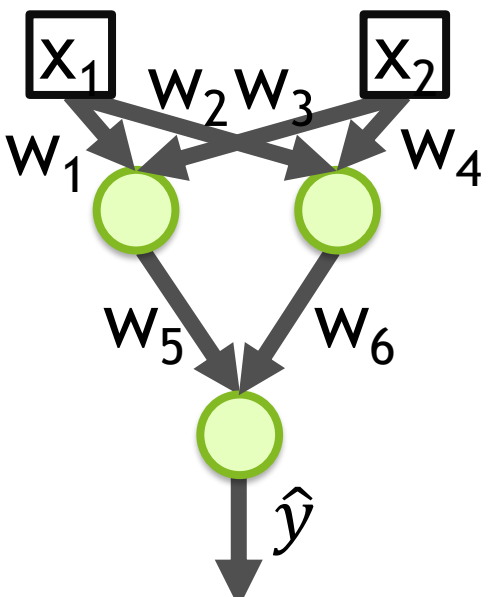


KERNELS AND NEURAL NETWORKS

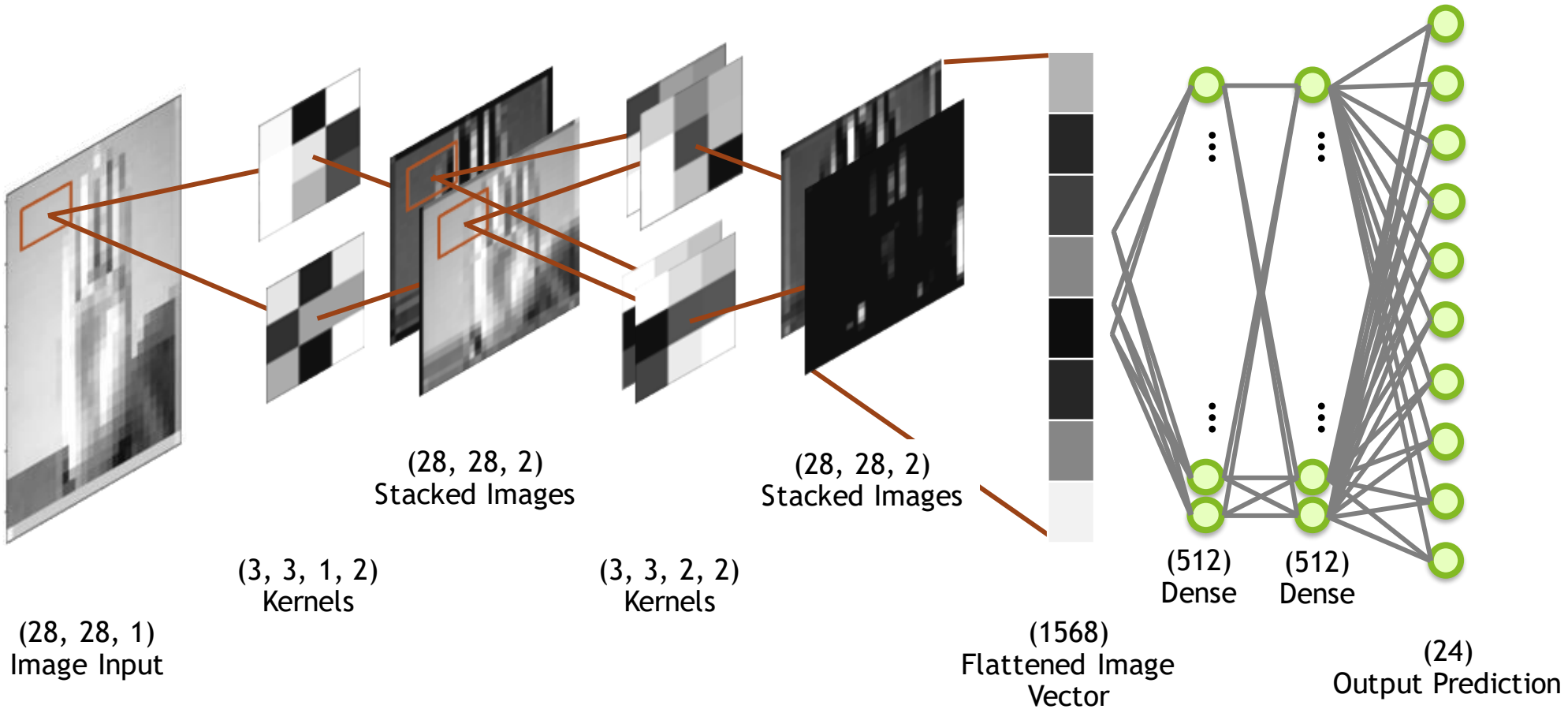
Kernel

w_1	w_2	w_3
w_4	w_5	w_6
w_7	w_8	w_9

