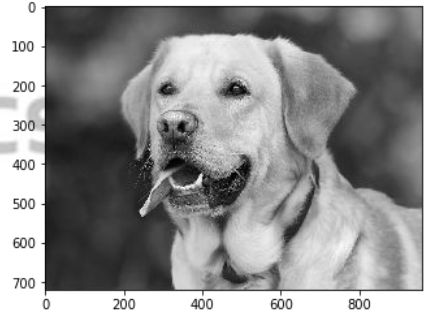
Why do we need Convolutional Neural Networks?

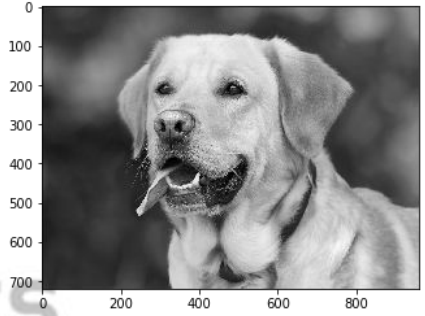
Identify the Image

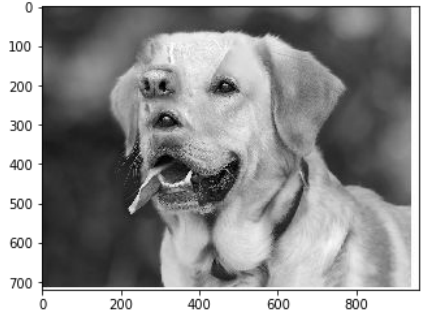
Identify the Image



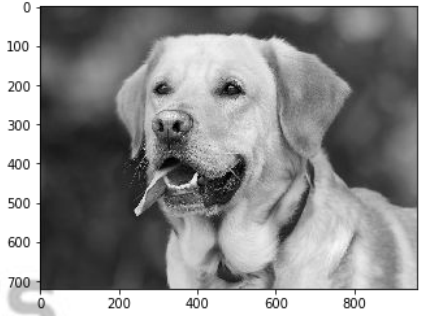
Identify the Image

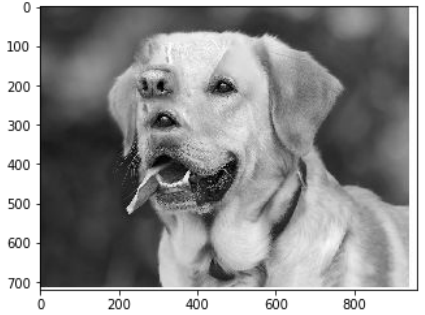
Problems with using MLP for Images





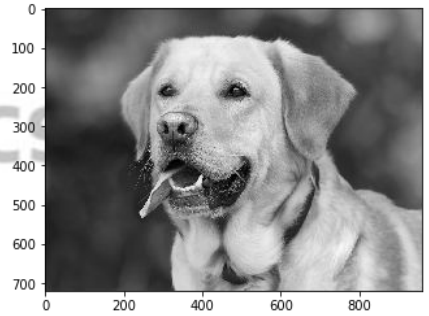
Problems with using MLP for Images





Losing spatial Orientation of Images

Problems with using MLP for Images

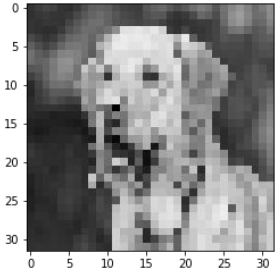


Input to MLP

Input to CNN

Losing spatial Orientation of Images

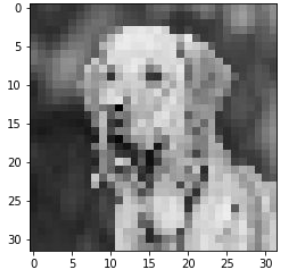
