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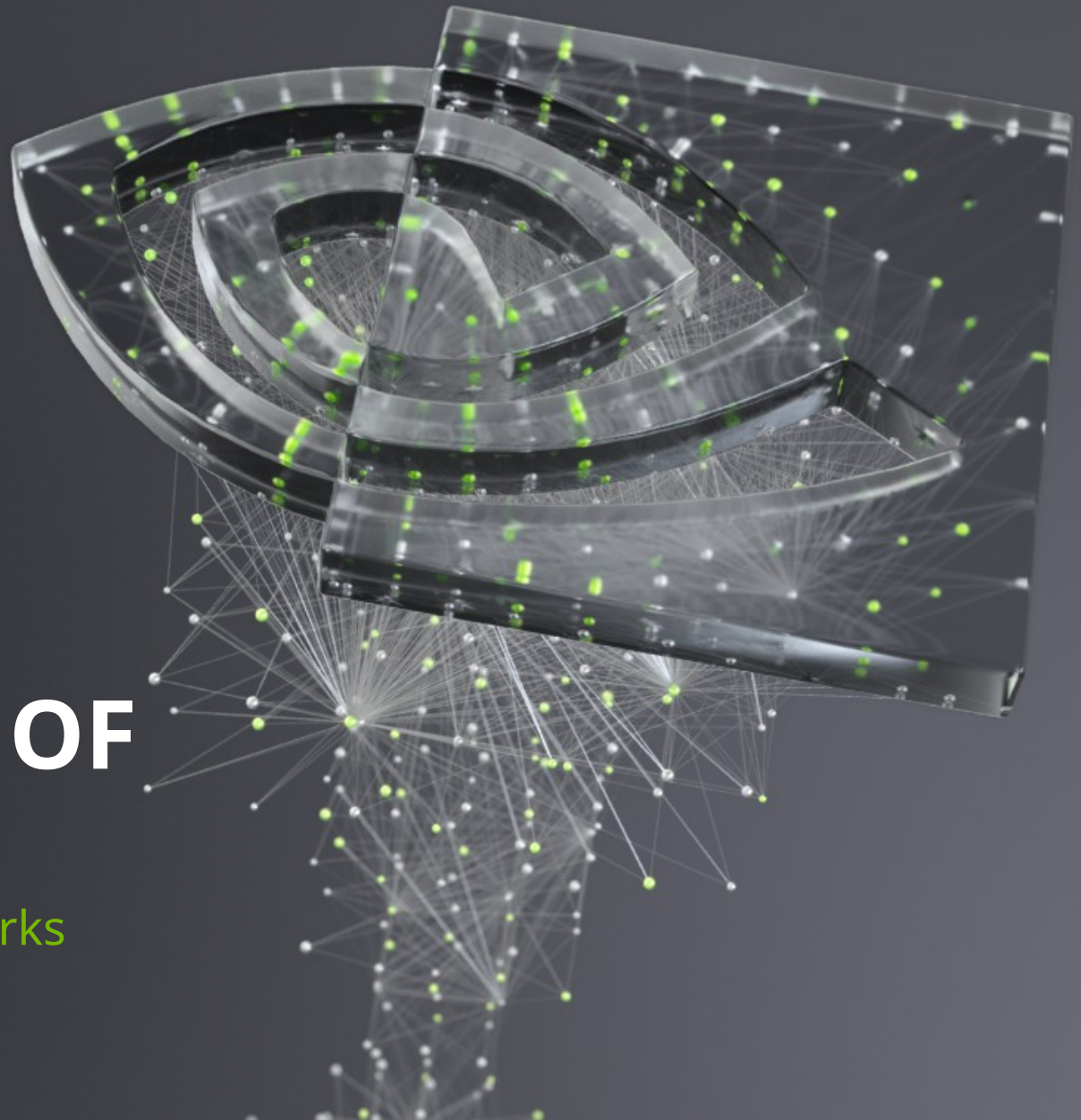

FUNDAMENTALS OF DEEP LEARNING

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

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KERNELS AND CONVOLUTION

KERNELS AND CONVOLUTION

Original Image

Blur

Sharpen

Brighten

Darken

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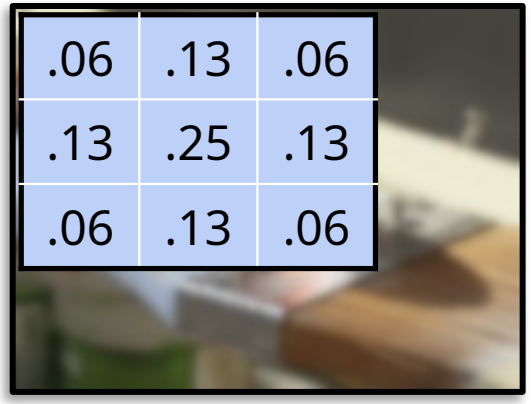
KERNELS AND CONVOLUTION

Original Image

Blur

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



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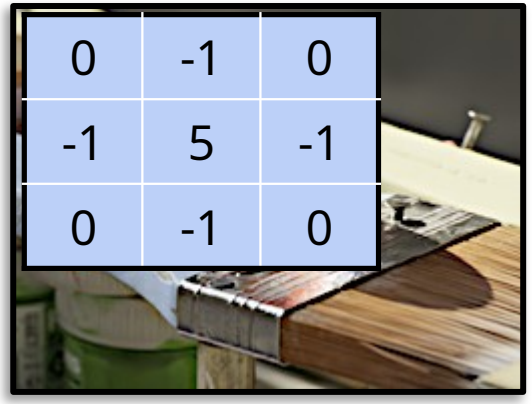

Brighten

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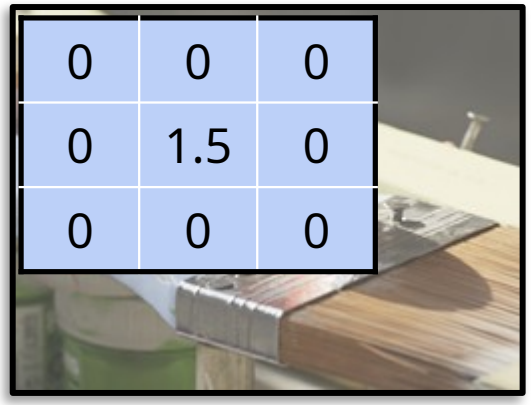

