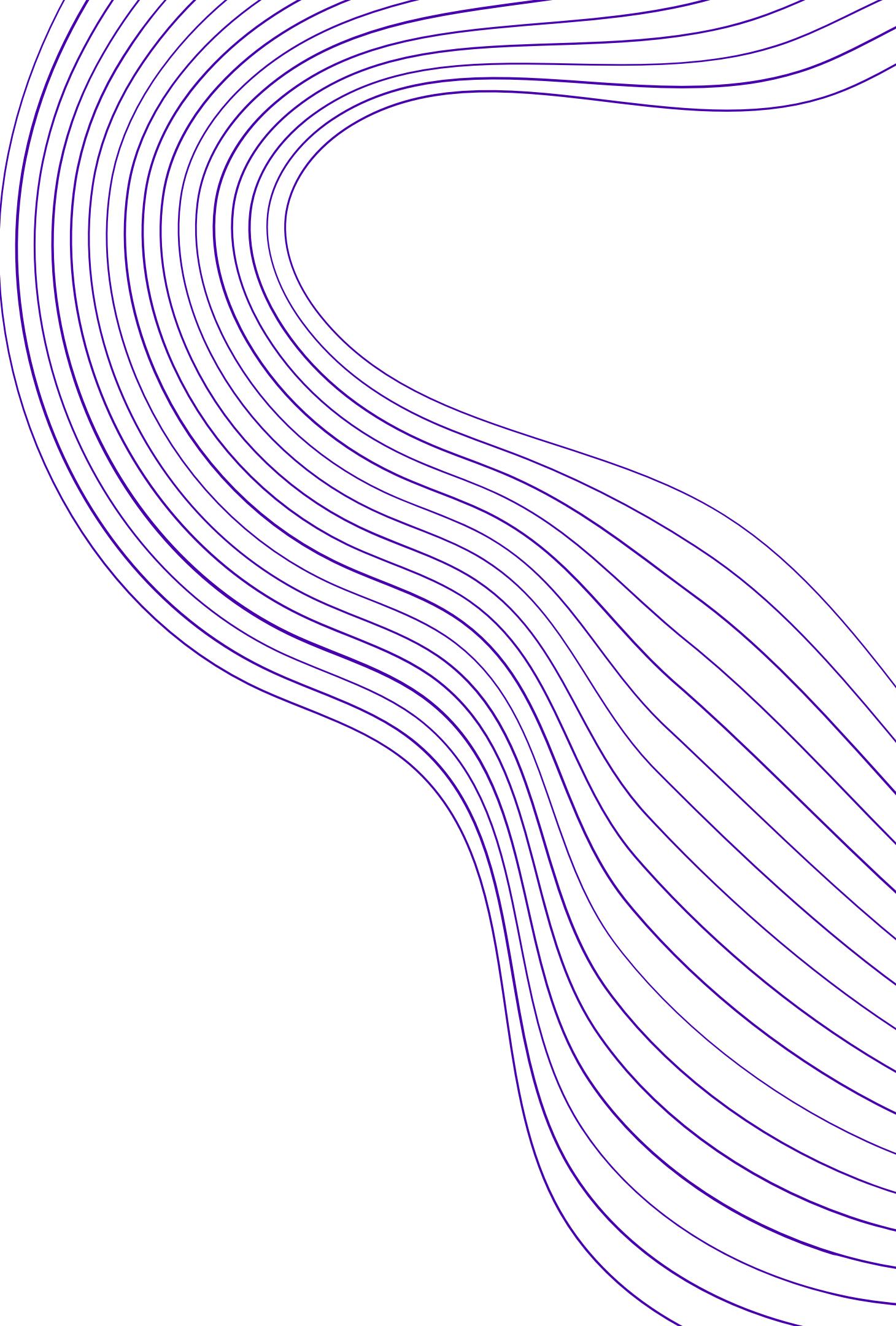


01

TECART | SMART TECHNOLOGY

Neural Network



The team



Nara Surya (Presenter)

Ketua Divisi Smart Technology Tecart



Jana

Anggota Divisi Smart Technology Tecart



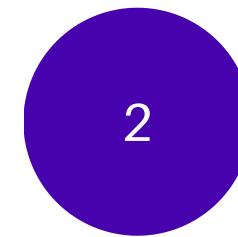
Gede Ocha

Anggota Divisi Smart Technology Tecart

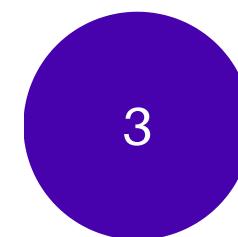
Goal Workshop



Sebagai landasan dasar peserta untuk mengexplore deep learning.



Menumbuhkan minat terhadap deep learning dan membangun komunitas.



Memperkaya gallery ide ide TA anda.

Week 1
Neural Network

Week 3
RNN

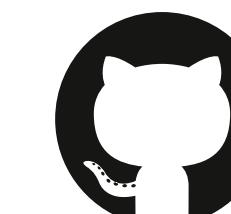
Week 2
CNN

Week 4
Attention Mechanism & Transformer

Available:



On Recording



<https://github.com/NaraSurya/Deep-Learning-Workshop-Tecart-2020>

Workshop Methods

1

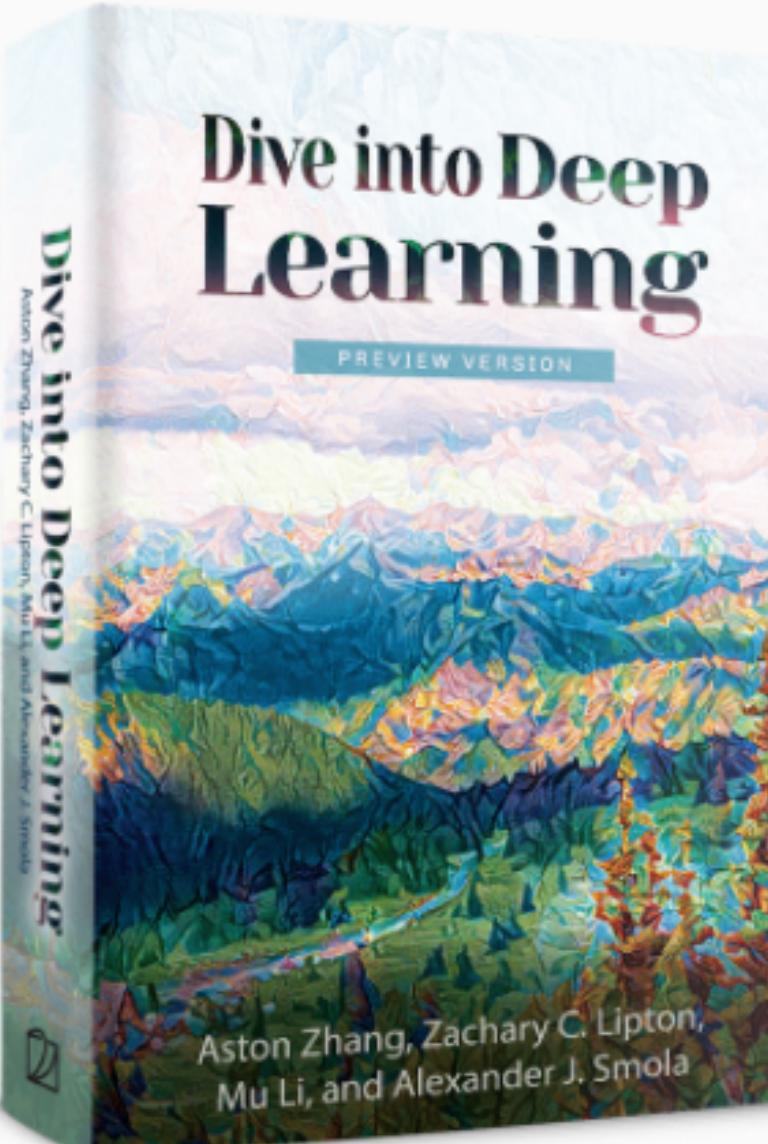
Balance Theory and Practice

2

**Pytorch Lightning
Tensorflow**

3

Colab



Dive into Deep Learning

Interactive deep learning book with code, math, and discussions

Implemented with **NumPy/MXNet, PyTorch, and TensorFlow**

Adopted at 140 universities from 35 countries

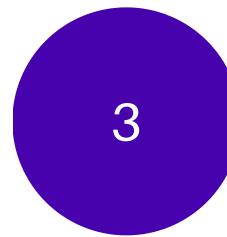
Apa yang akan dipelajari hari ini



Pengenalan Deep Learning

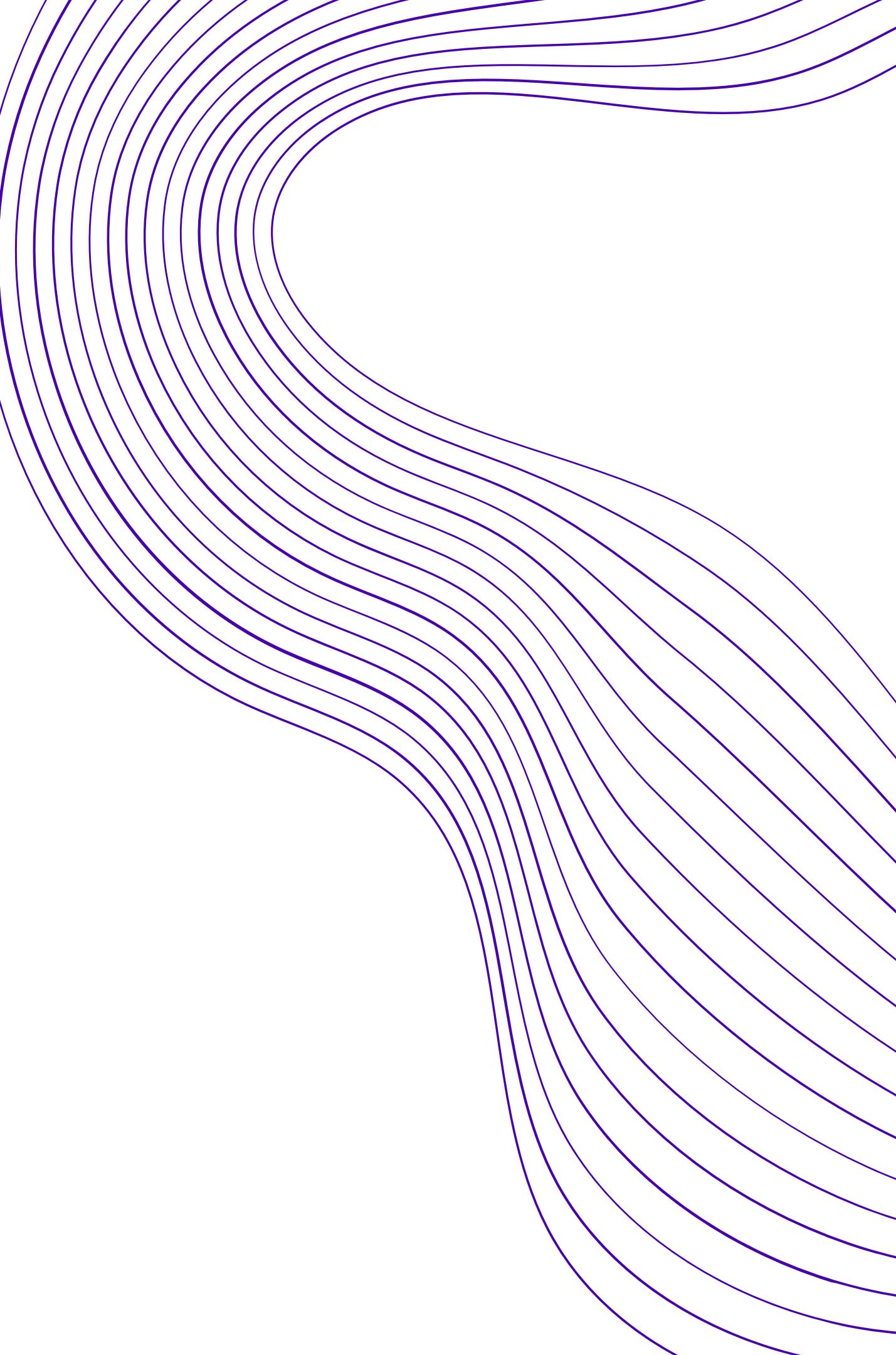


**Konsep , Cara Kerja dan Penerapan
Artificial Neural Network**



**Permasalahan dalam Deep Learning dan
Regurization**

Machine Learning



Apa yang salah dari Traditional Programming ?

