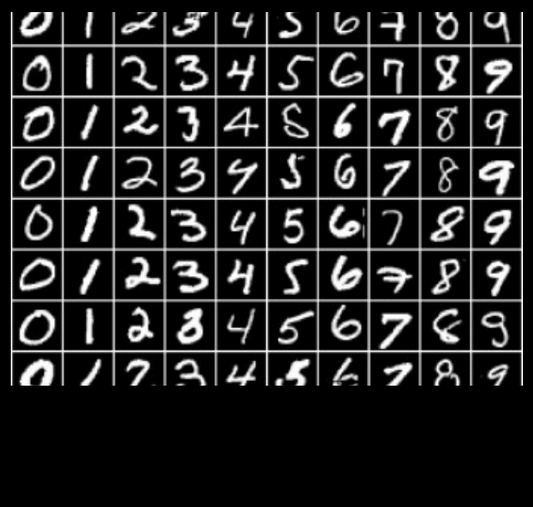
Newcastle University

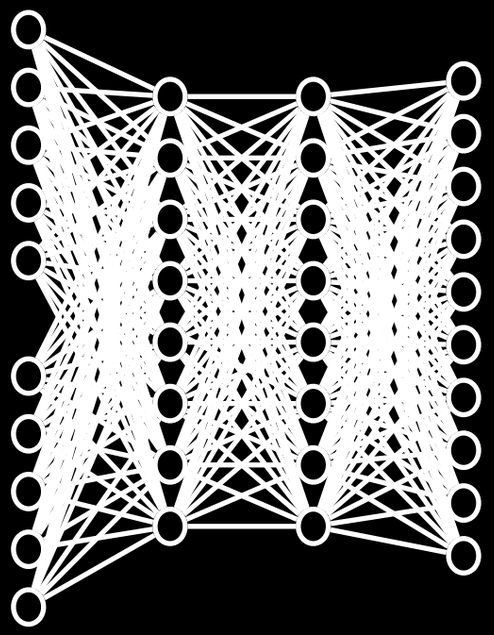
ML Tutorial on Convolutional Neural Networks

31st Jan. 2019

Outline

- Review of previous tutorials (MLP&CNN)
- CNN for face recognition in Excel
- Google Cloud Tutorial
- Using pre-trained model for face recognition





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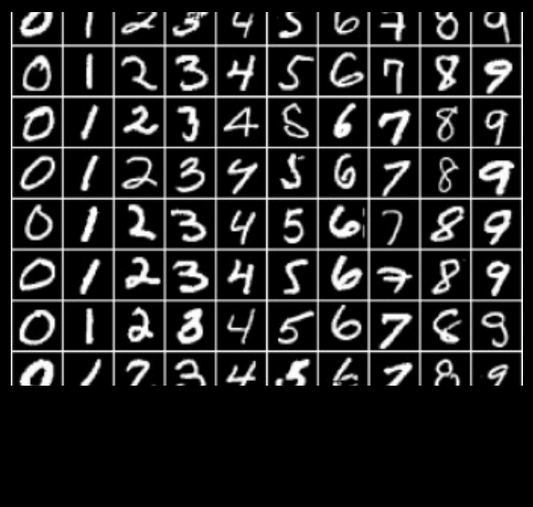

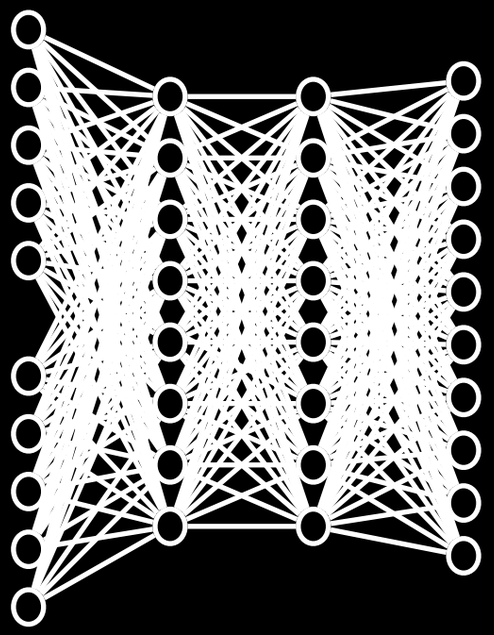

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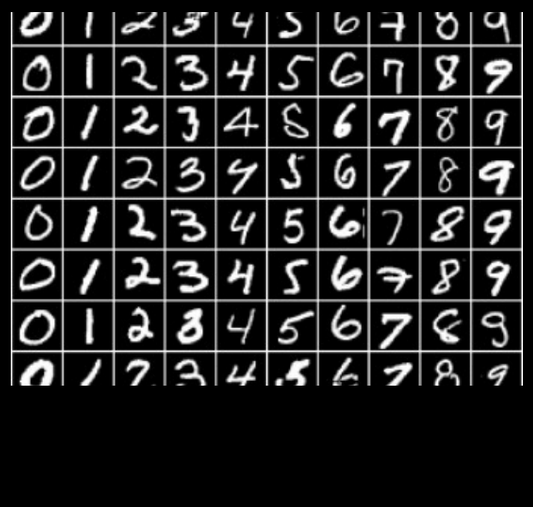

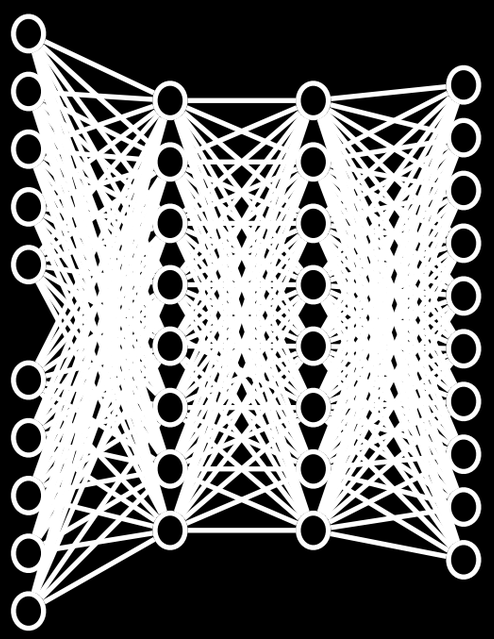

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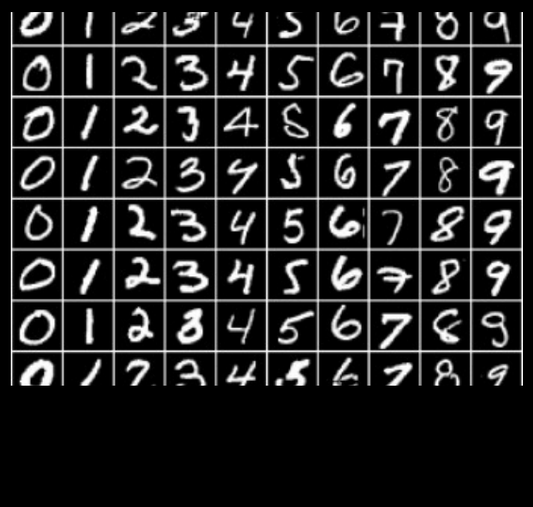