Neuron

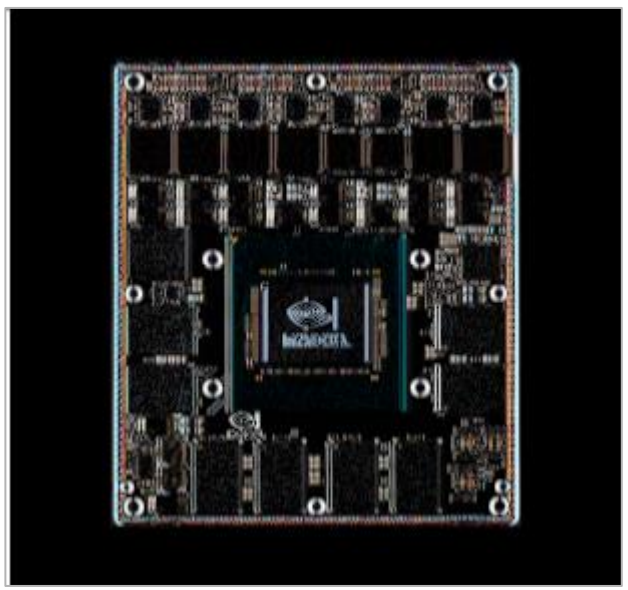


KERNELS AND NEURAL NETWORKS



FINDING EDGES

Vertical Edges

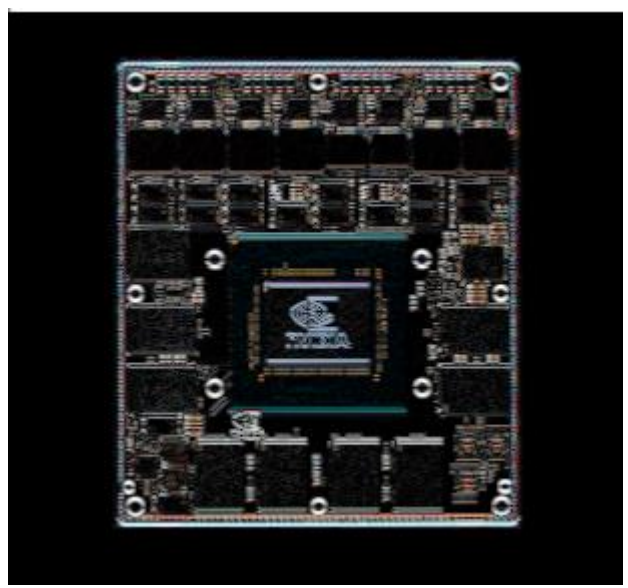


1	0	-1