"Cat"



"Cat"



"Dog"



"Dog"

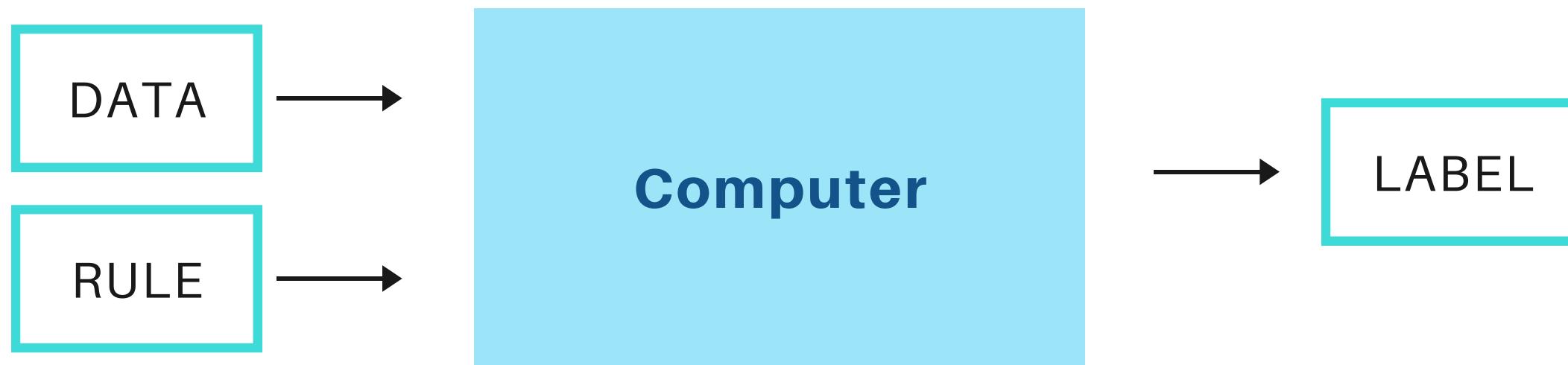


?

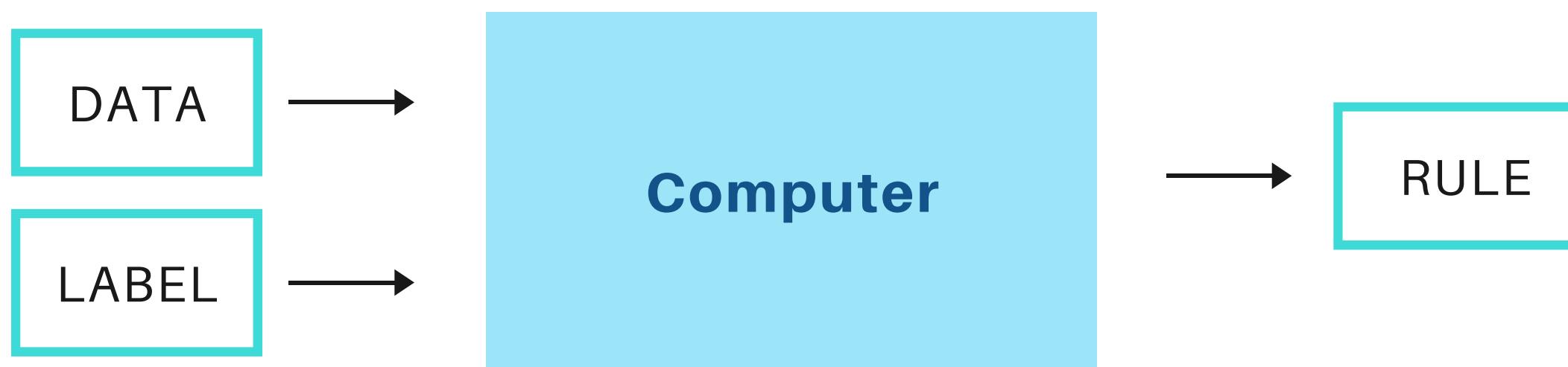


?