Problems with using MLP for Images



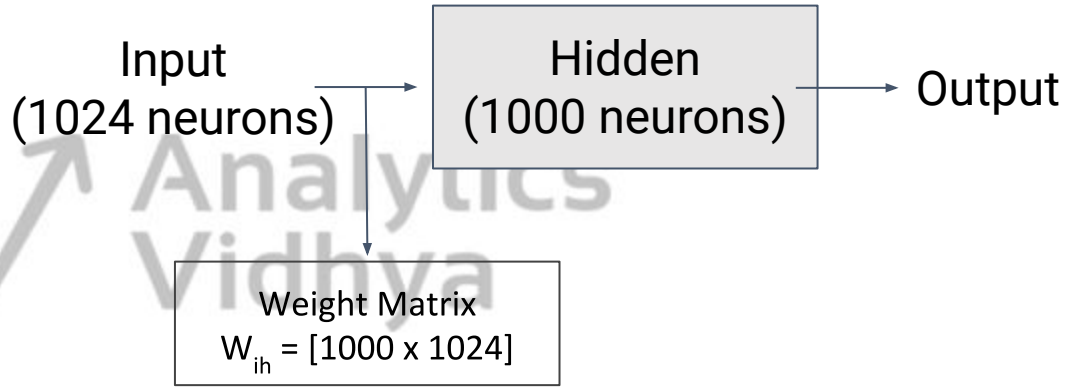
32 X 32 = 1024

720 X 960 = 691,200

Problems with using MLP for Images

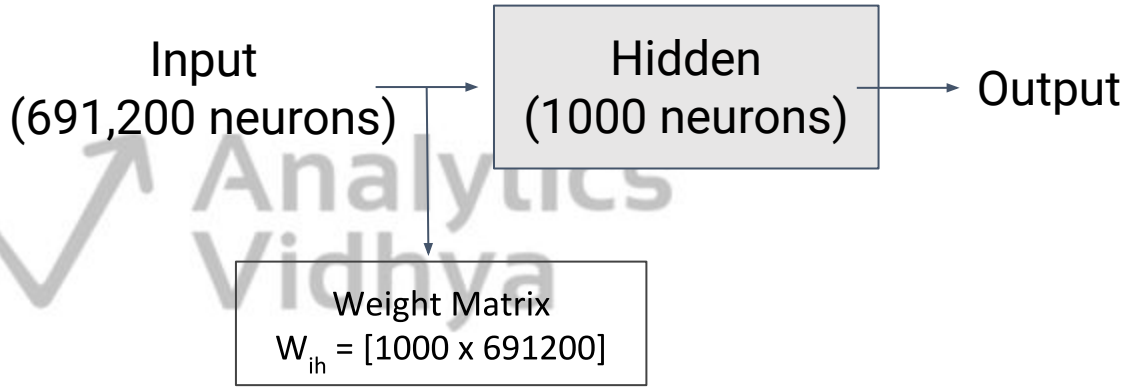


32 X 32 = 1024

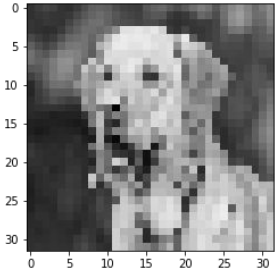


Problems with using MLP for Images

720 X 960 = 691,200



Problems with using MLP for Images



32 X 32 = 1024

720 X 960 = 691,200

Parameter Explosion in Neural Networks

Enter CNN

Preserves Spatial Orientation

Reduces learnable Parameters

Enter CNN

Preserves Spatial Orientation

Reduces learnable Parameters

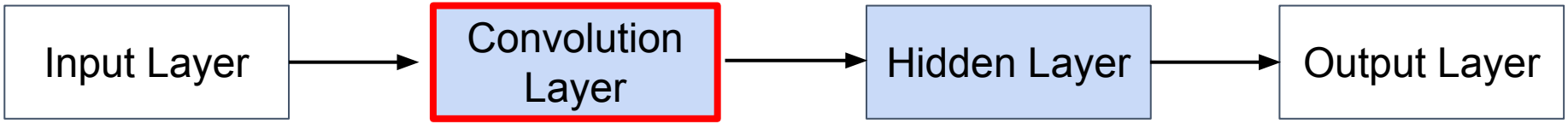
"Gradient-Based Learning Applied to Document Recognition"