2	0	-2
1	0	-1

Original Image

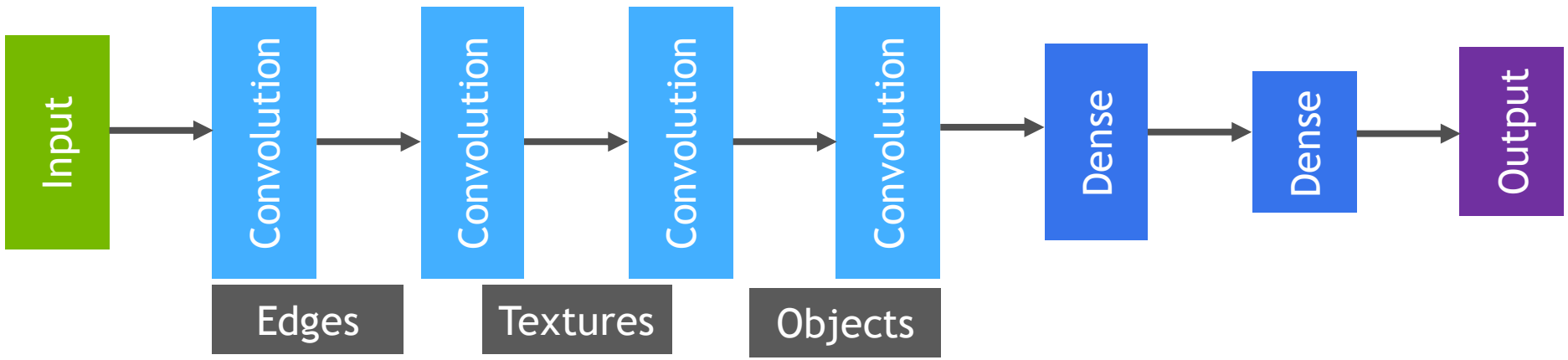
0	0	0
0	1	0
0	0	0

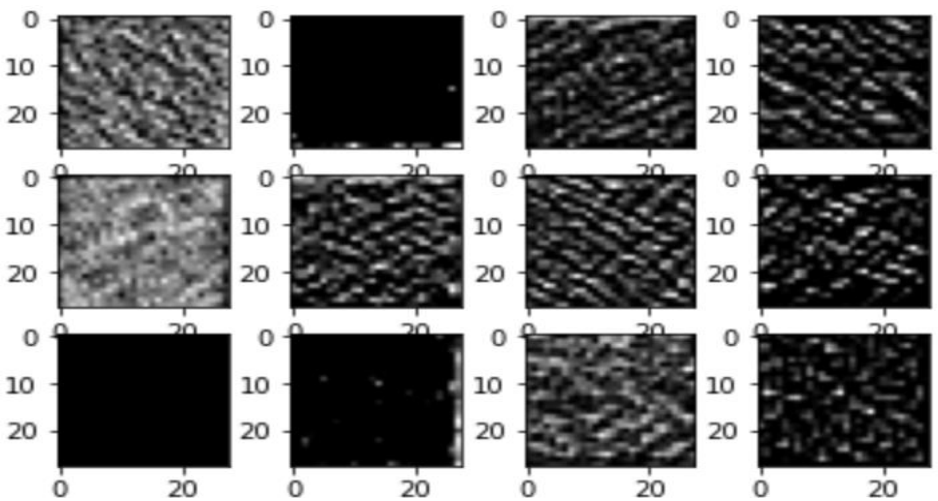
Horizontal Edges



1	2	1