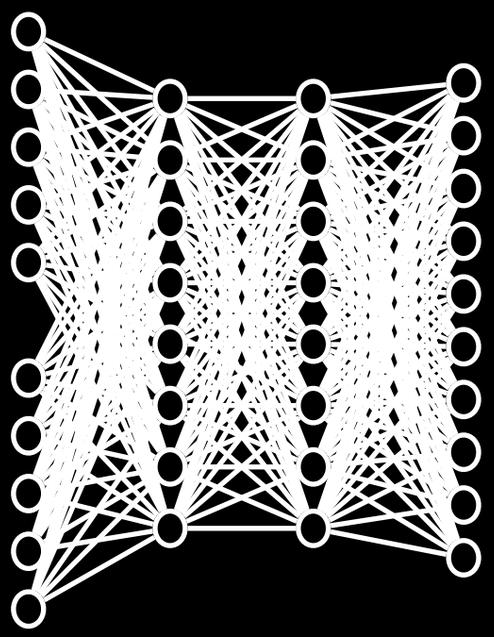

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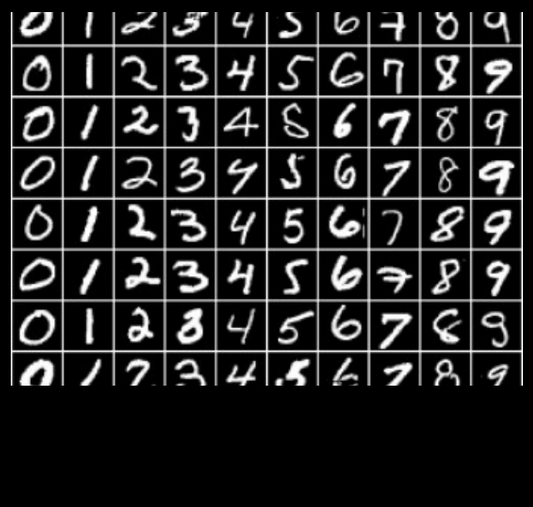