Darken

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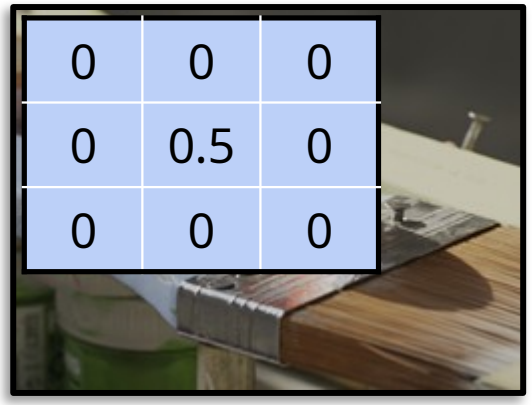

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KERNELS AND CONVOLUTION

Blur Kernel

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

*

Original Image

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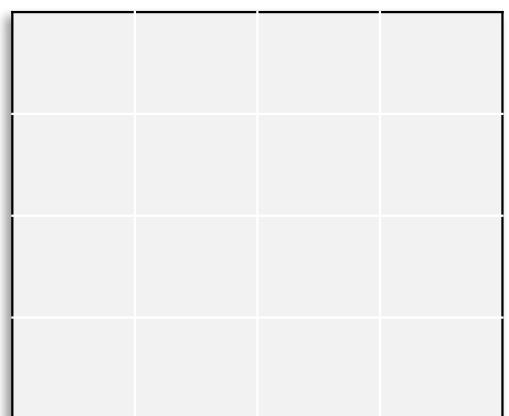
Convolved Image



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KERNELS AND CONVOLUTION

Blur Kernel

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

*

Original Image

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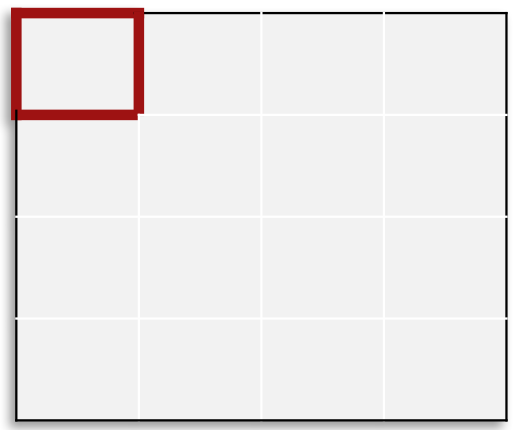
Convolved Image



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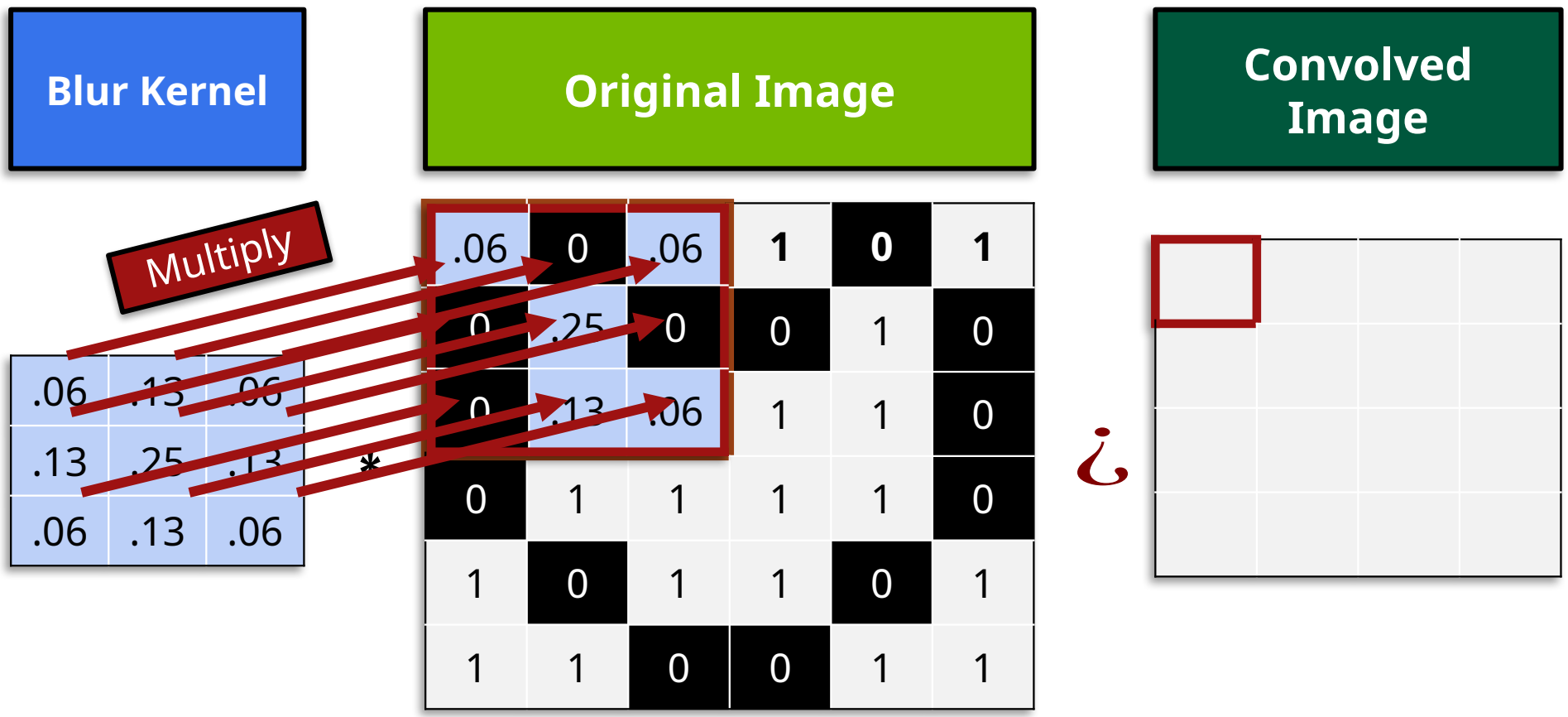
KERNELS AND CONVOLUTION