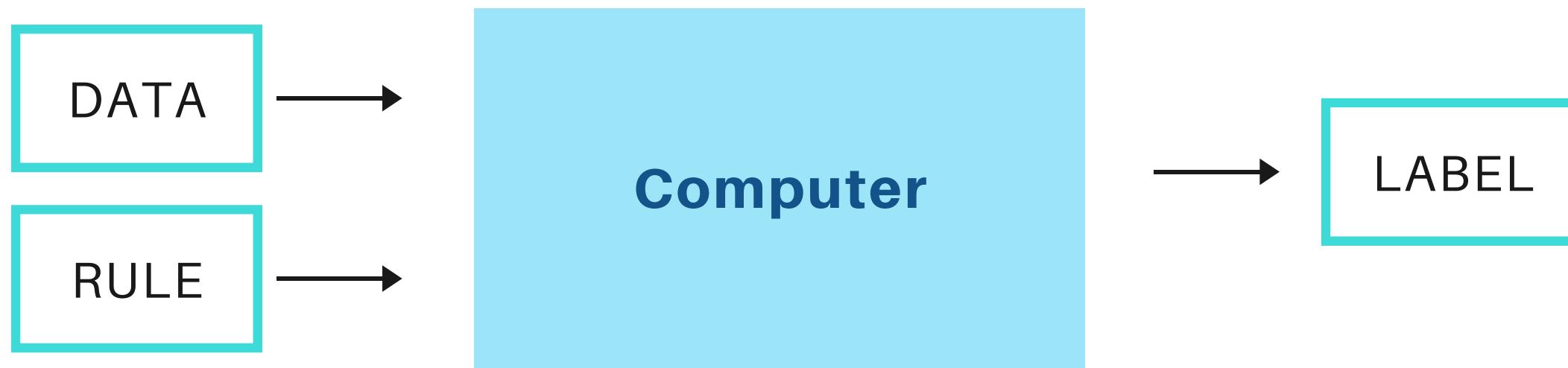
Traditional Programming



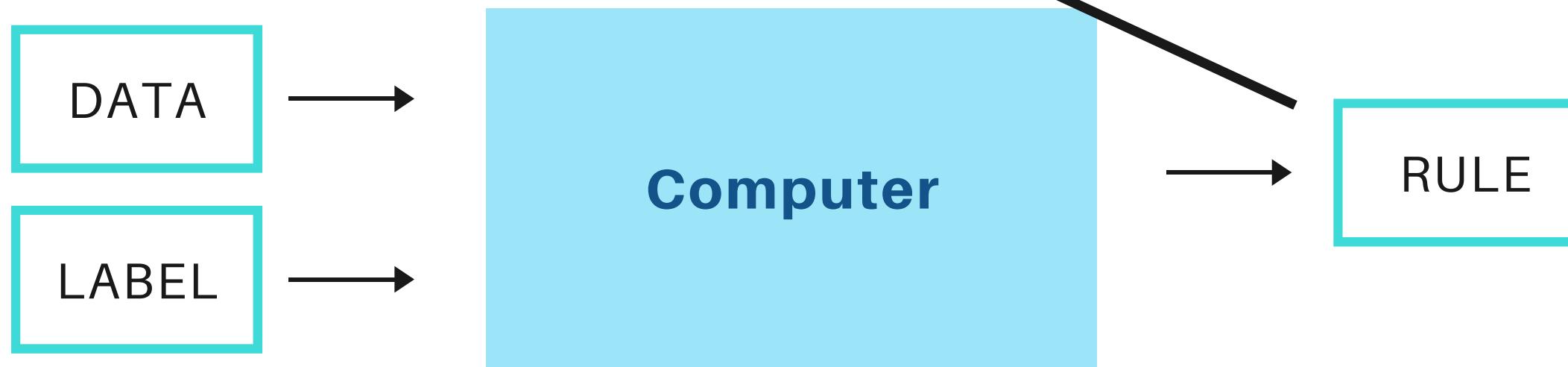
Machine Learning



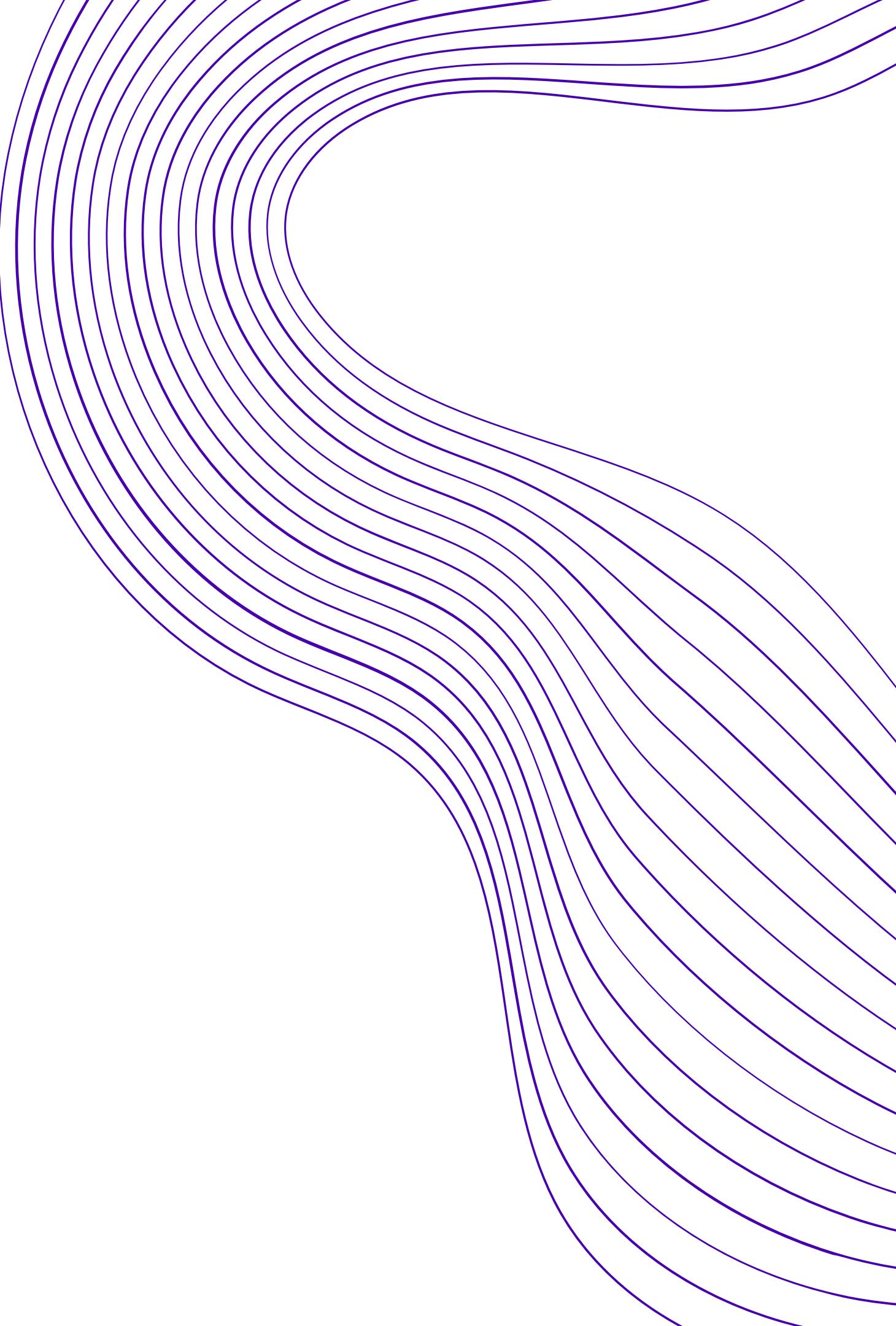
Traditional Programming



Machine Learning



Deep Learning



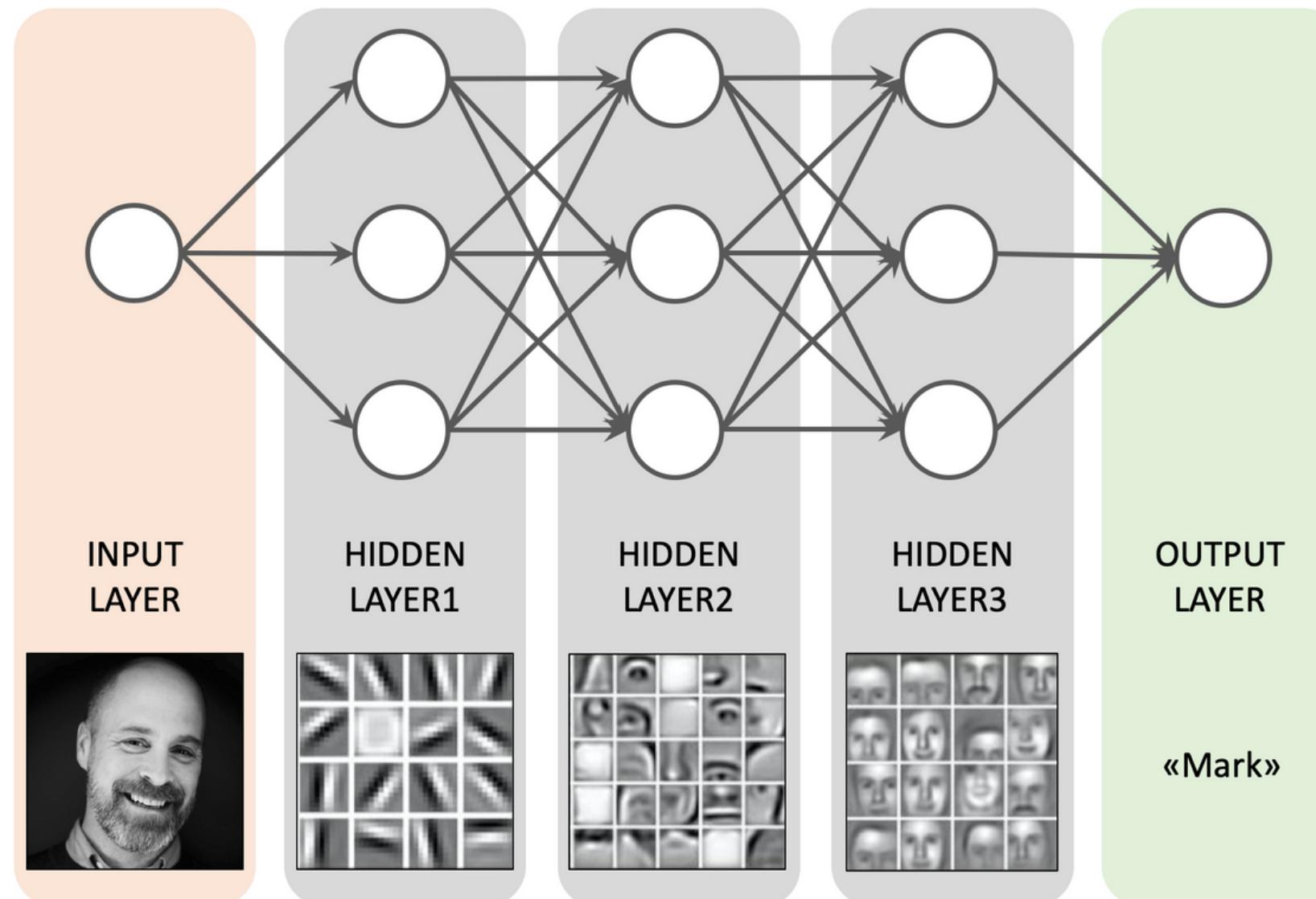
What is Deep Learning ?

Deep Learning adalah metode **representation-learning** yang memiliki **multiple level representation** dari low level representation hingga high level representation dimana setiap level representationnya didapat dari kombinasi transformasi **module non-linear** dari level representasi sebelumnya.

Reference : LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton.
"Deep learning." Nature 521.7553 (2015): 436-444.

What is Deep Learning ?

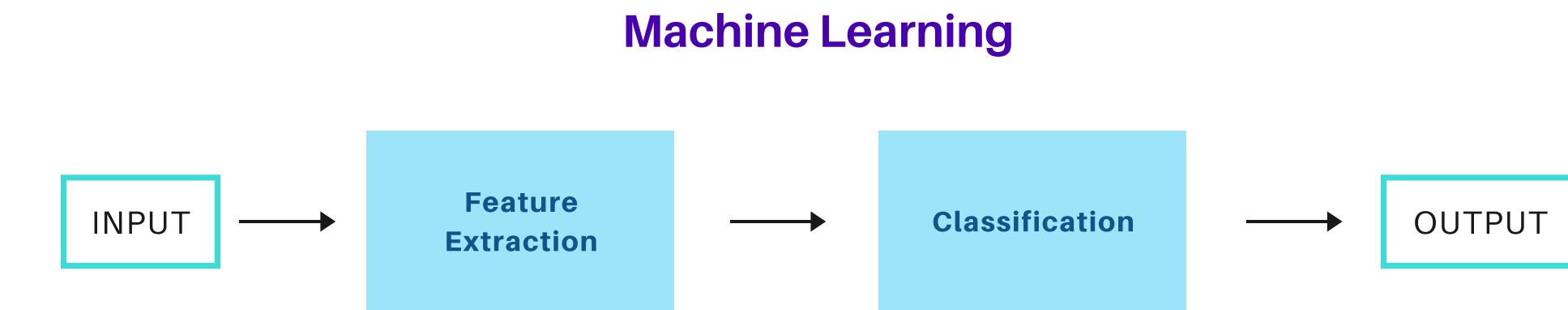
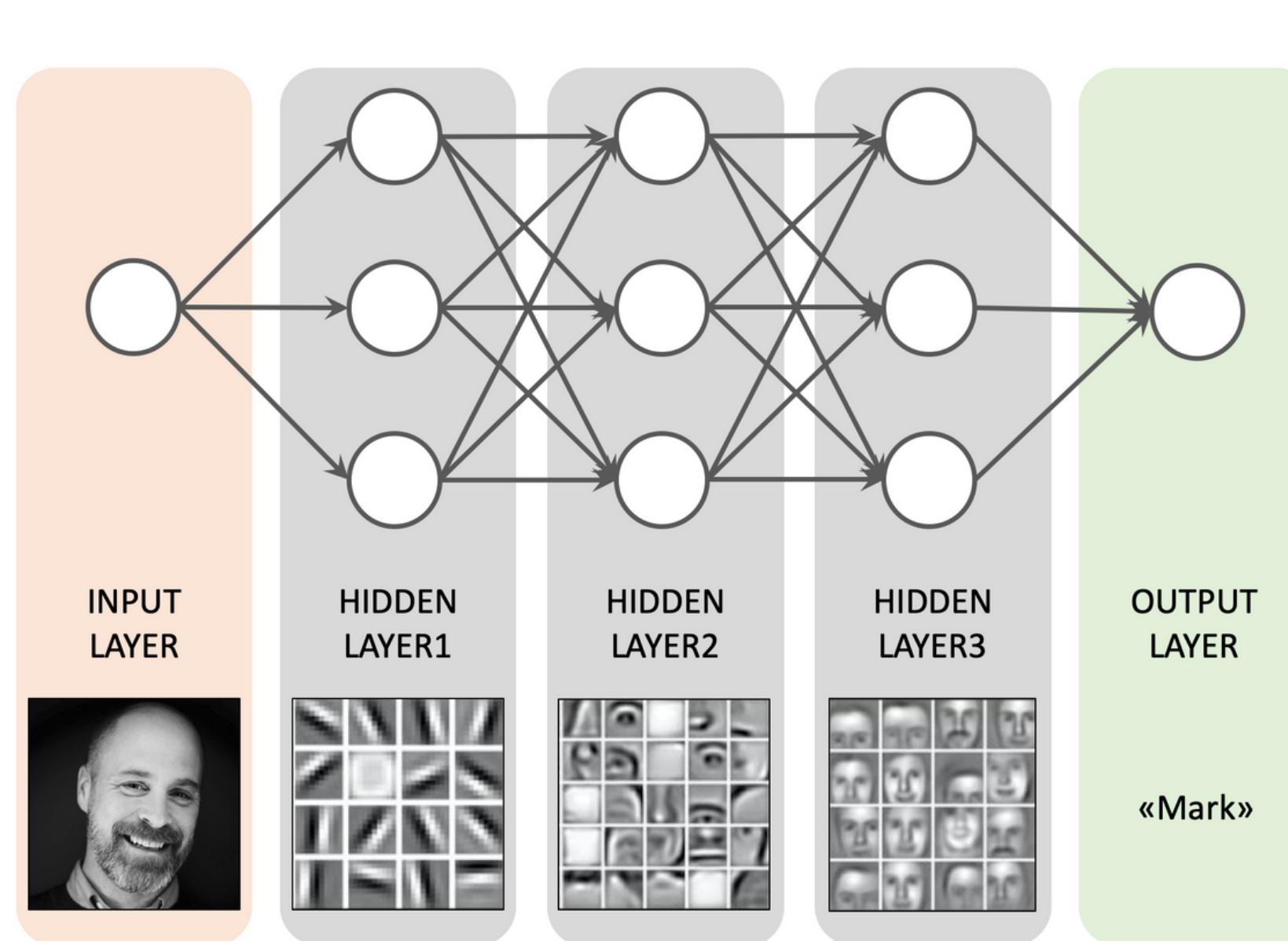
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learn more : LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton.
"Deep learning." Nature 521.7553 (2015): 436-444.

What is Deep Learning ?

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Learn More : LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton.
"Deep learning." Nature 521.7553 (2015): 436-444.