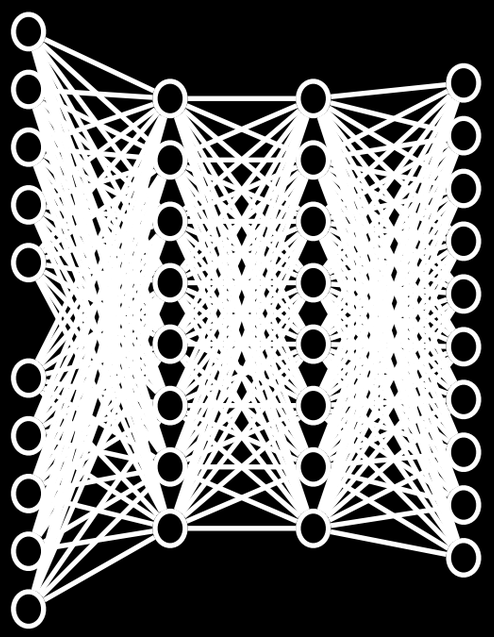

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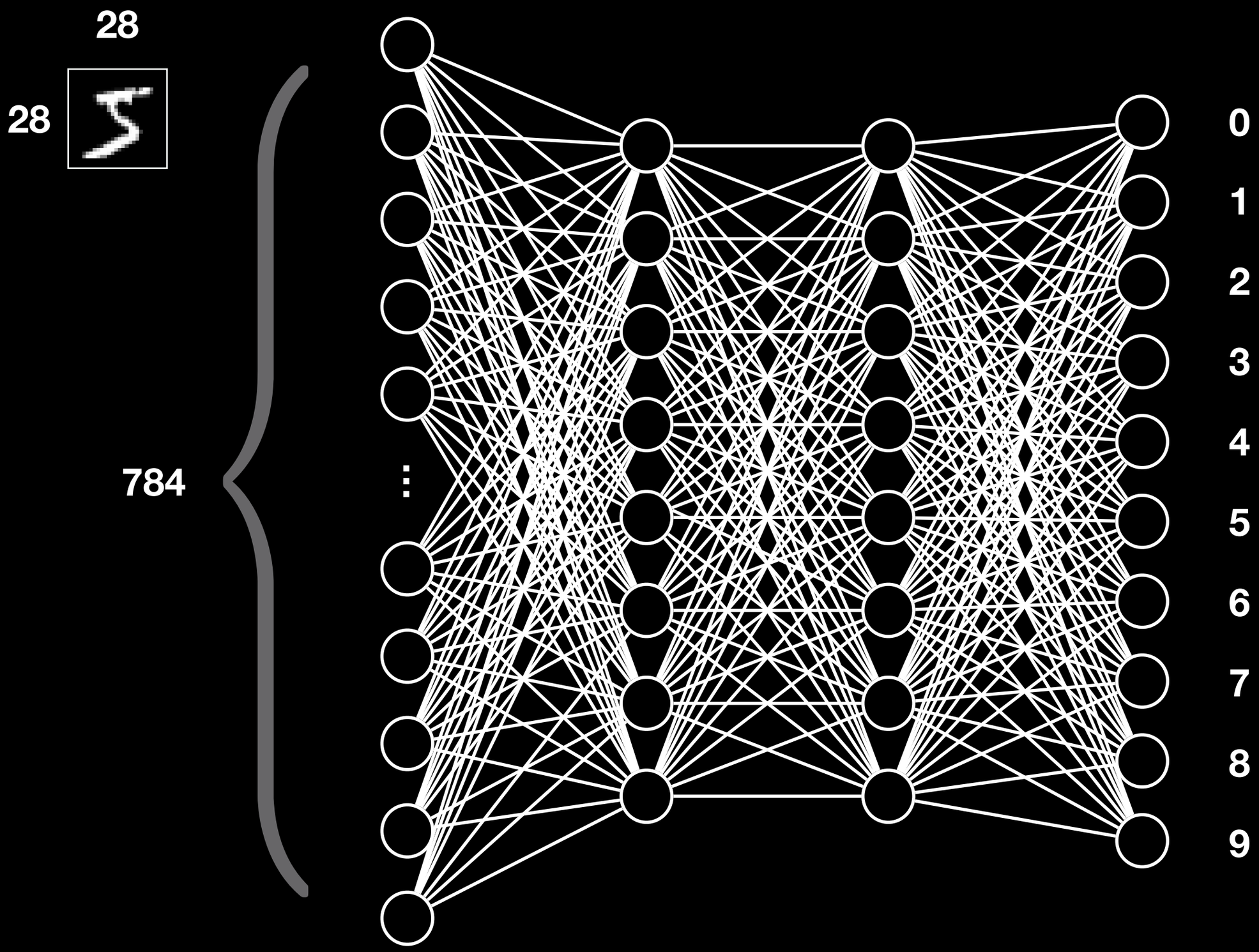
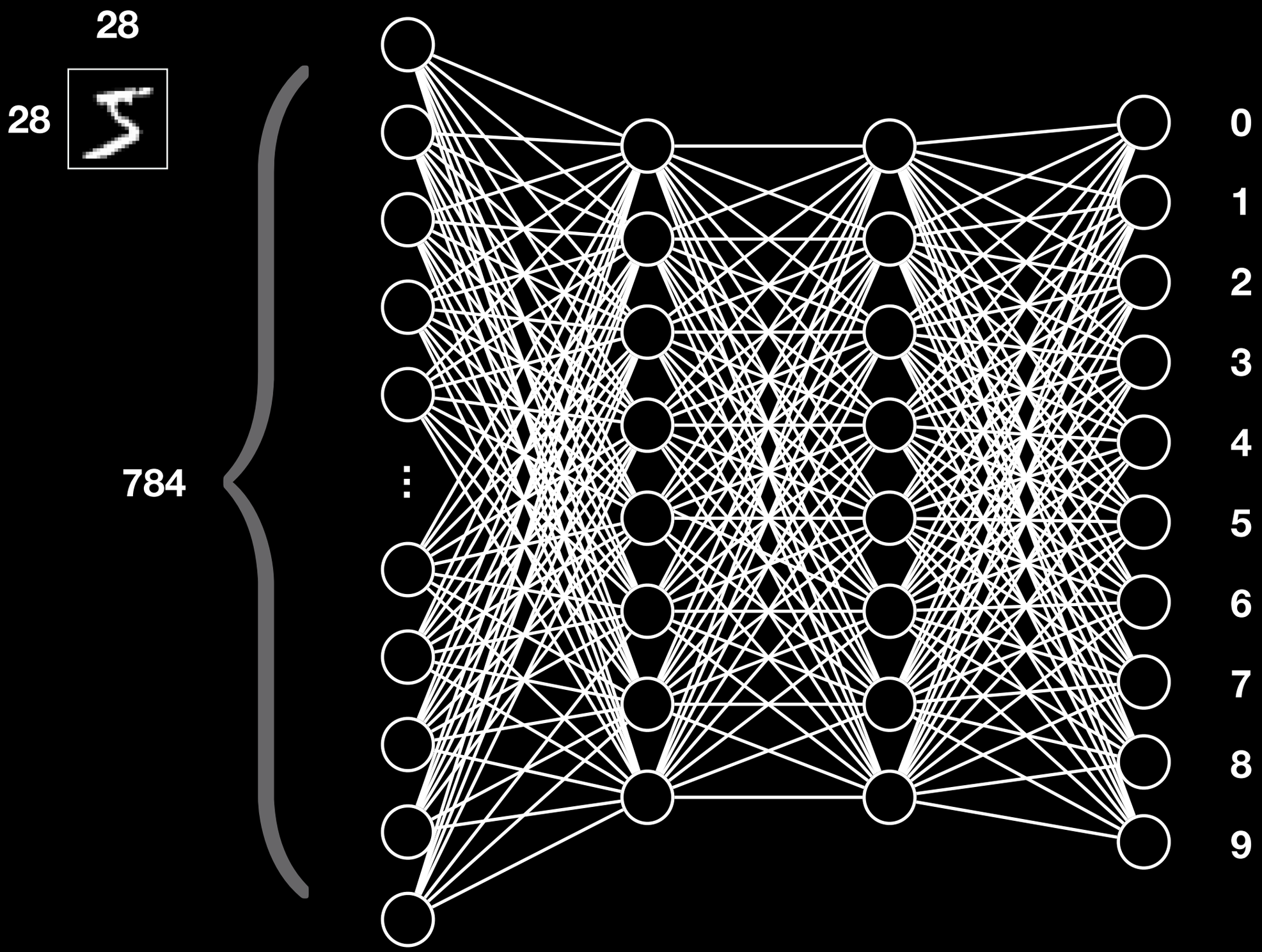


Neurons: Placeholders that take the input.

Connections: Parameters/Weights of the network.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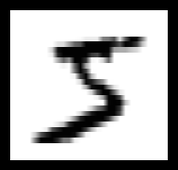