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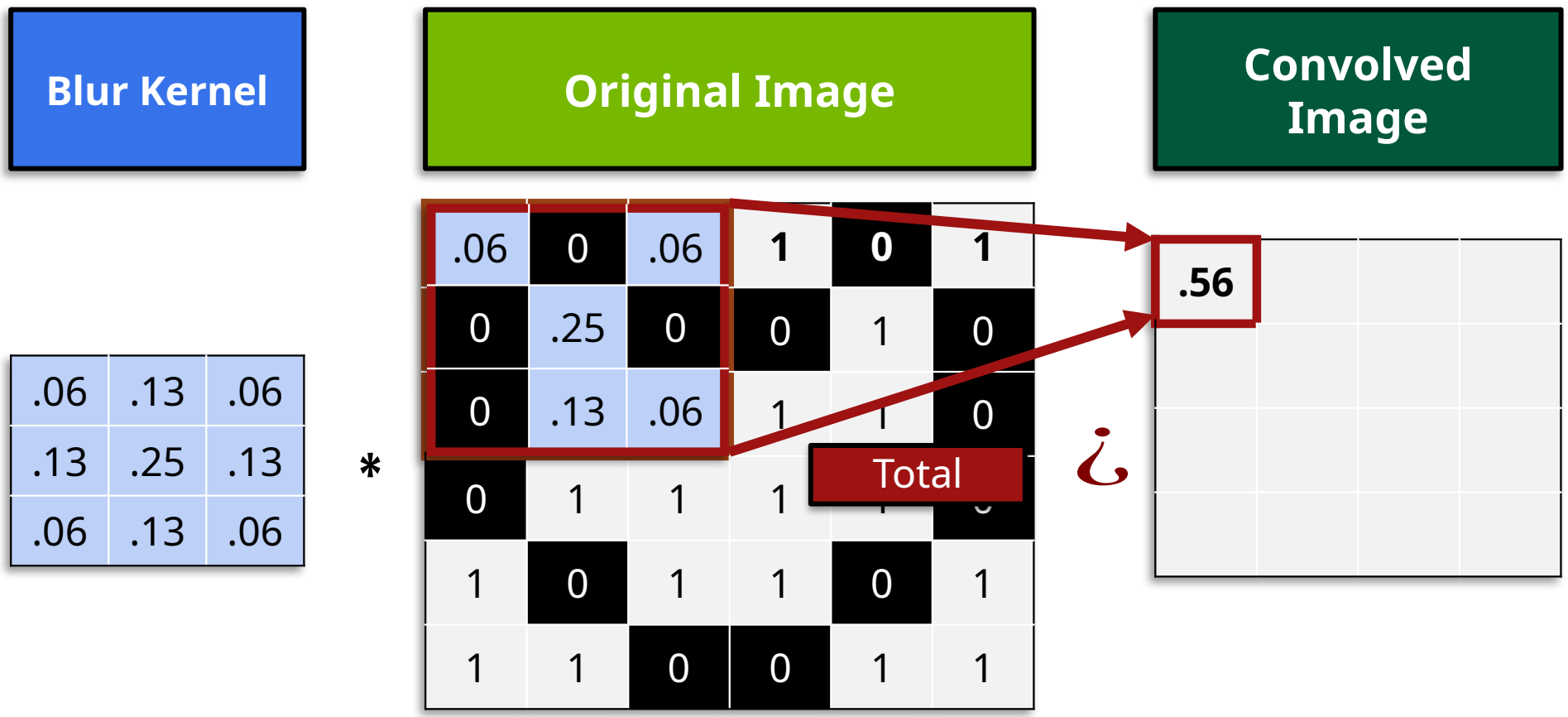
KERNELS AND CONVOLUTION



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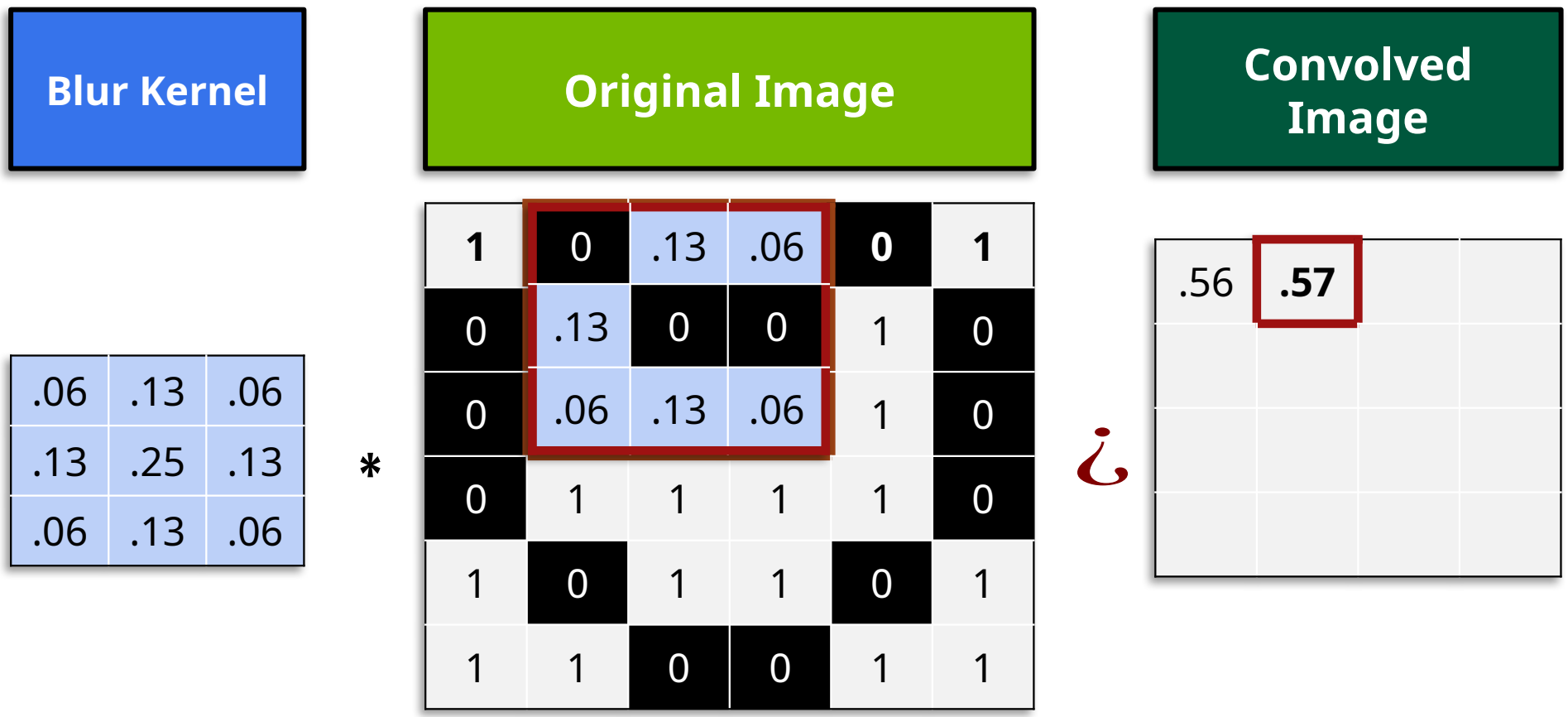
KERNELS AND CONVOLUTION