0	0	0
-1	-2	-1

NEURAL NETWORK PERCEPTION

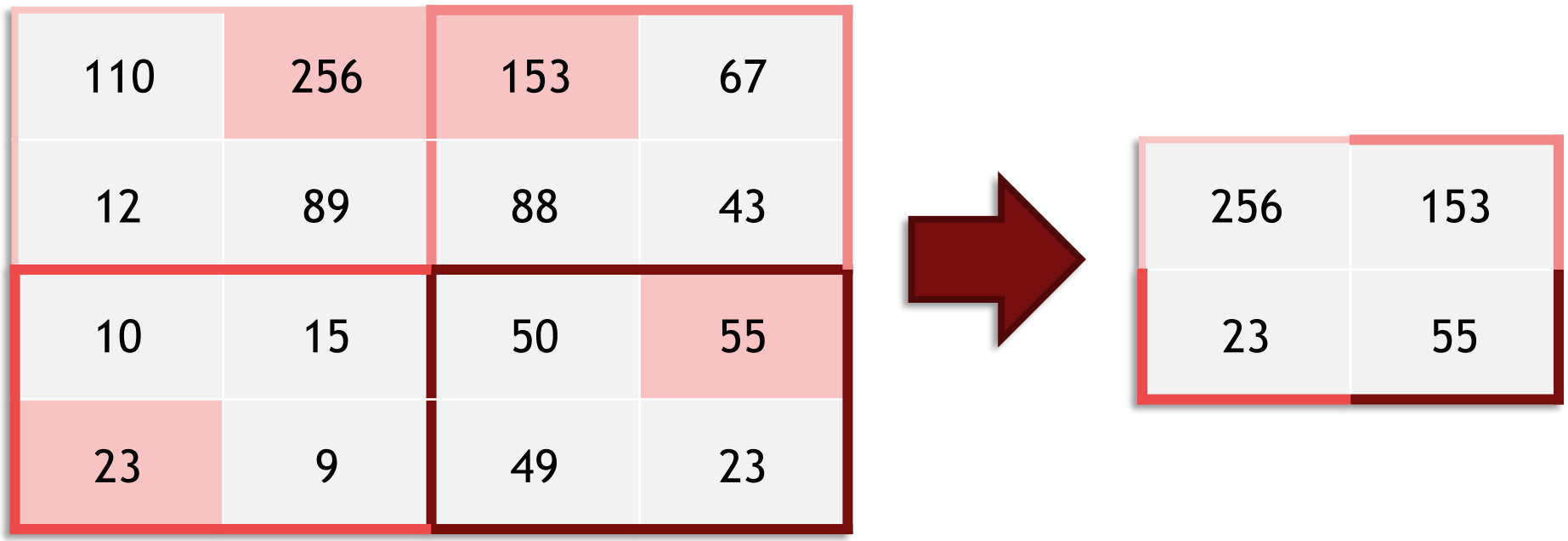




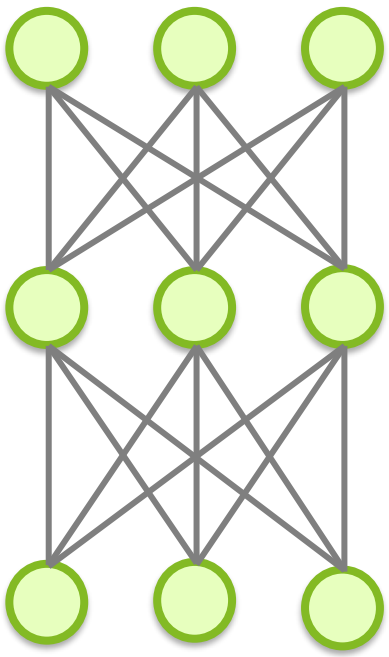
NEURAL NETWORK PERCEPTION