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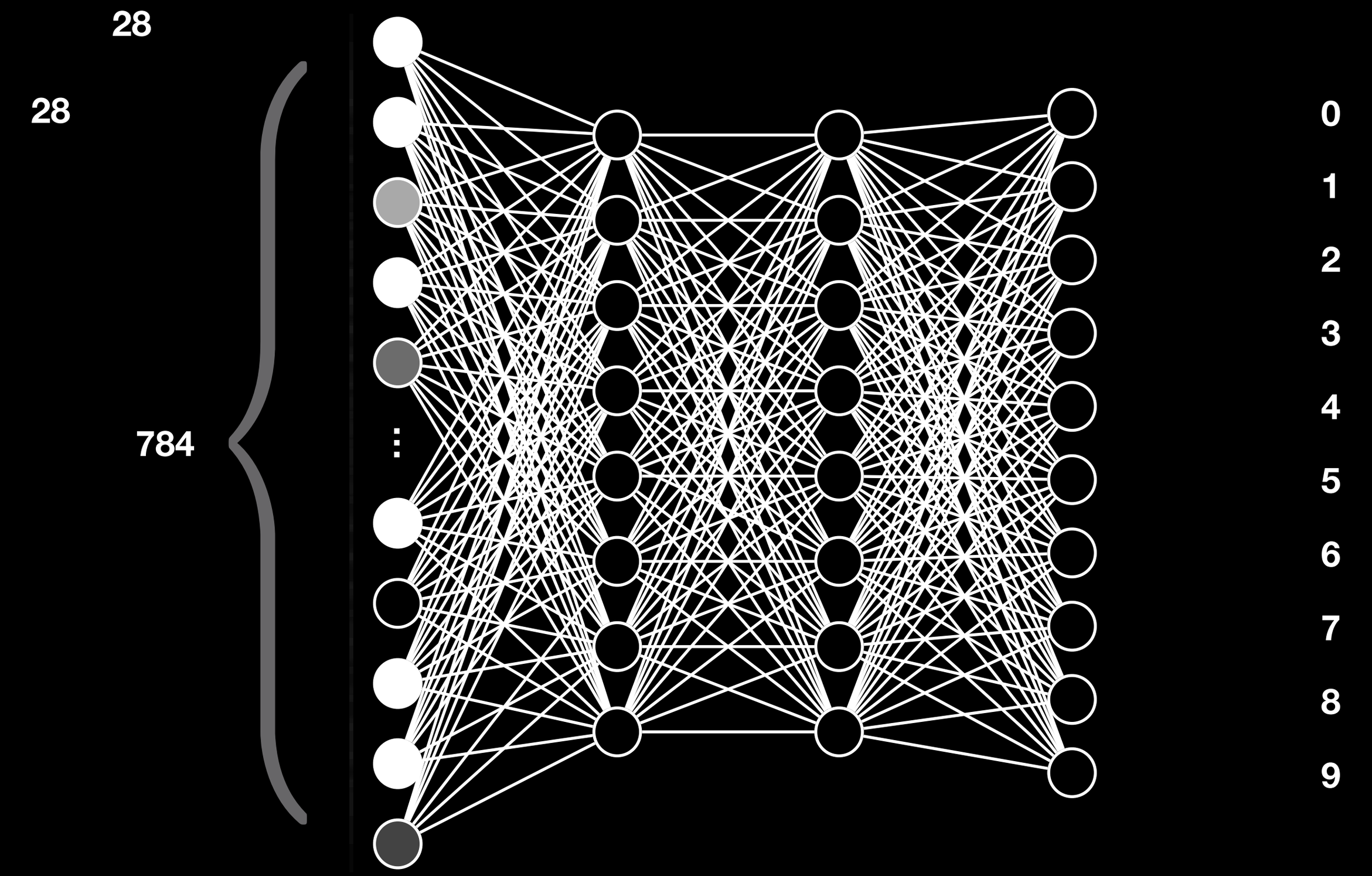
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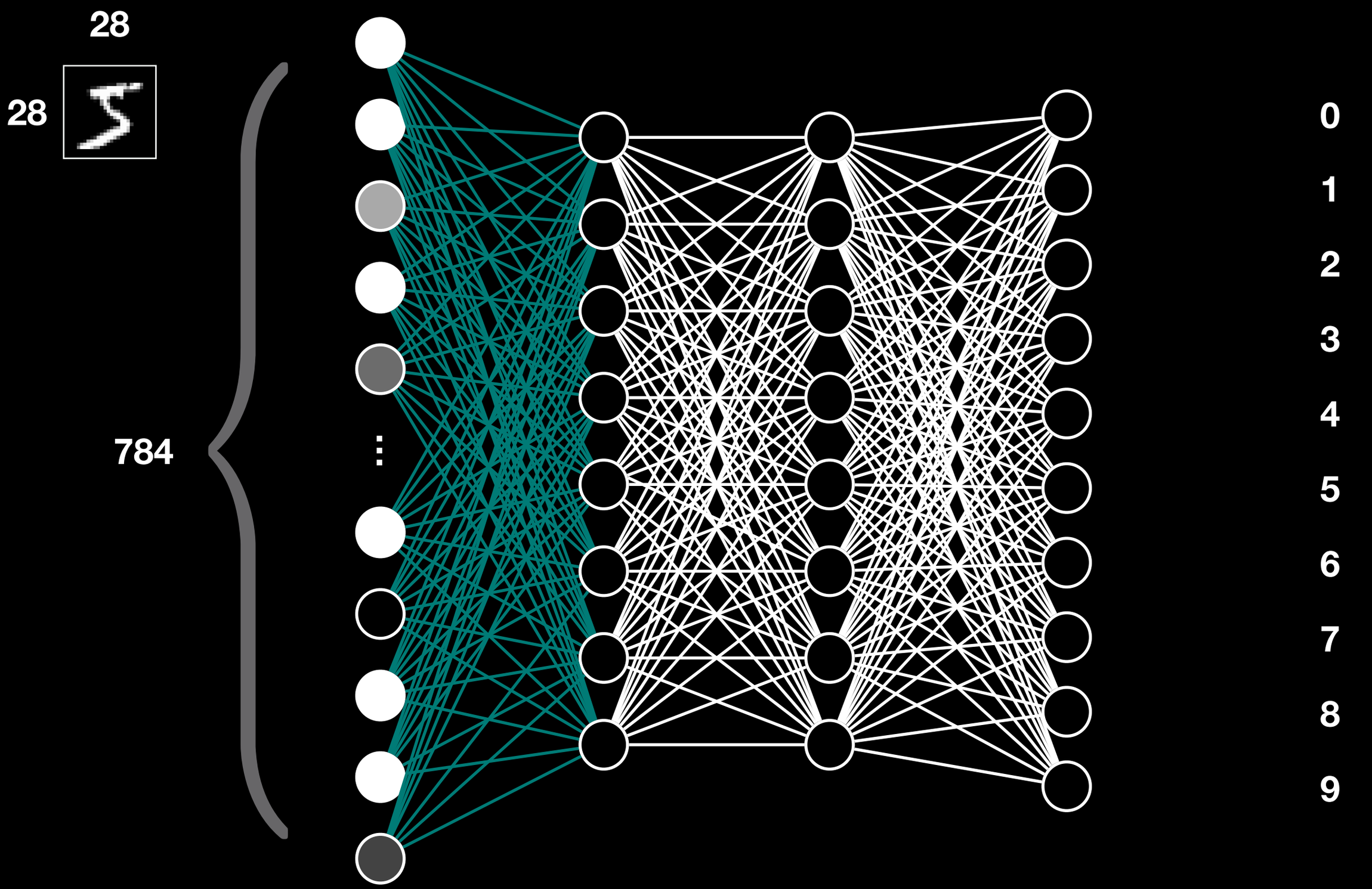
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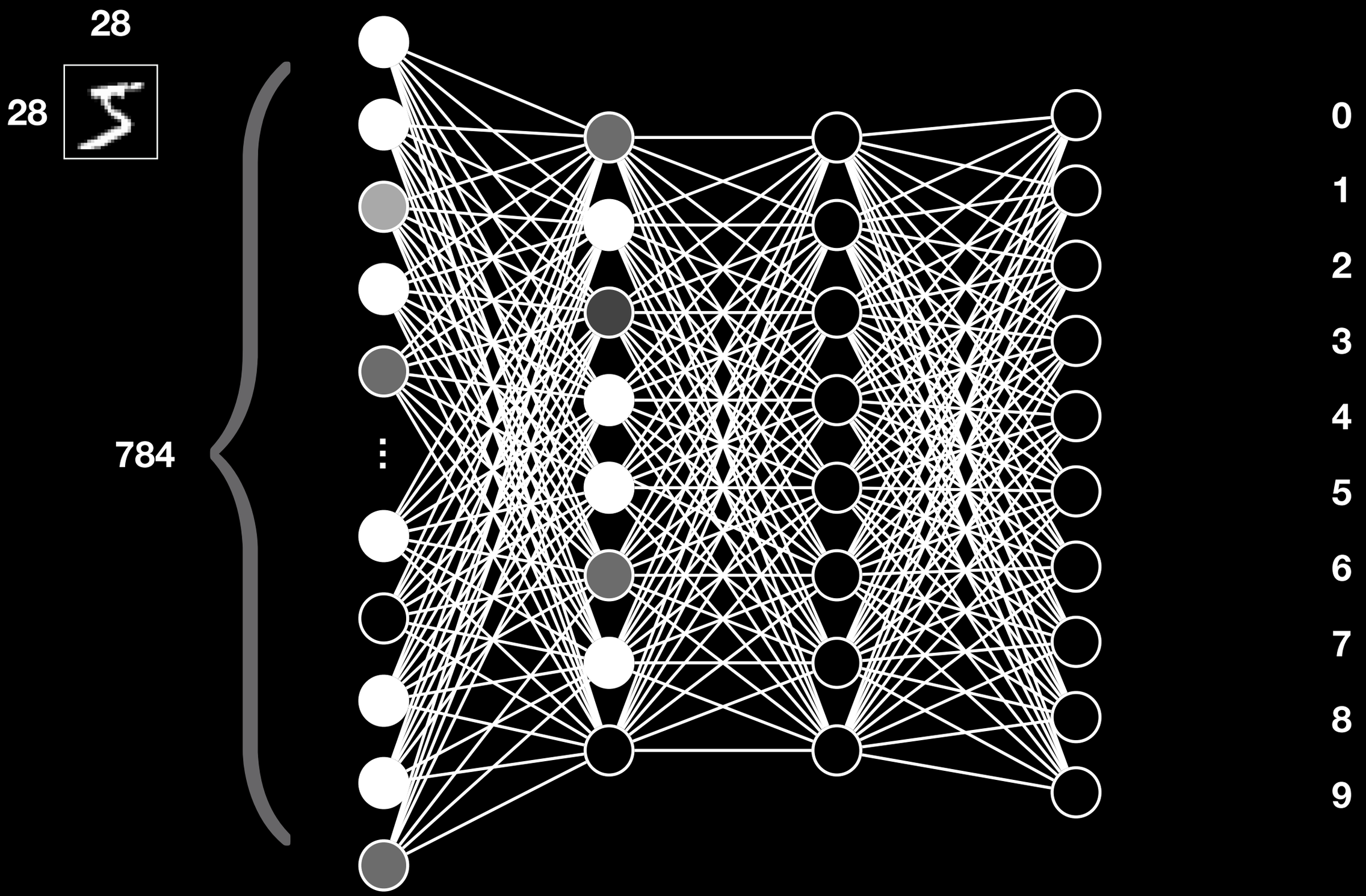
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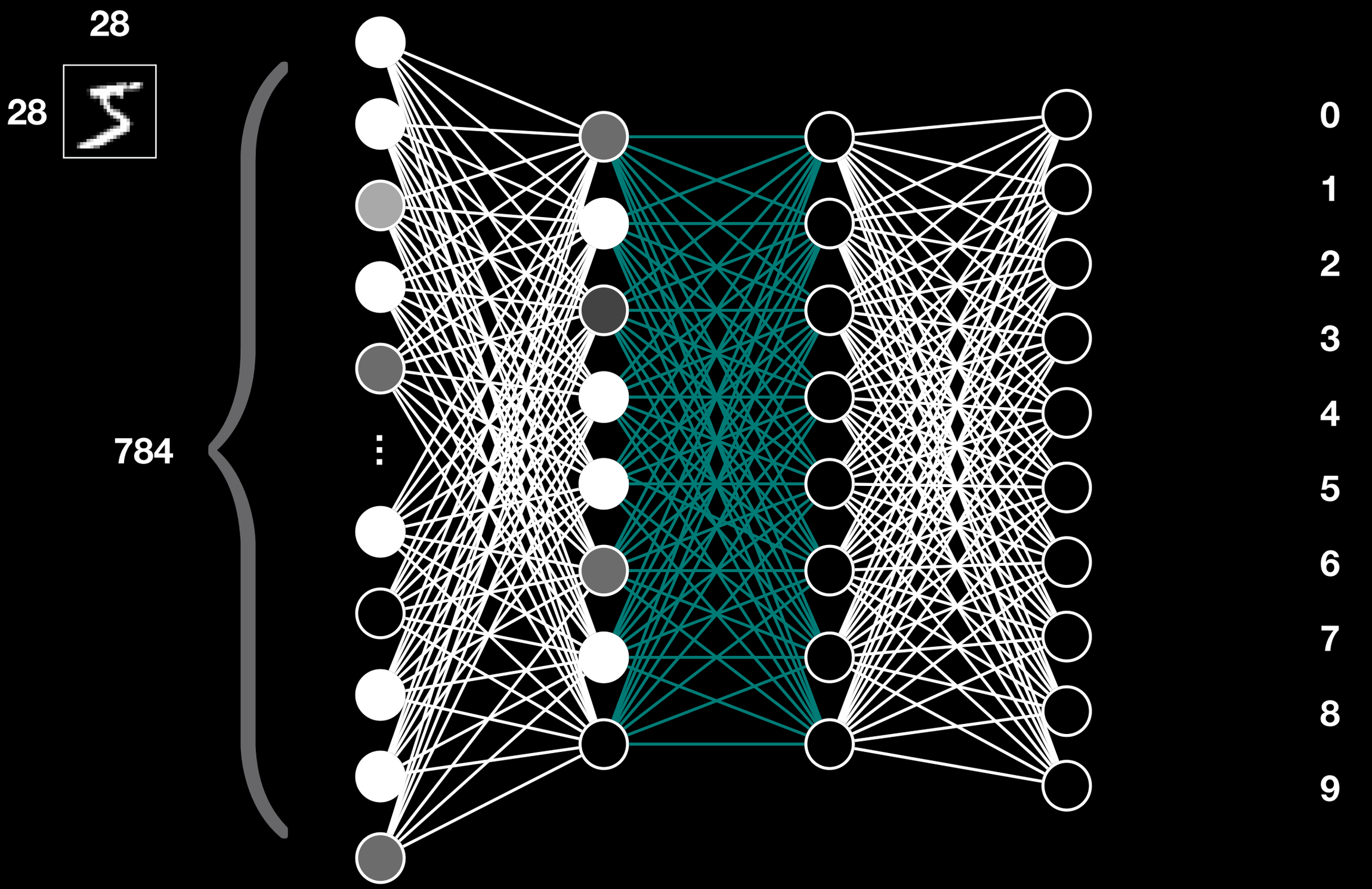