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KERNELS AND CONVOLUTION

Blur Kernel

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

*

Original Image

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Convolved Image

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.7	.82	.82	.7
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.64	.69	.69	.64

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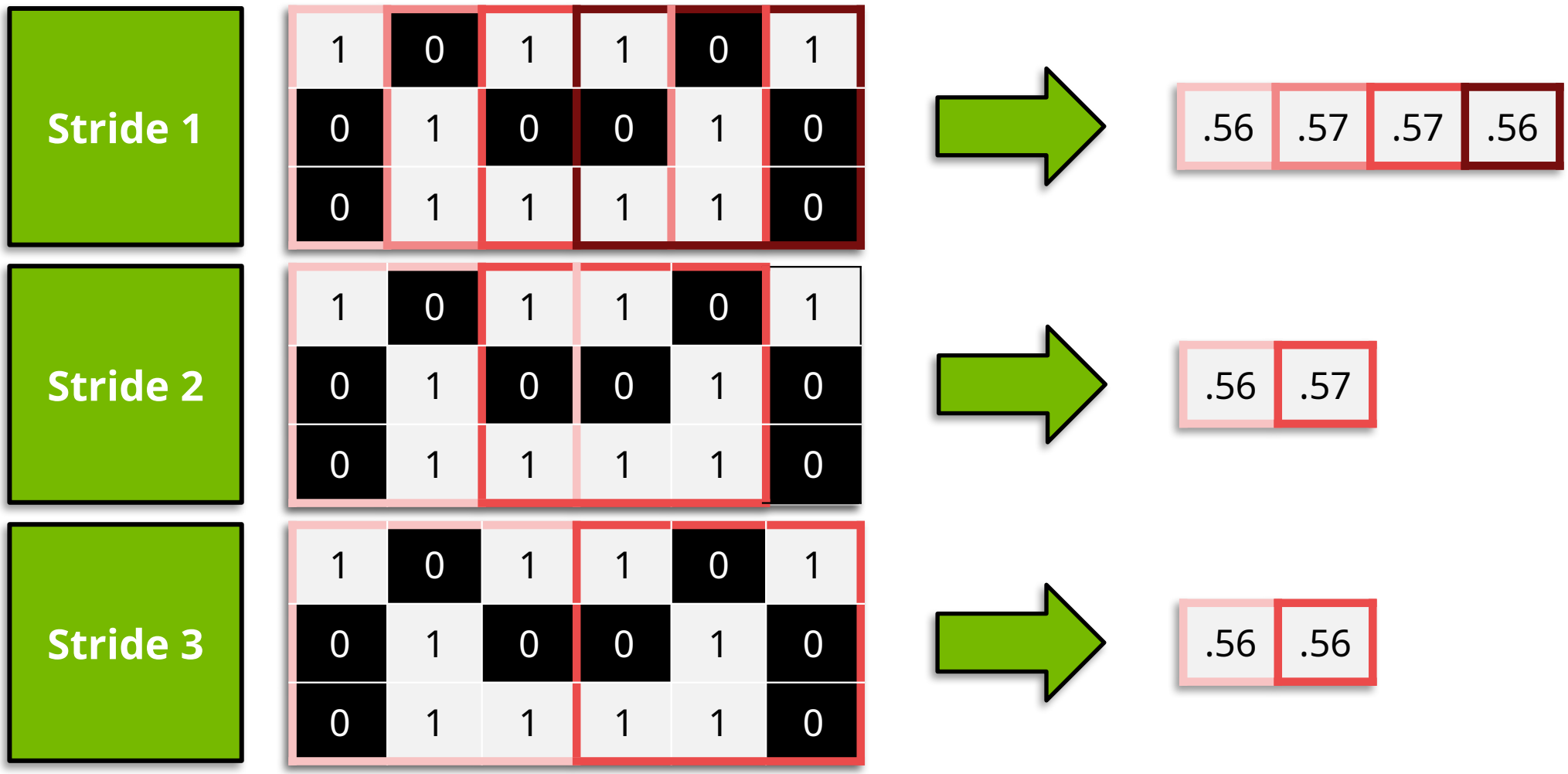
STRIDE



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PADDING

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NVIDIA DEEP LEARNING INSTITUTE

PADDING

Original Image

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Mirror Padding

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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