Multilayer Perceptron

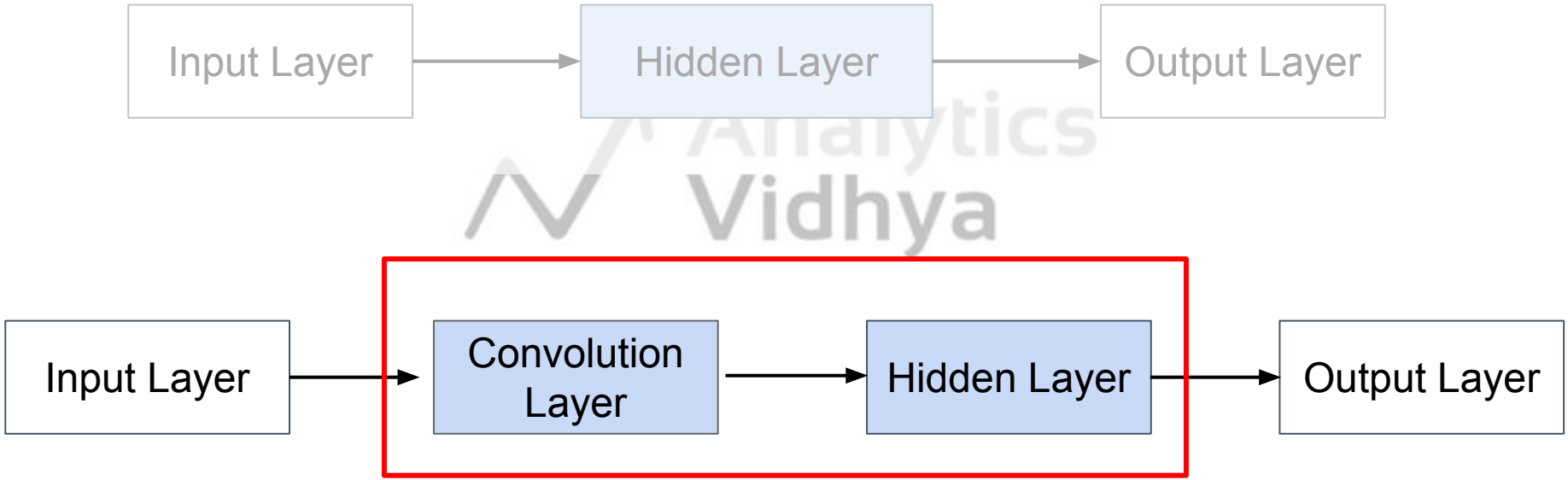
Multilayer Perceptron

Feature Extractor

Convolutional Neural Network



Convolutional Neural Network



Feature Extractor

Thank You!