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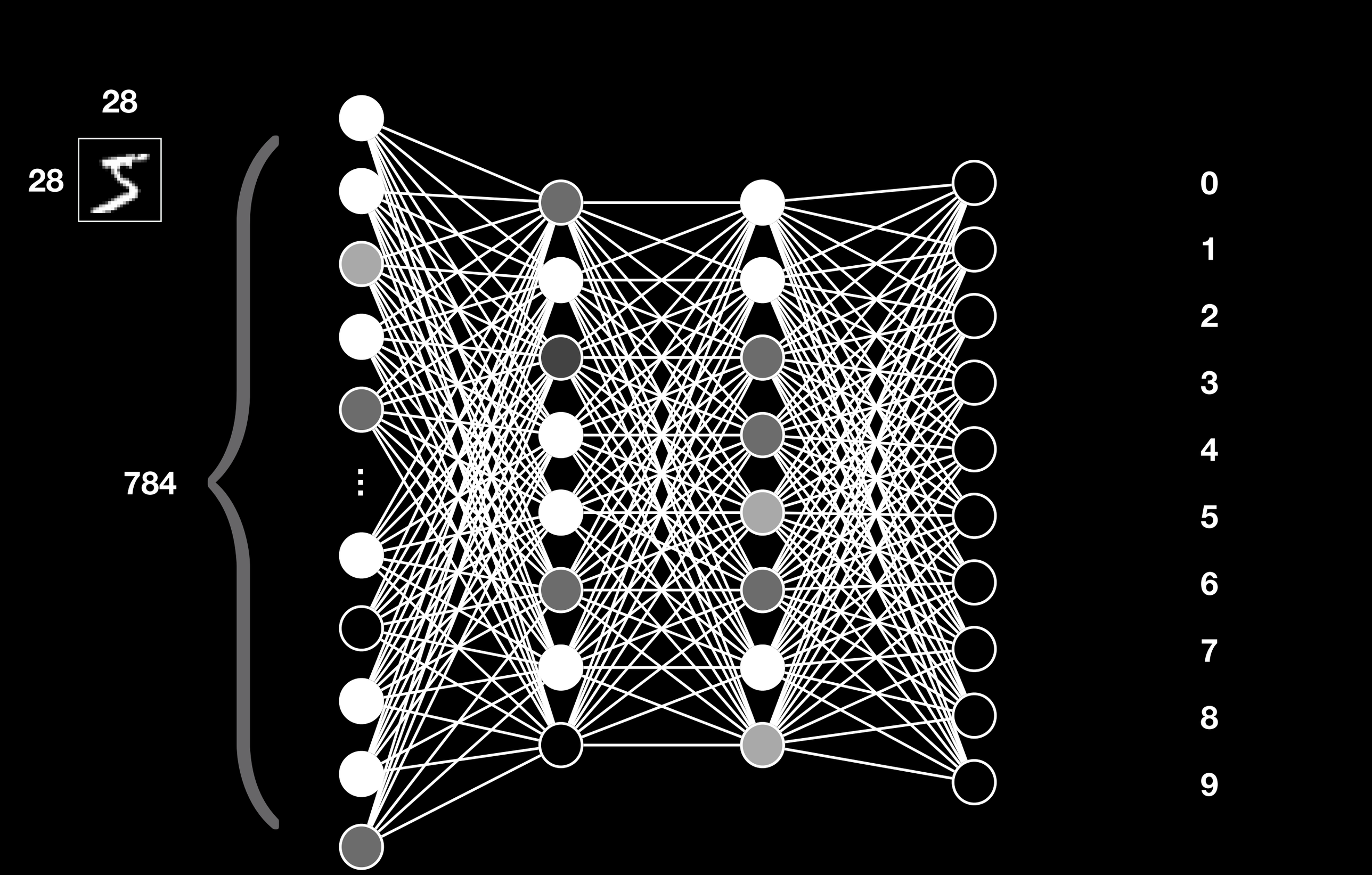
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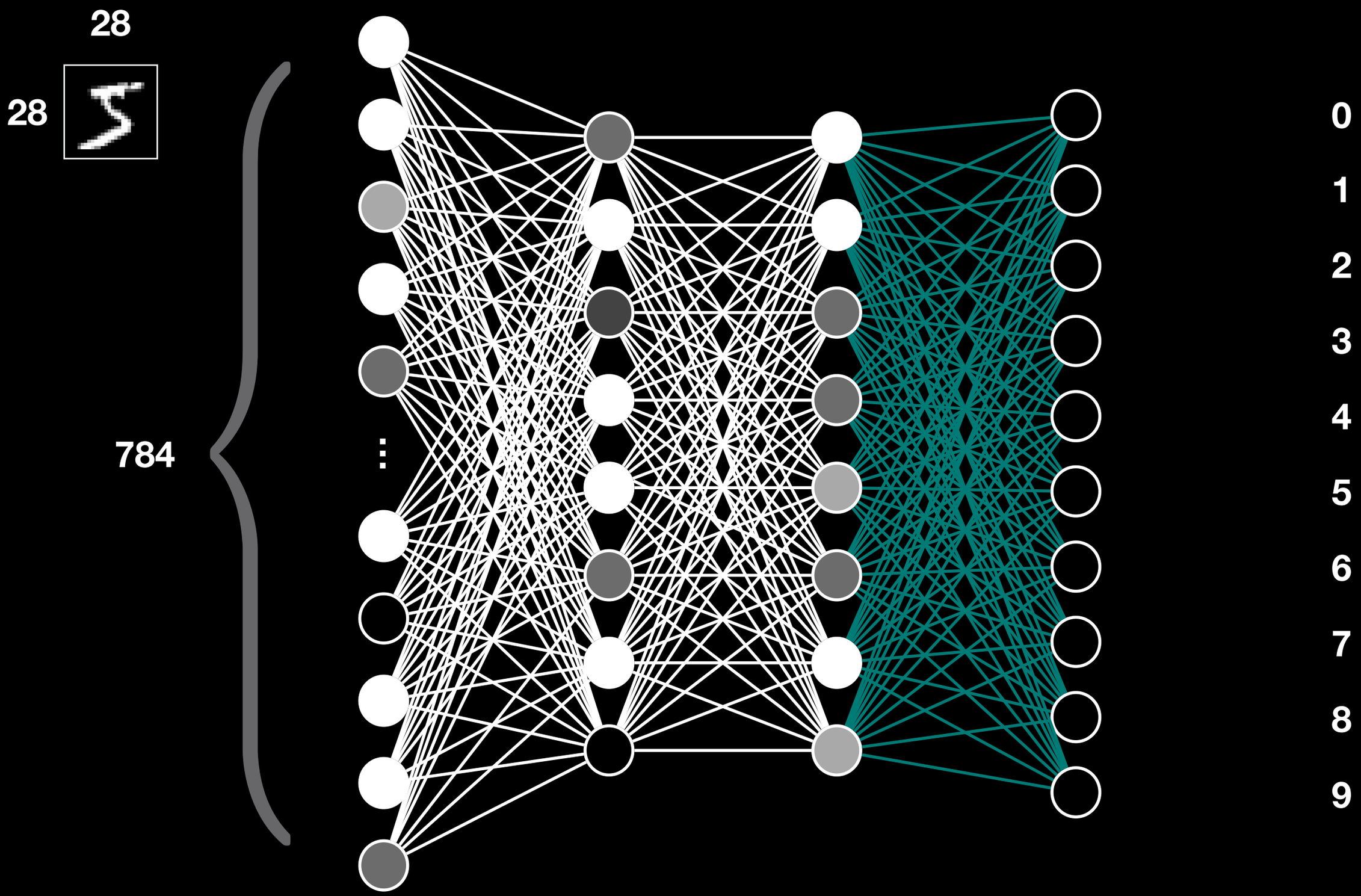
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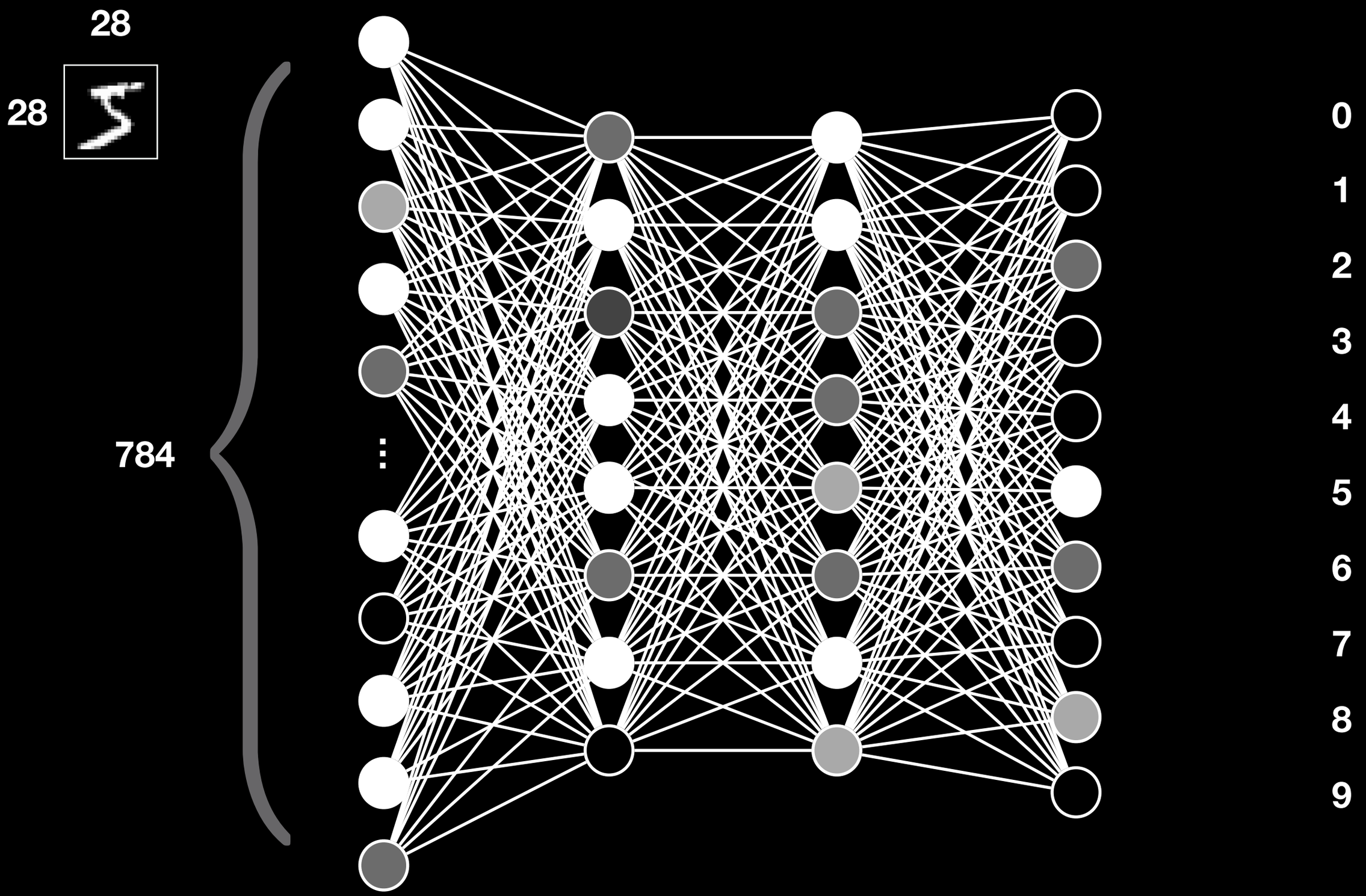
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Probability