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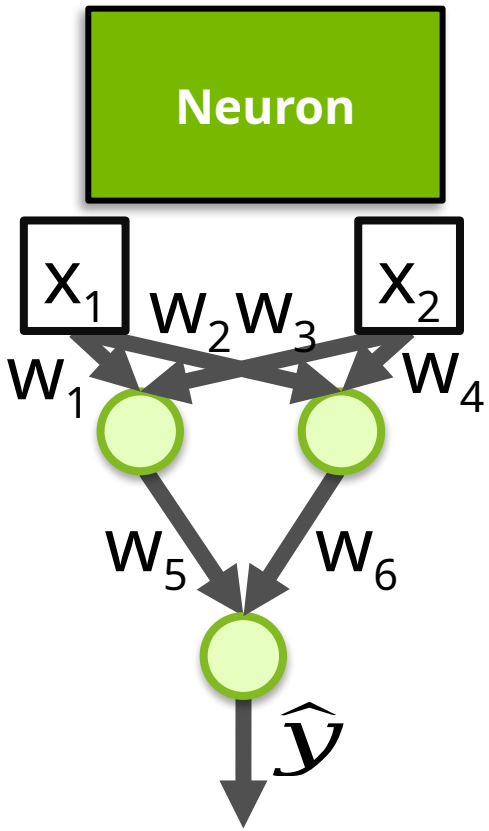
KERNELS AND NEURAL NETWORKS

Kernel

w_1	w_2	w_3
w_4	w_5	w_6
w_7	w_8	w_9



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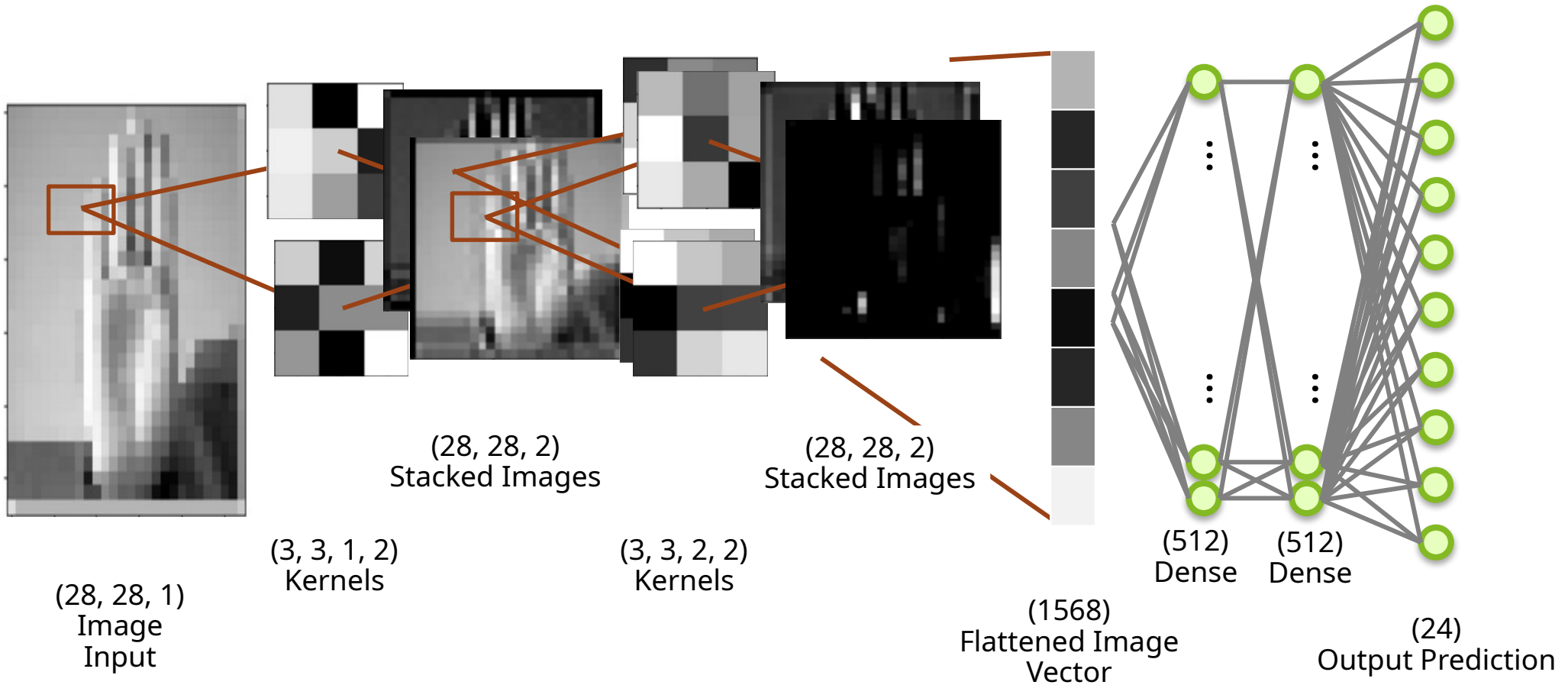
KERNELS AND NEURAL NETWORKS



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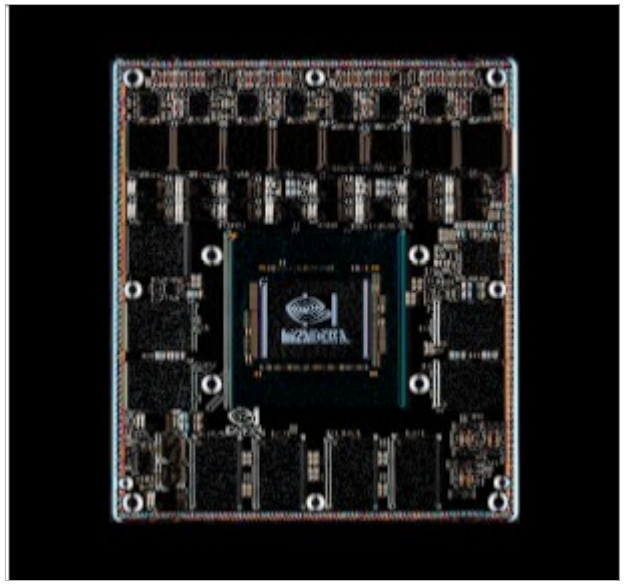
FINDING EDGES