Variation of Learning Problem

1

Supervised Learning

2

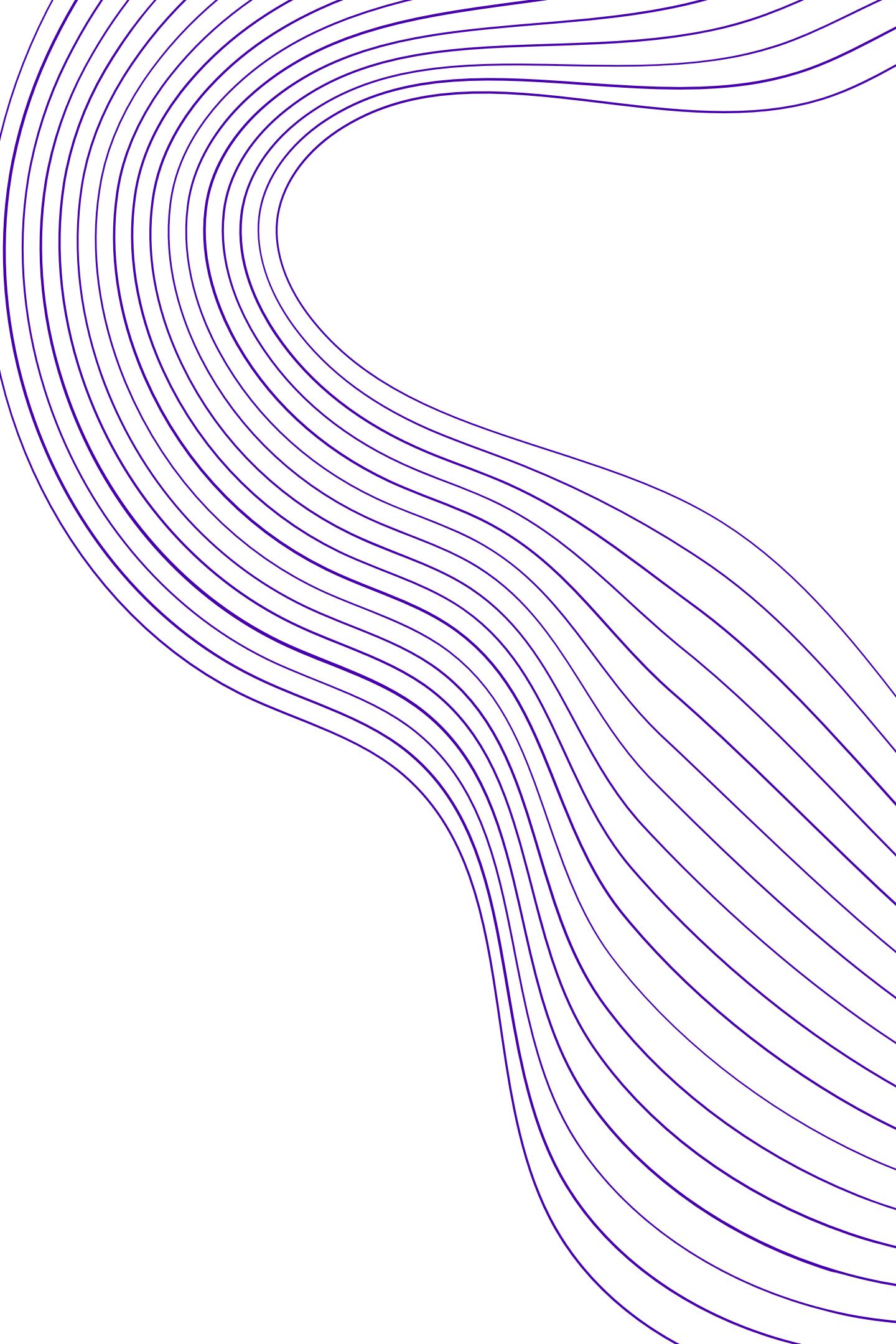
**Reinforcement
Learning**

3

Unsupervised Learning

Learn More : Aston Zhang and Zachary C. Lipton and Mu Li and Alexander J. Smola. "Dive into Deep Learning." 2020