OTHER LAYERS IN THE MODEL

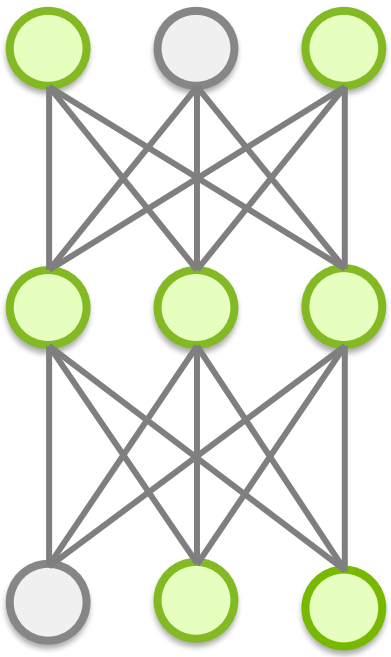
MAX POOLING



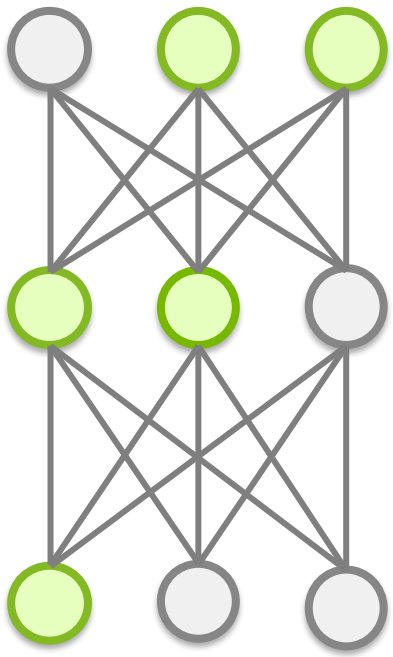
DROPOUT



rate = 0