Vertical Edges



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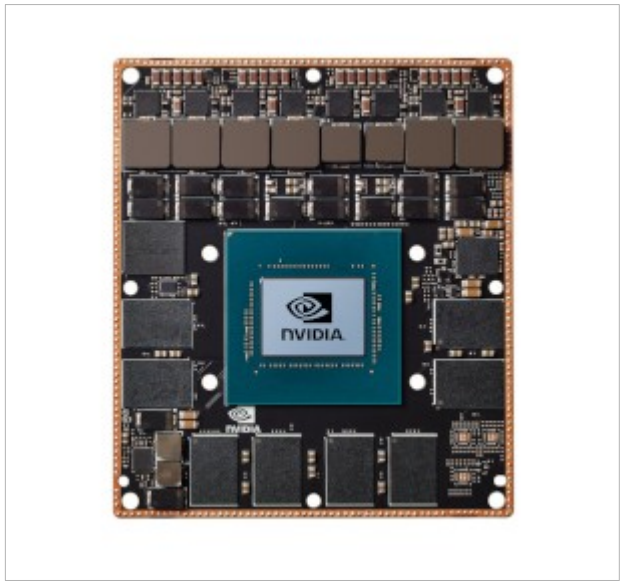

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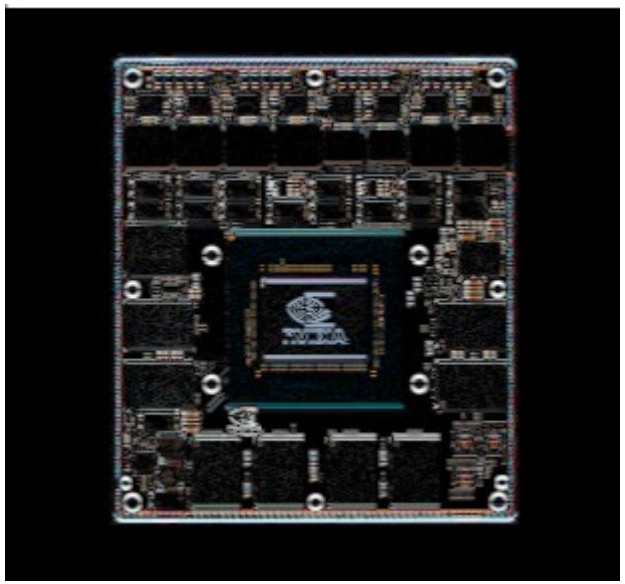

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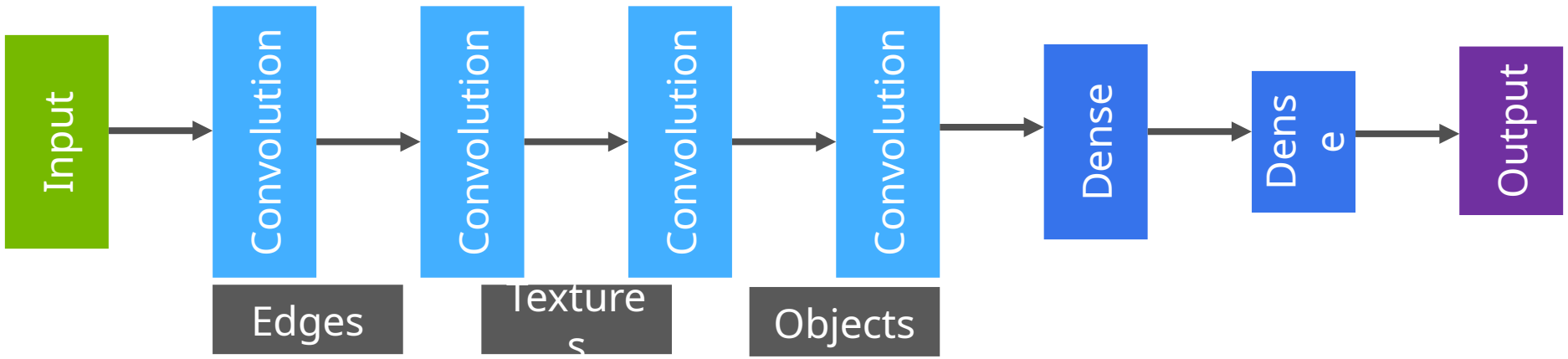
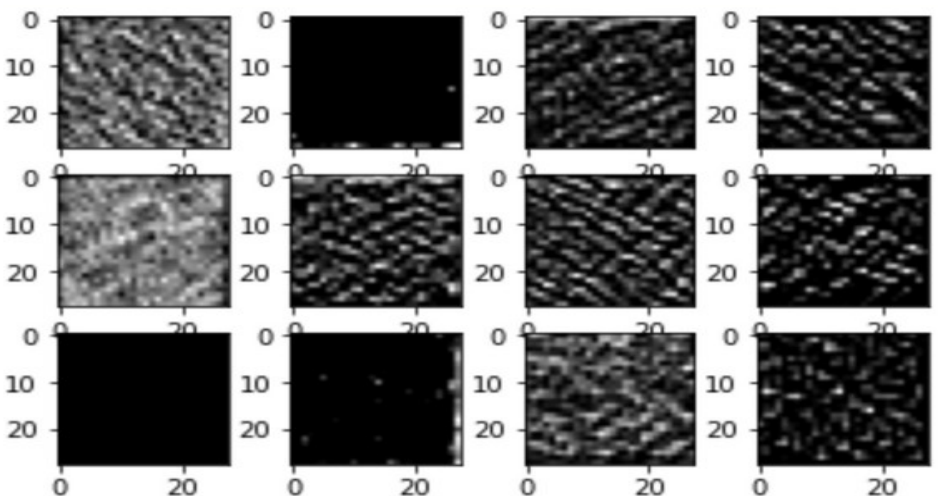
NEURAL NETWORK PERCEPTION