Artificial Neural Network



Real Neuron

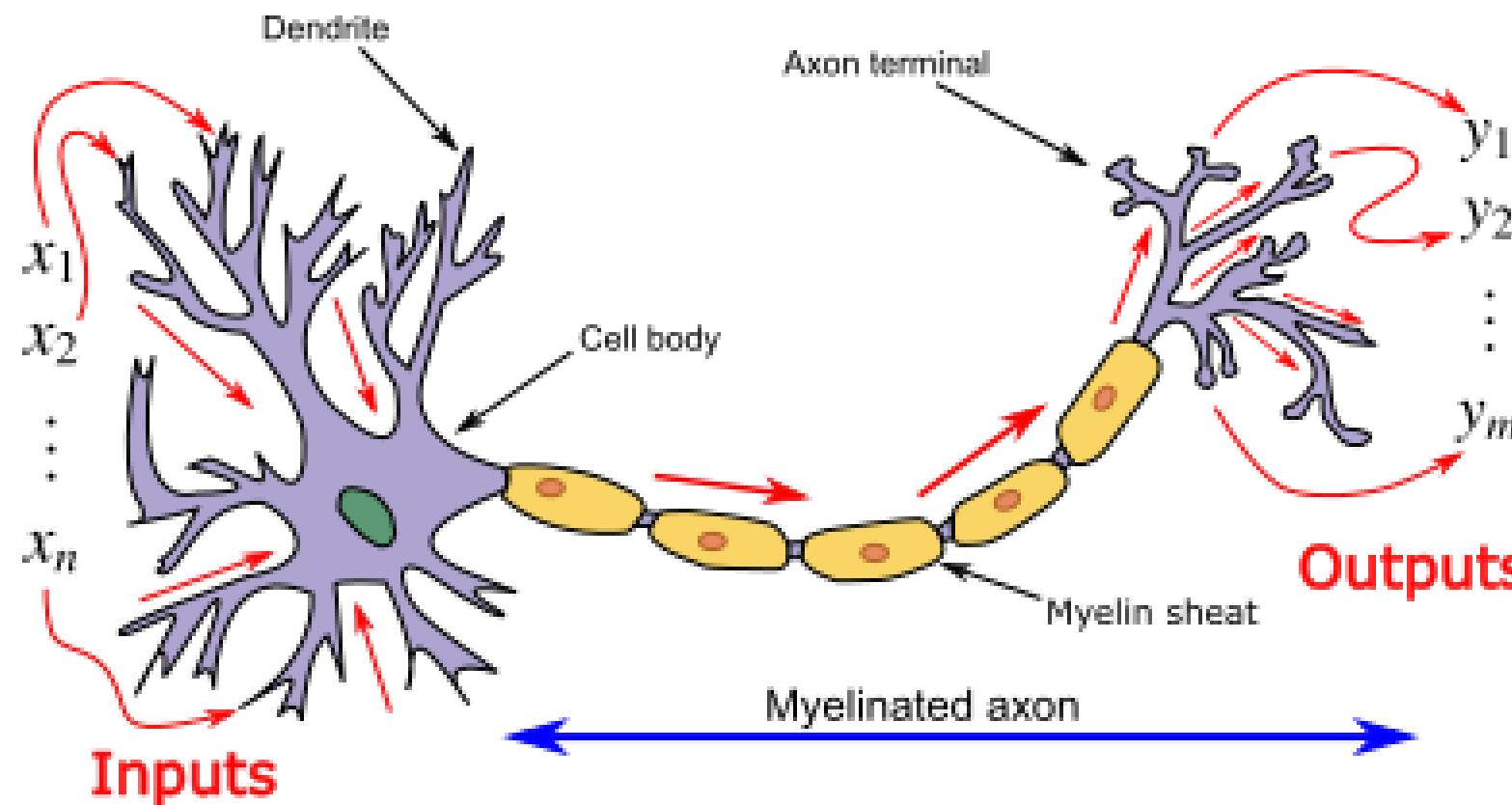


Image Created By Wikipedia

Artificial Neuron

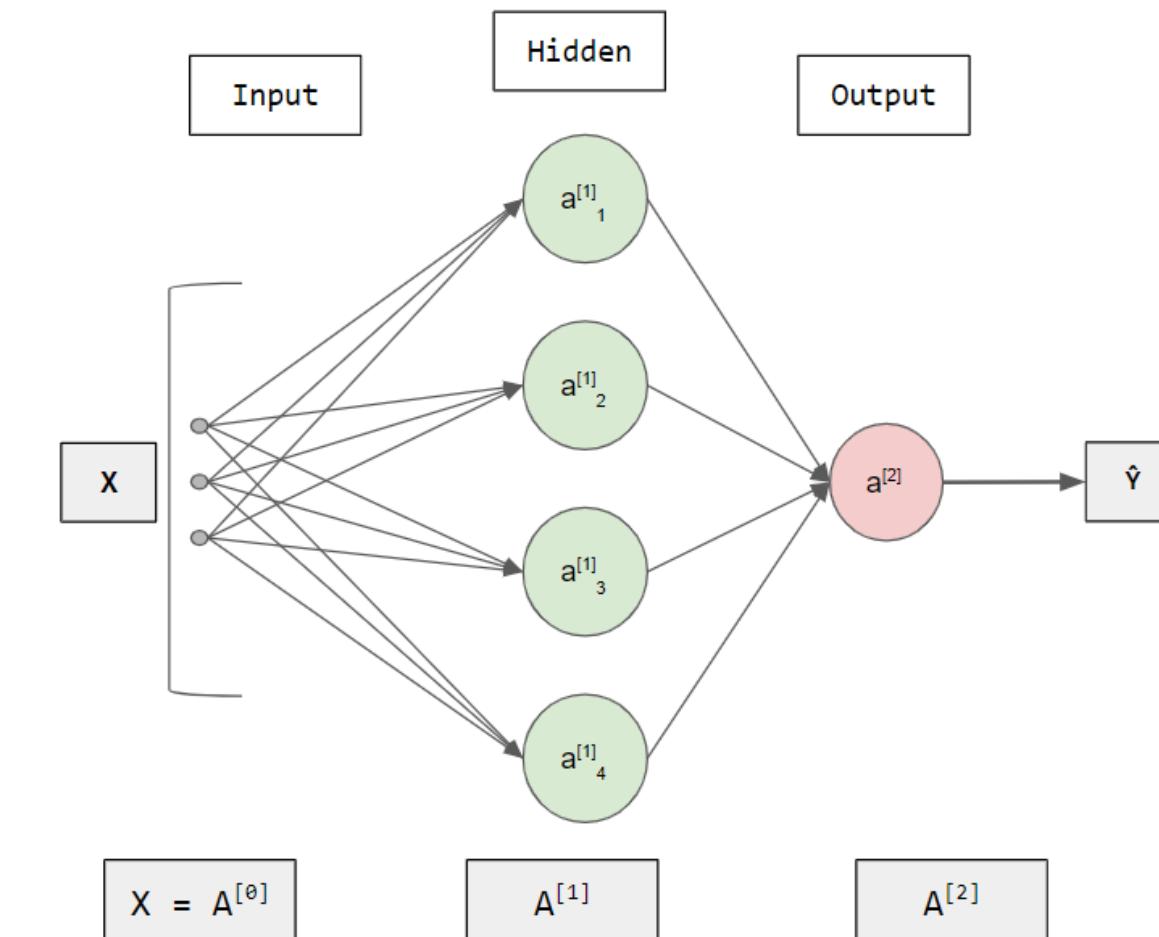
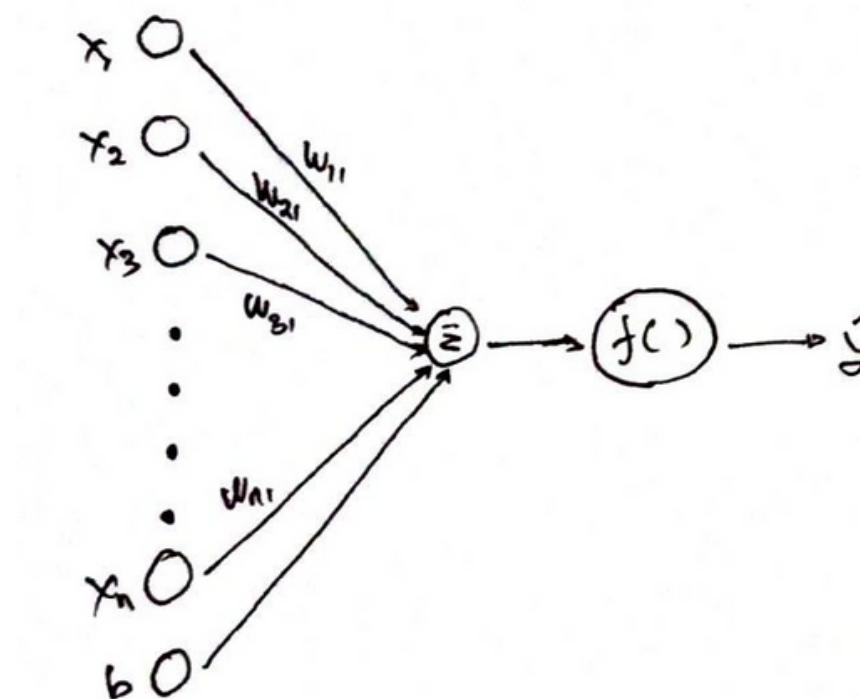
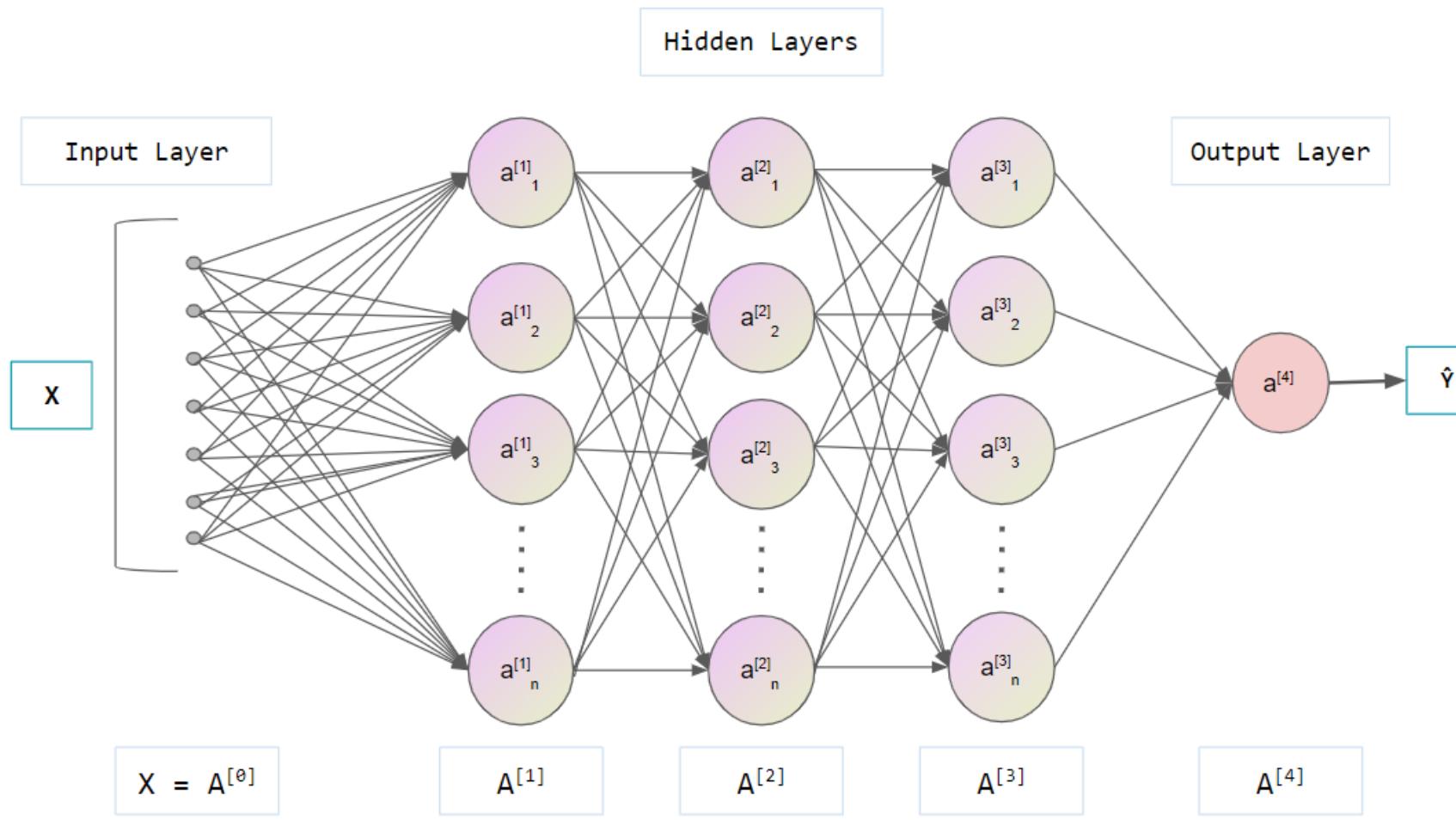


Image Created By @srvmshr
sourav@yahoo.com

Learning more : Yang, Guangyu Robert, and Xiao-Jing Wang.
"Artificial neural networks for neuroscientists: A primer." arXiv preprint arXiv:2006.01001 (2020).

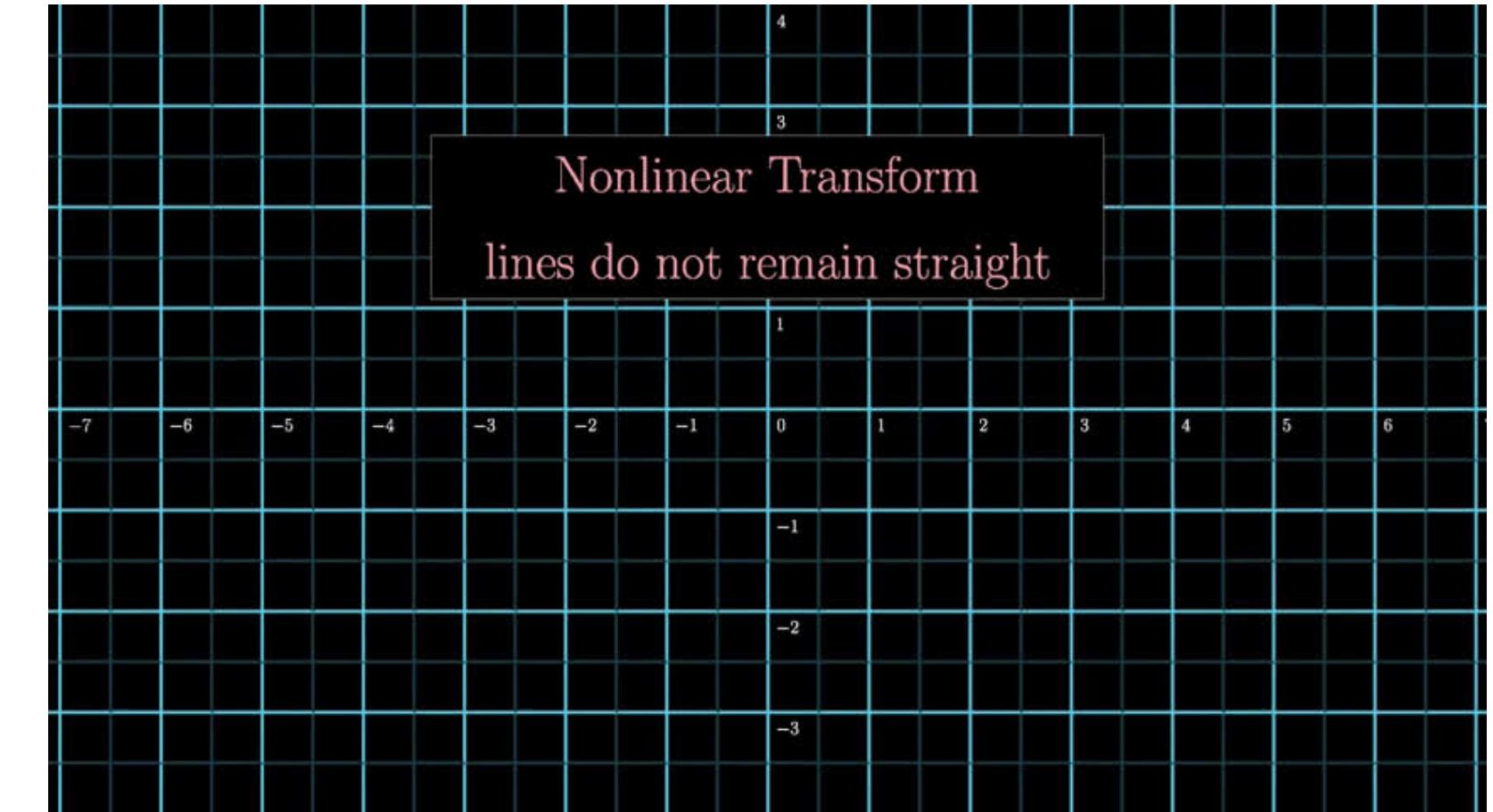
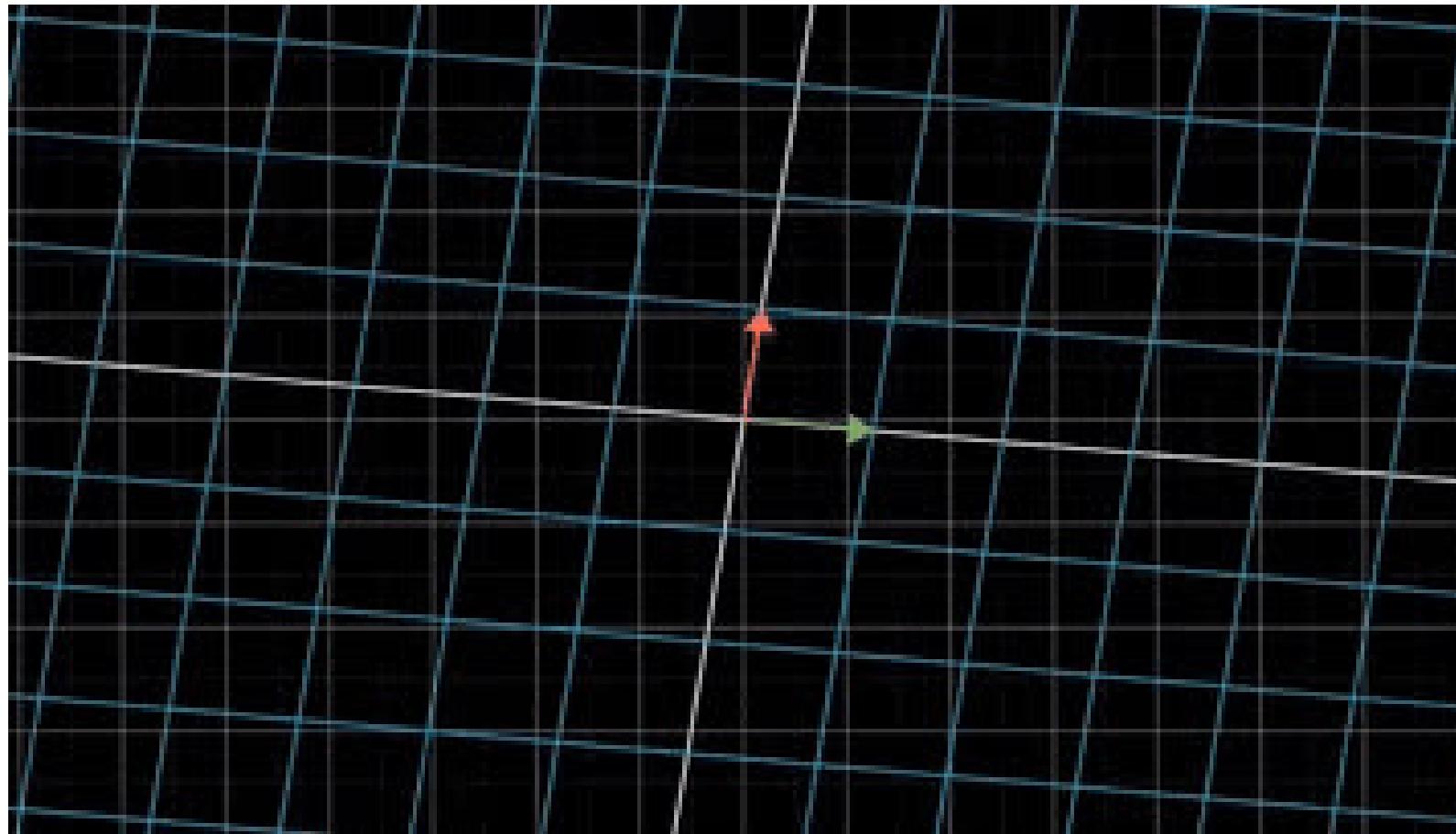
Struktur Artificial Neural Network



$$f(w_{11} \cdot x_1 + w_{21} \cdot x_2 + w_{31} \cdot x_3 + \dots + w_{n1} \cdot x_n + b) = y$$