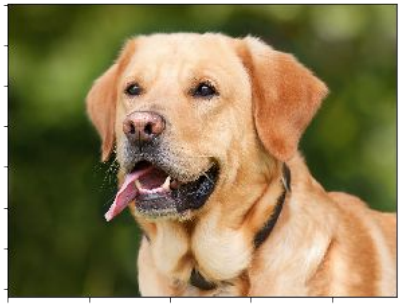
Enter CNN

Preserves Spatial Orientation

Enter CNN

Preserves Spatial Orientation

filter



filter

Enter CNN

Reduces learnable Parameters

Filters

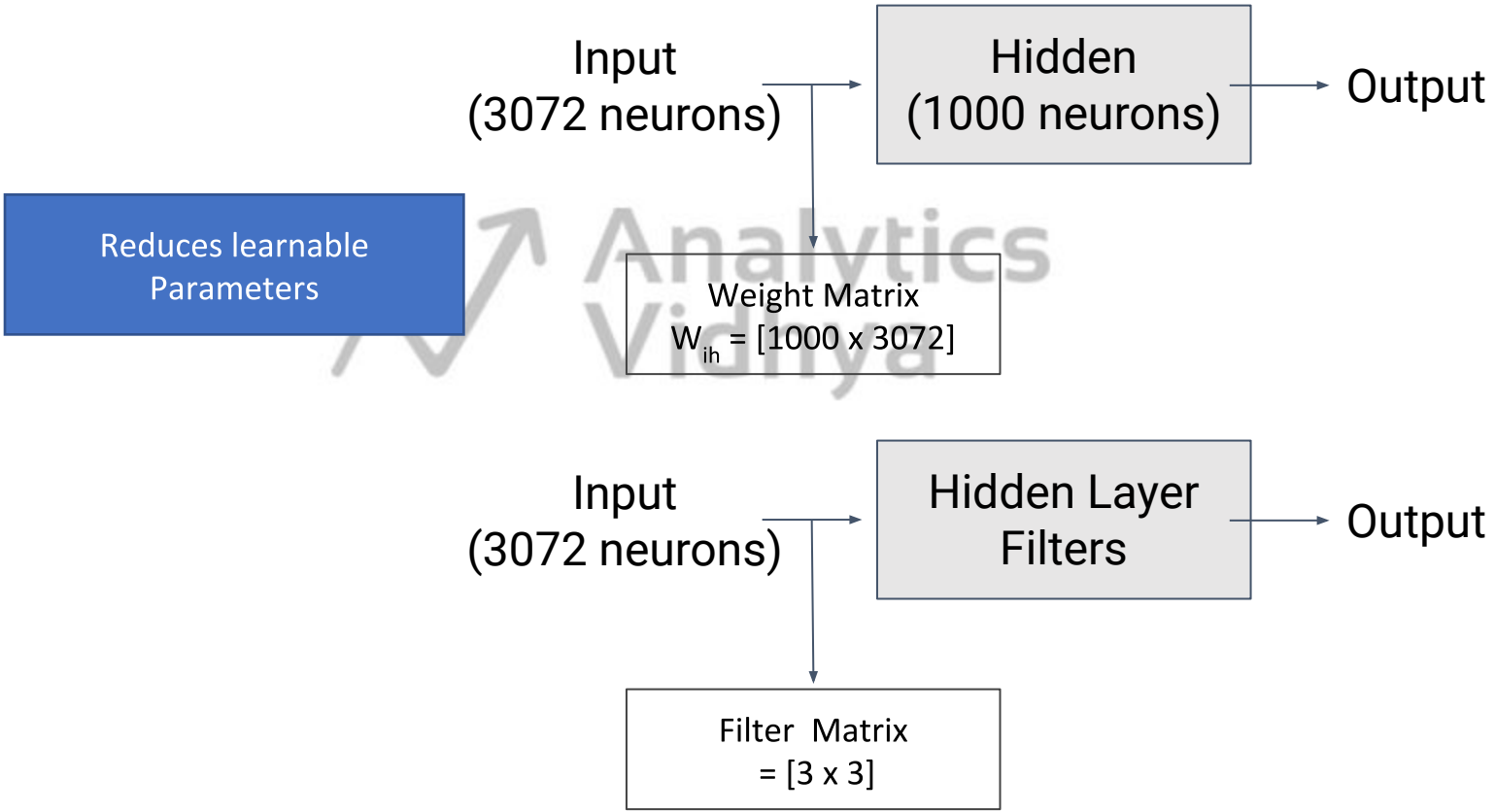
-1	0	1
-1	0	1
-1	0	1

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

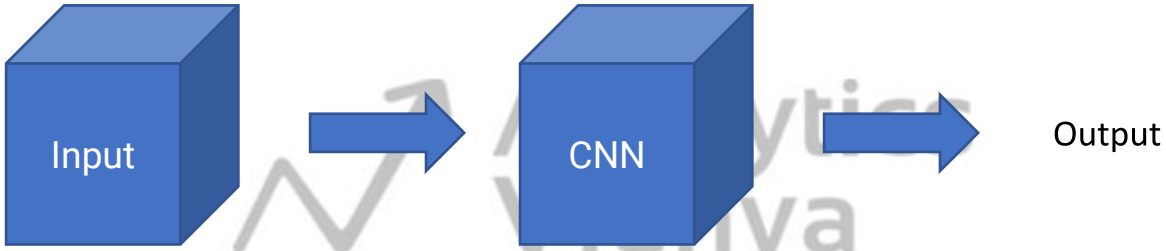
.0625	.125	.0625
.125	0.25	.125
.0625	.125	.0625

W_{11}	W_{12}	W_{13}
W_{21}	W_{22}	W_{23}
W_{31}	W_{32}	W_{33}

Enter CNN



CNN Structure



Feature Extractor

CNN Structure