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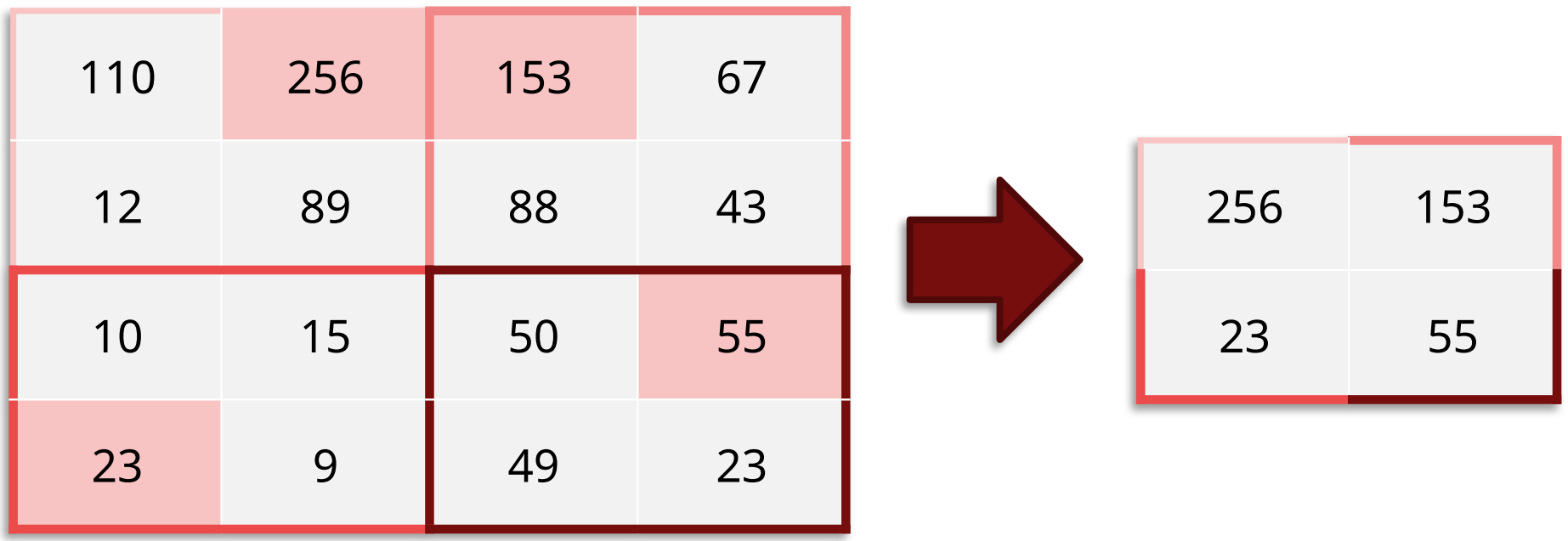
NEURAL NETWORK PERCEPTION

OTHER LAYERS IN THE MODEL

MAX POOLING



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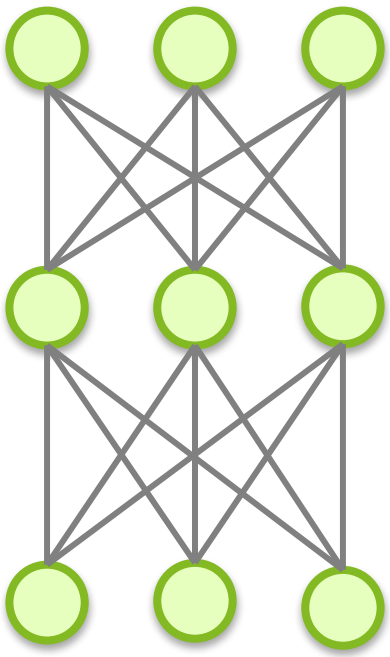
DROPOUT



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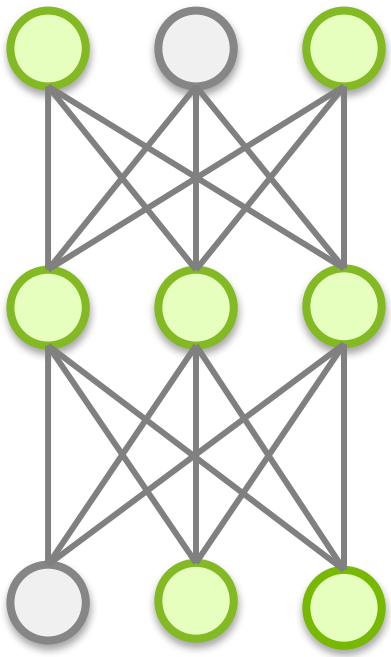

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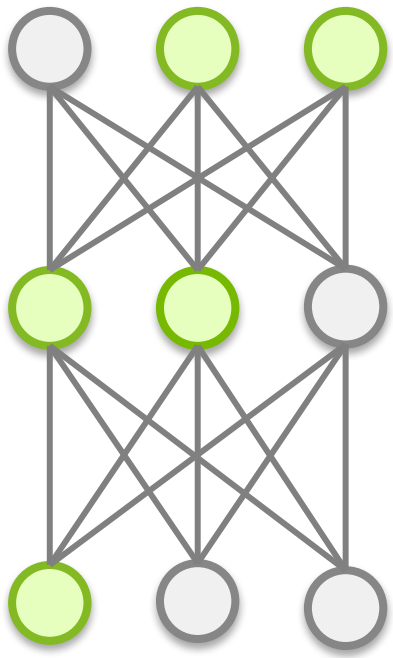