Image Created By @srvmshr
sourav@yahoo.com

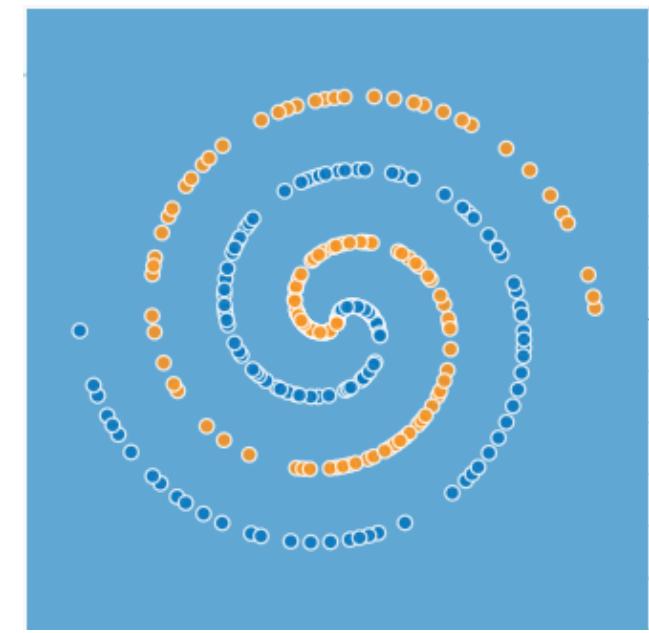
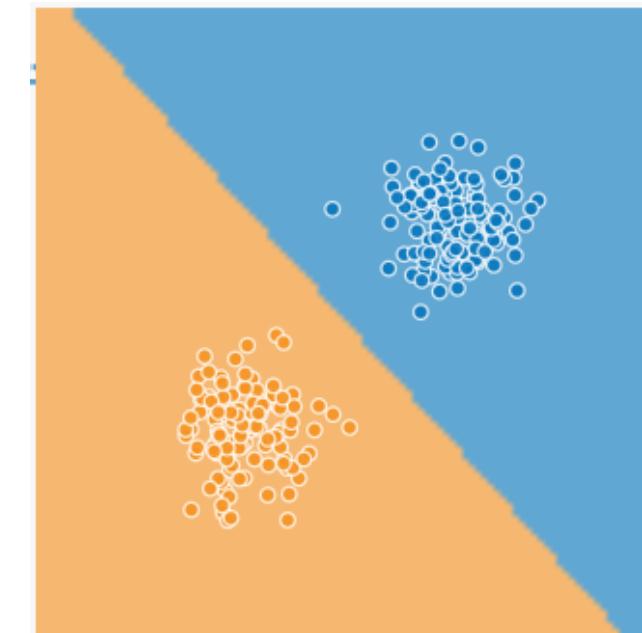
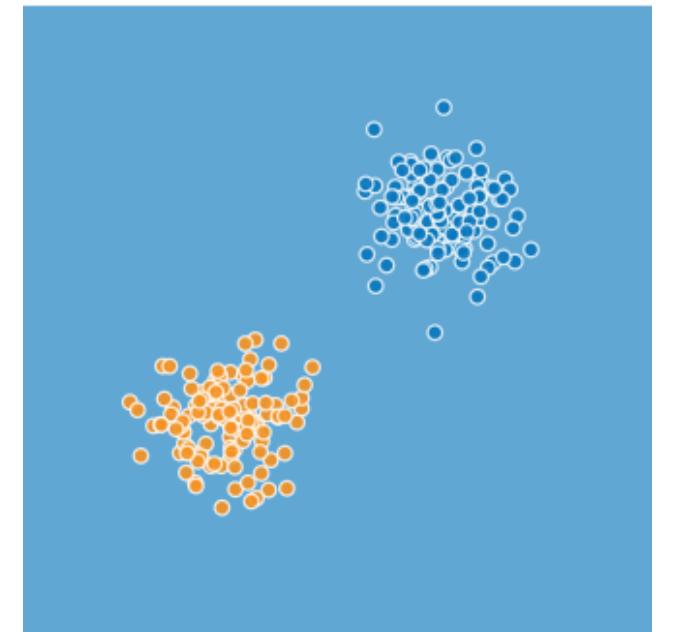
Recap understanding about Linear transformation



Video Created By 3 Blue 1 Brown

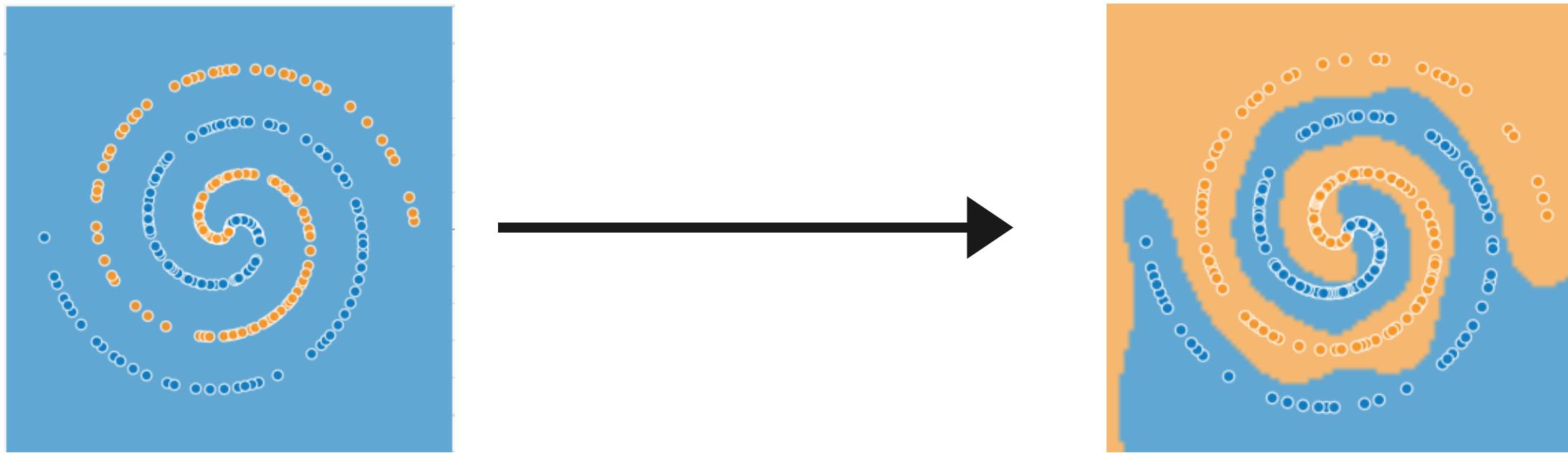
Learn More about Linear Algebra in 3 blue 1 brown Linear Algebra Series :
<https://www.youtube.com/playlist?list=PLO-GT3co4r2y2YErbmujw2L5tW4Ew2O5B>

Linearity in Neural Network

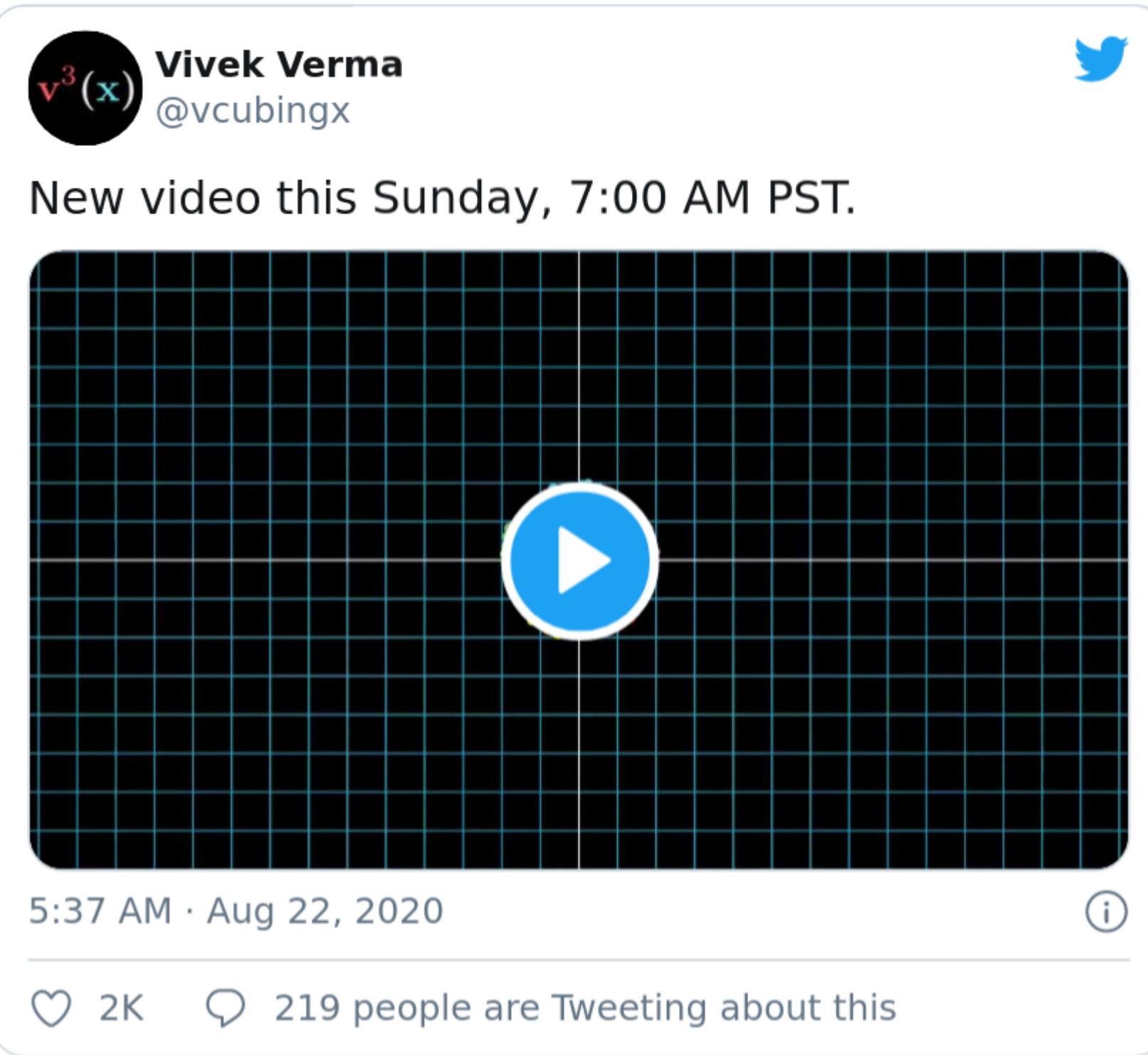


?