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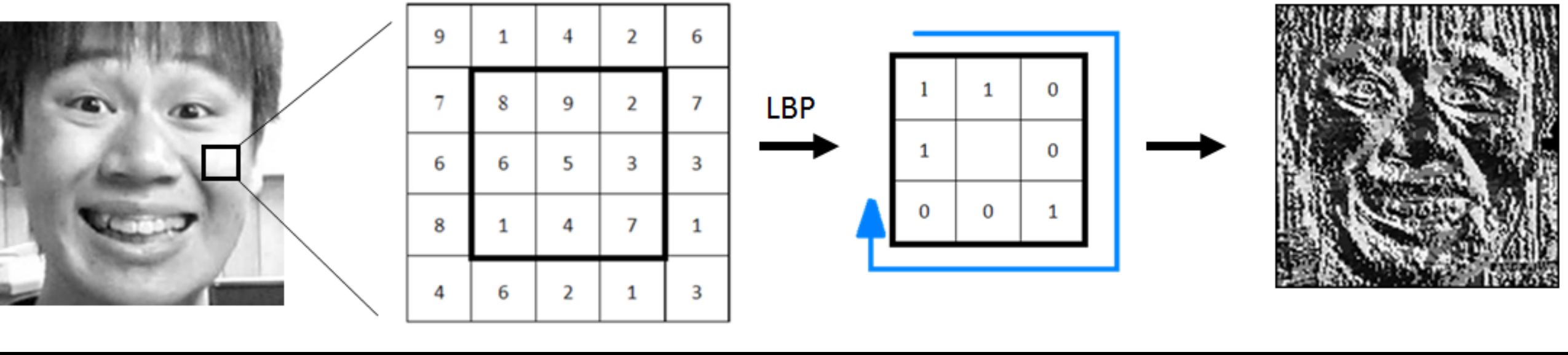
0	1
10%	2
0	3
0	4
60%	5
20%	6
0	7
10%	8
0	9