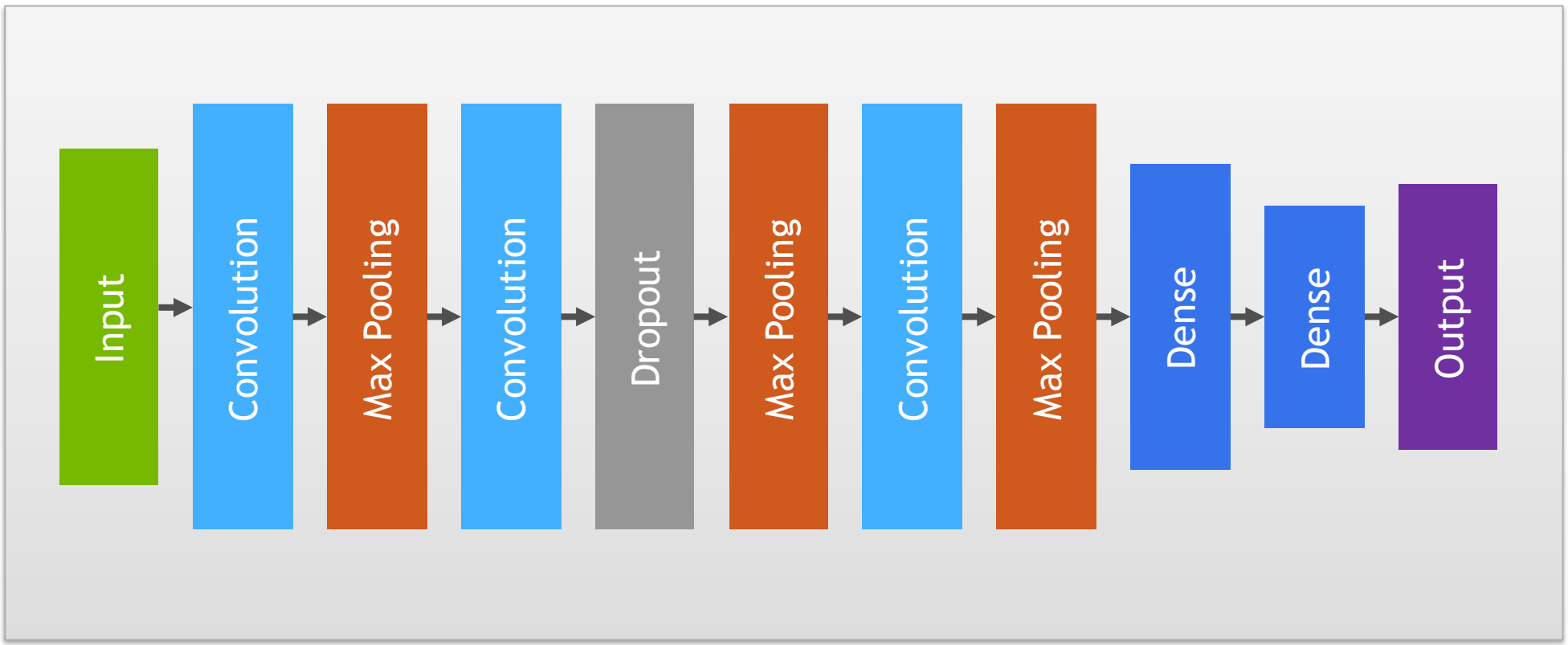


rate = .2

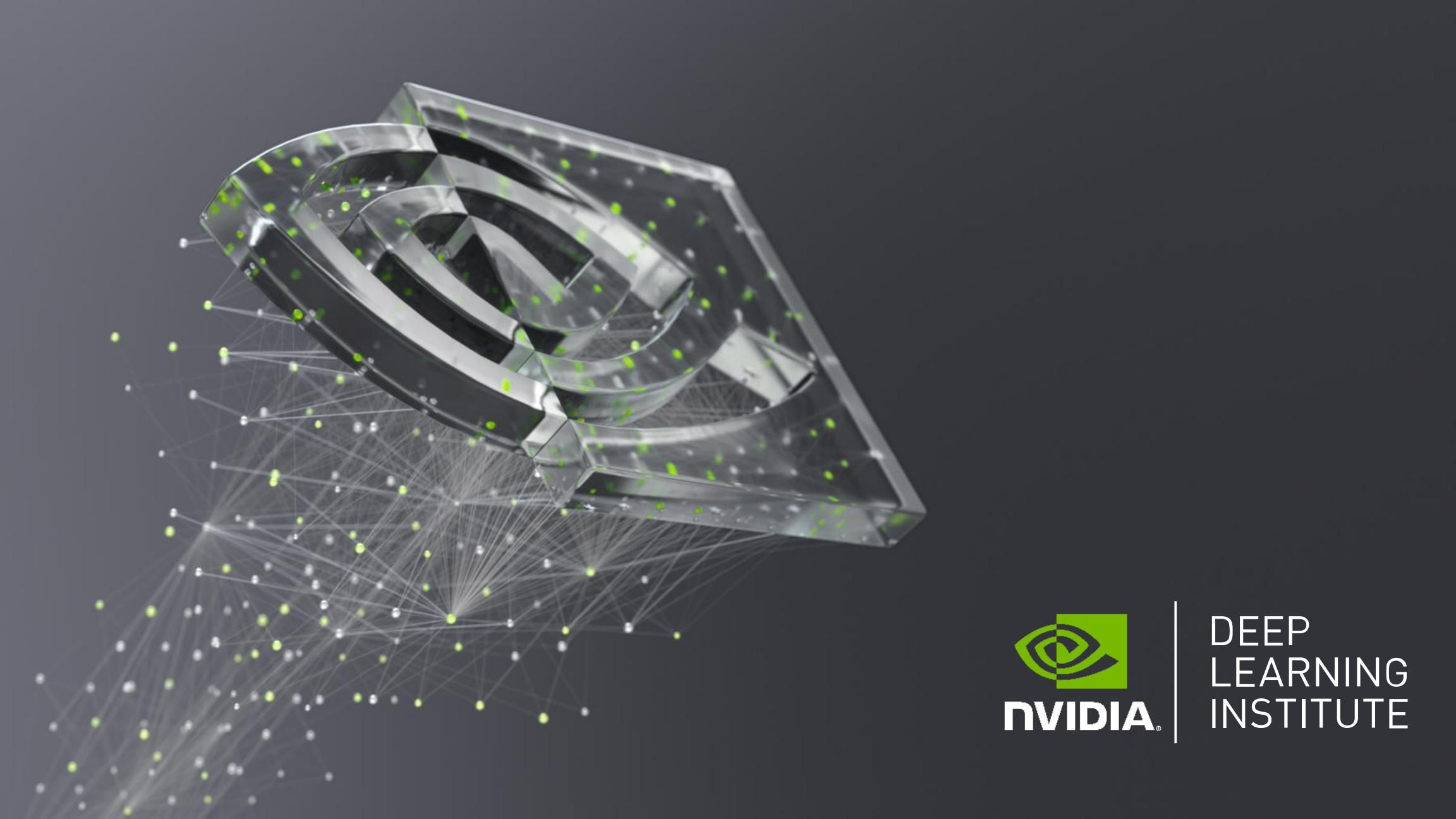


rate = .4

WHOLE ARCHITECTURE




LET’S GO!


NVIDIA
DEEP
LEARNING
INSTITUTE