non-Linearity in Neural Network



non-Linearity in Neural Network



Vivek Verma
@vcubingx

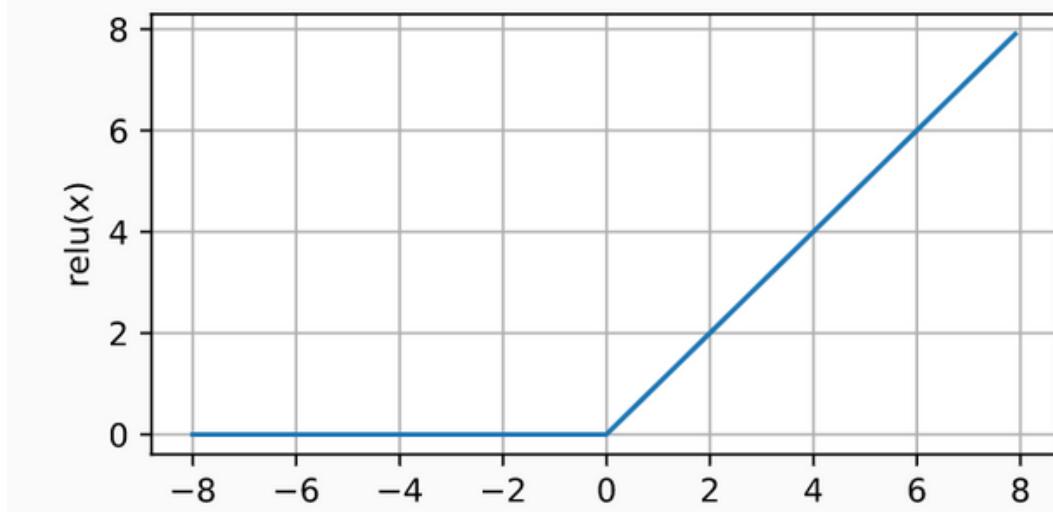
New video this Sunday, 7:00 AM PST.

5:37 AM · Aug 22, 2020

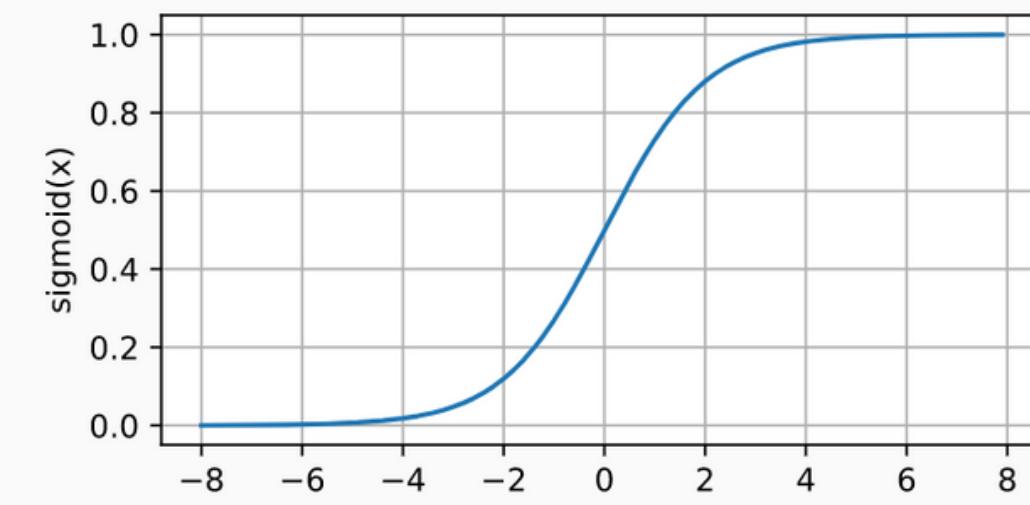
1 2K 219 people are Tweeting about this

Fungsi Aktivasi

$$\text{ReLU}(x) = \max(x, 0).$$



$$\text{sigmoid}(x) = \frac{1}{1 + \exp(-x)}.$$



$$\tanh(x) = \frac{1 - \exp(-2x)}{1 + \exp(-2x)}.$$

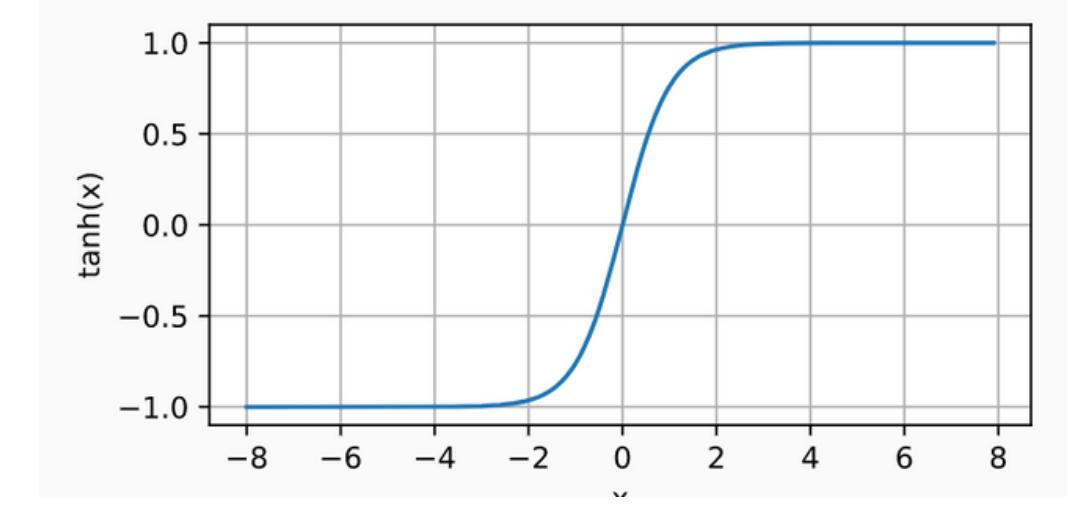
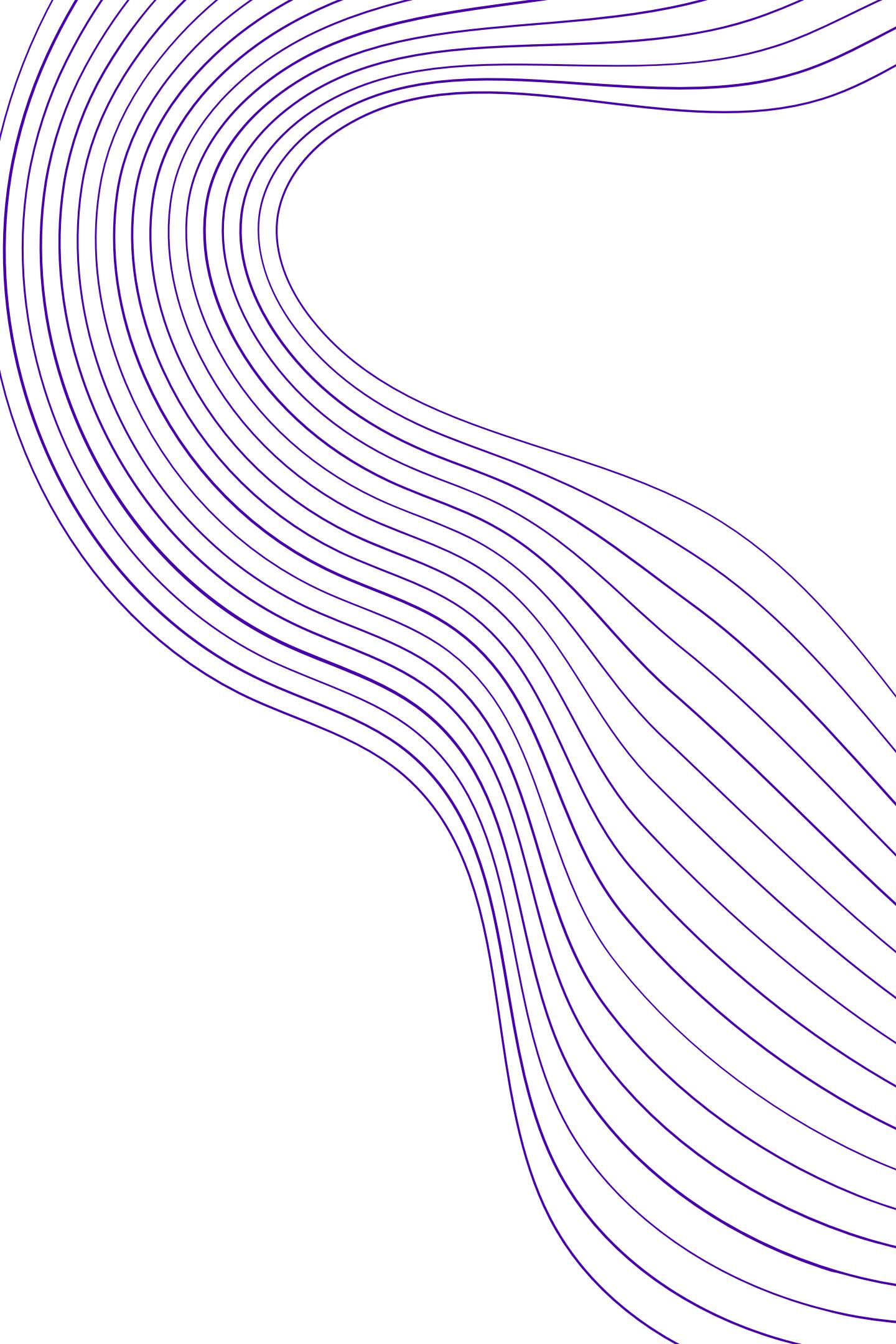
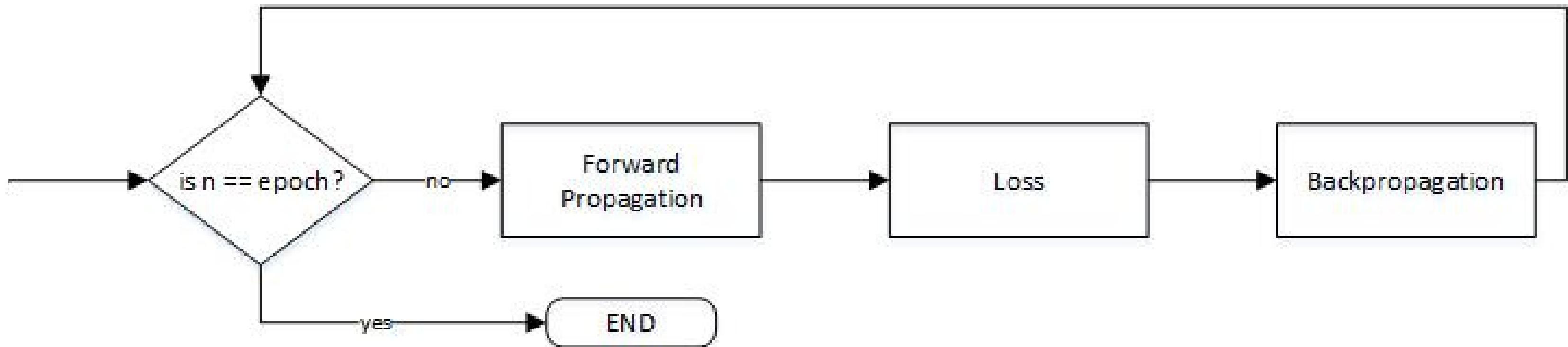