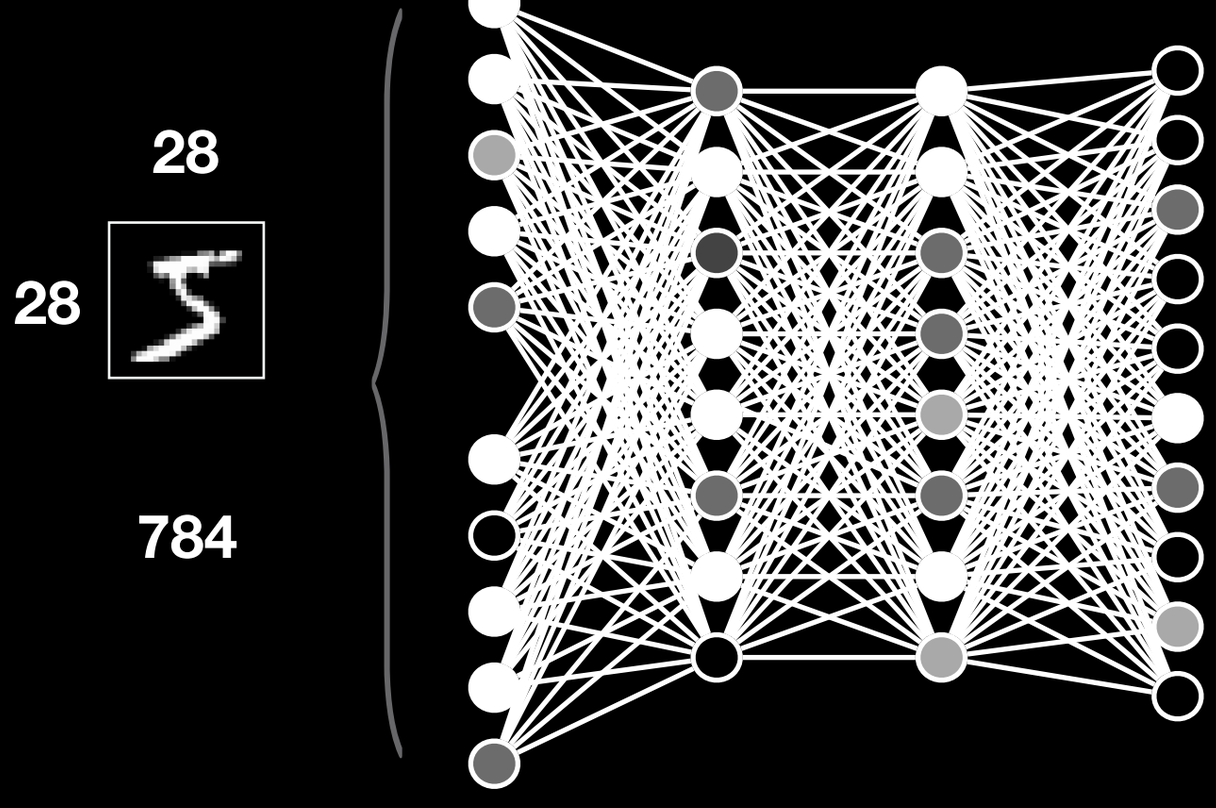
Local Binary Patterns:

- Compare each pixel with its 8 neighbours
- If the neighbour's intensity is larger, set it as 1, and 0 otherwise.
- Write down the results clockwise, for example, 1 1 0 0 1 0 0 1, and convert it into decimal.

- ★ Robust to illumination
- ★ Good at capturing texture
- ★ Easy to implement

- Hand crafted
- Task specific

CNN!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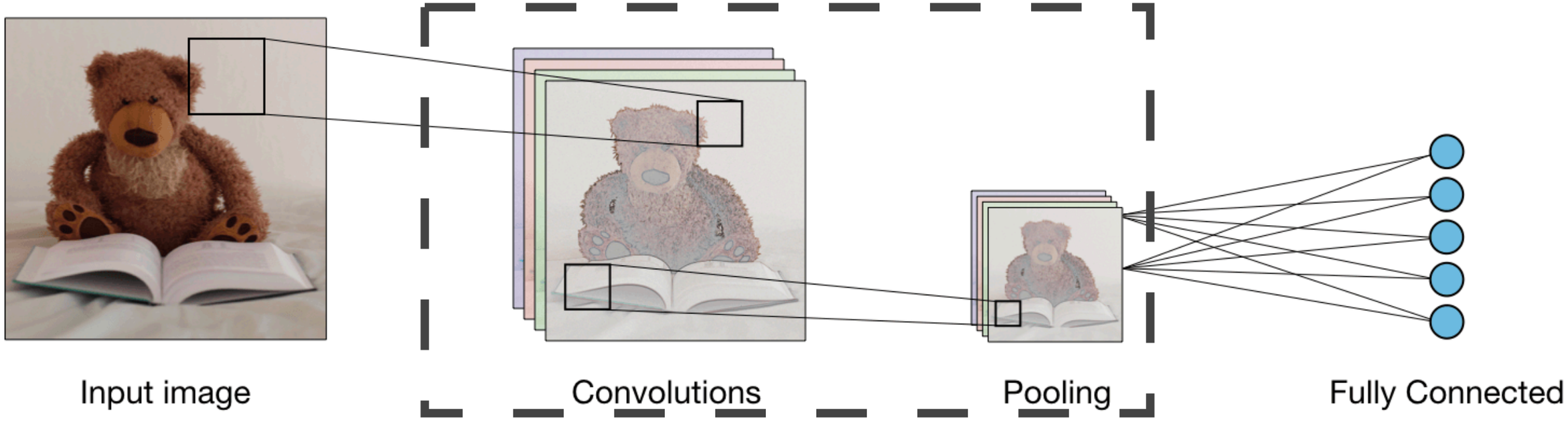
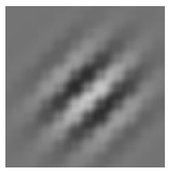

Input image
Convolutions
Pooling
Fully Connected

Learnable kernel/filter/weights



$$\begin{bmatrix} w_{11} & w_{12} & w_{13} \\ w_{21} & w_{22} & w_{23} \\ w_{31} & w_{32} & w_{33} \end{bmatrix}$$

Input

Pooling Operation