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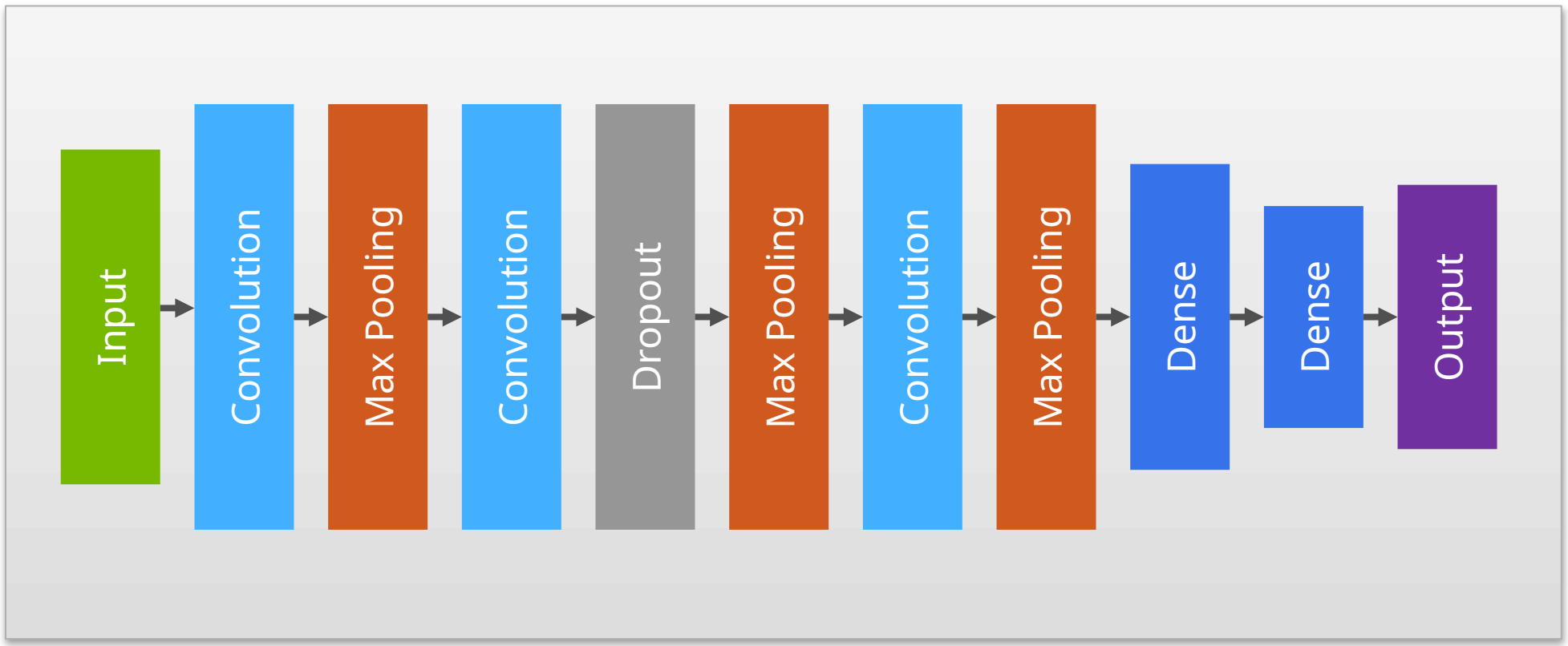
WHOLE ARCHITECTURE



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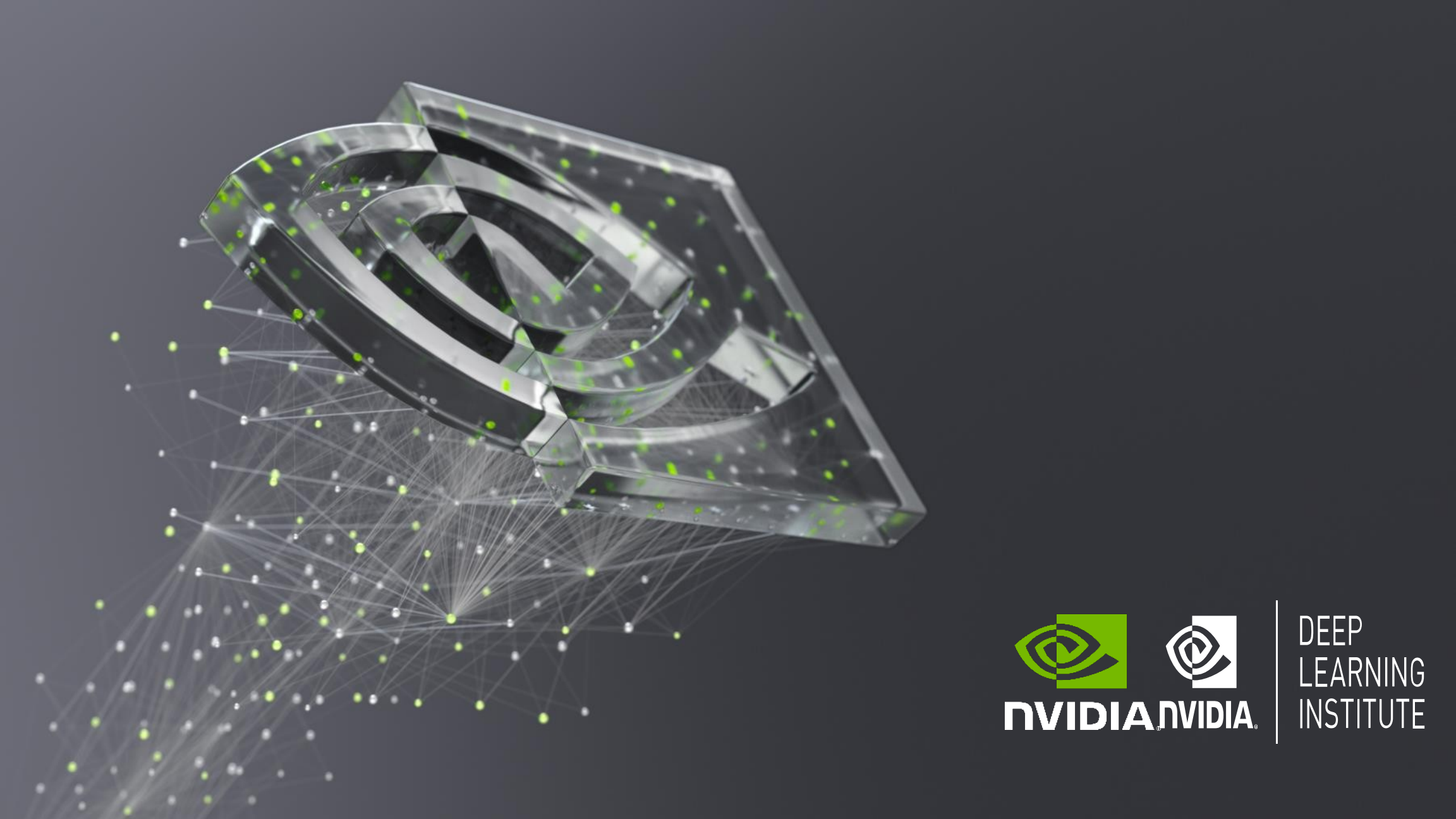
LET’S GO!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