Image Created By Book Dive into Deep Learning

Training Neural Network



Training Neural Network



Forwardpropagation

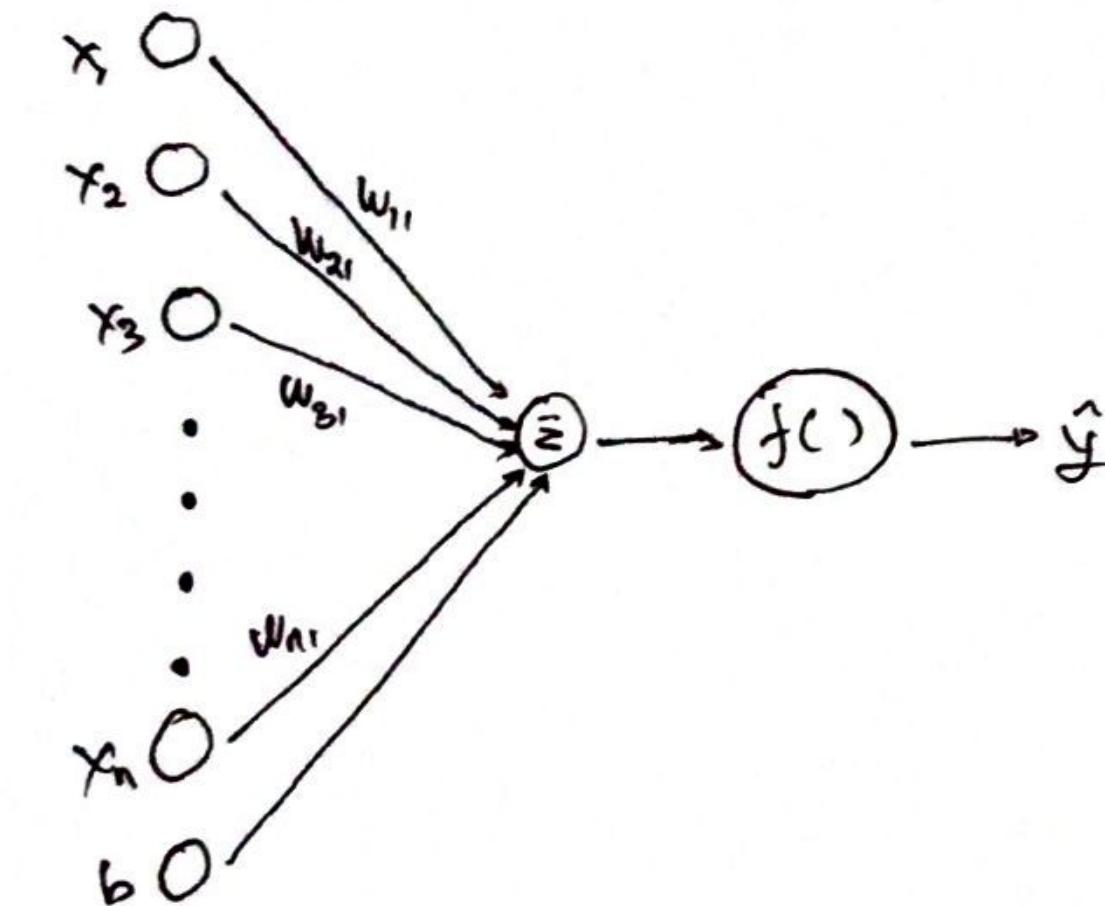
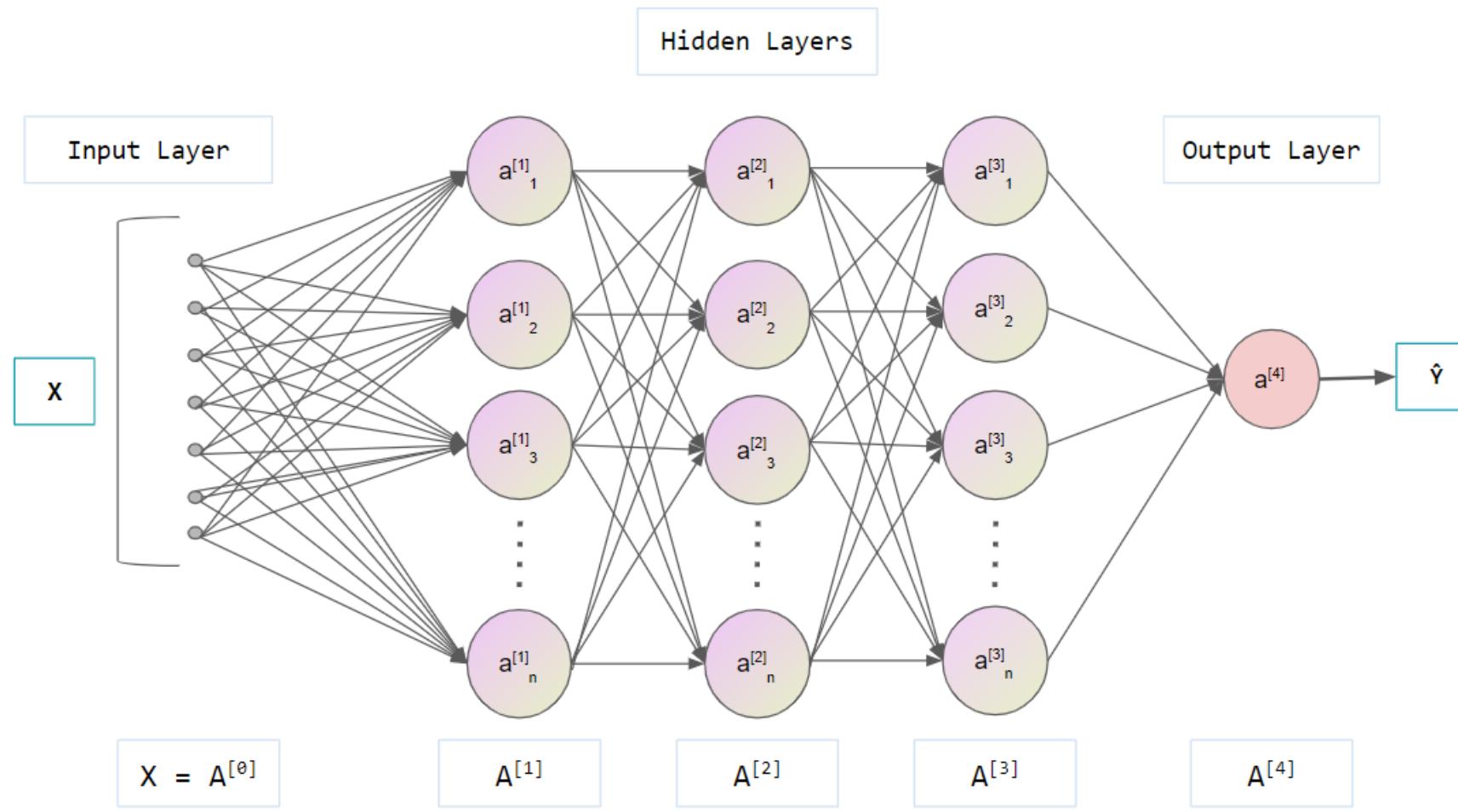


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sourav@yahoo.com

$$f(w_{11} \cdot x_1 + w_{21} \cdot x_2 + w_{31} \cdot x_3 + \dots + w_{n1} \cdot x_n + b) = \hat{y}$$

Forwardpropagation

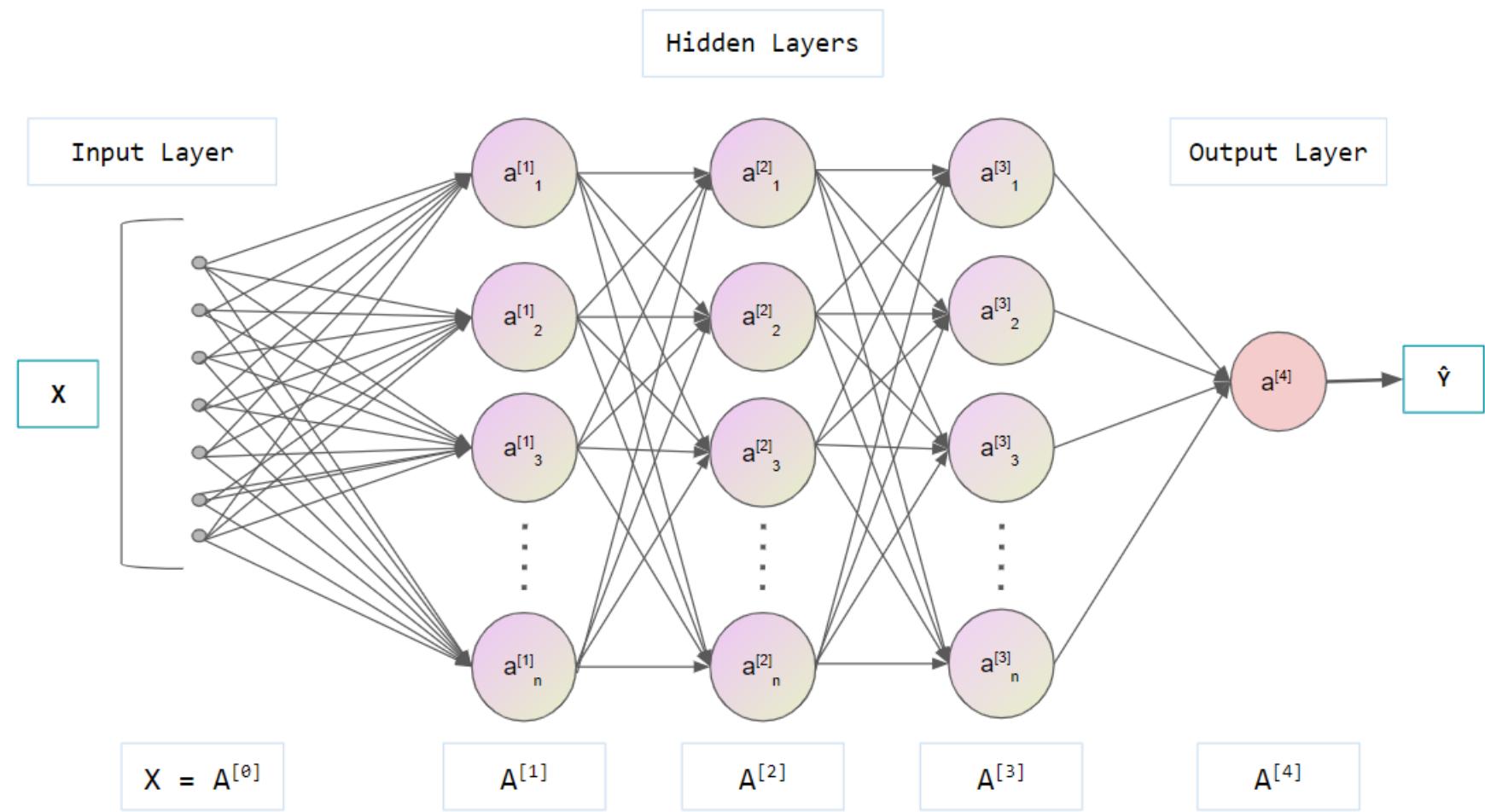


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$$\begin{aligned} ax_1 + by_1 &= z_1, \\ ax_2 + by_2 &= z_2 \end{aligned}$$
$$\begin{bmatrix} a & b \end{bmatrix} \begin{bmatrix} x_1 & x_2 \\ y_1 & y_2 \end{bmatrix} = \begin{bmatrix} z_1 & z_2 \end{bmatrix}$$

Forward propagation

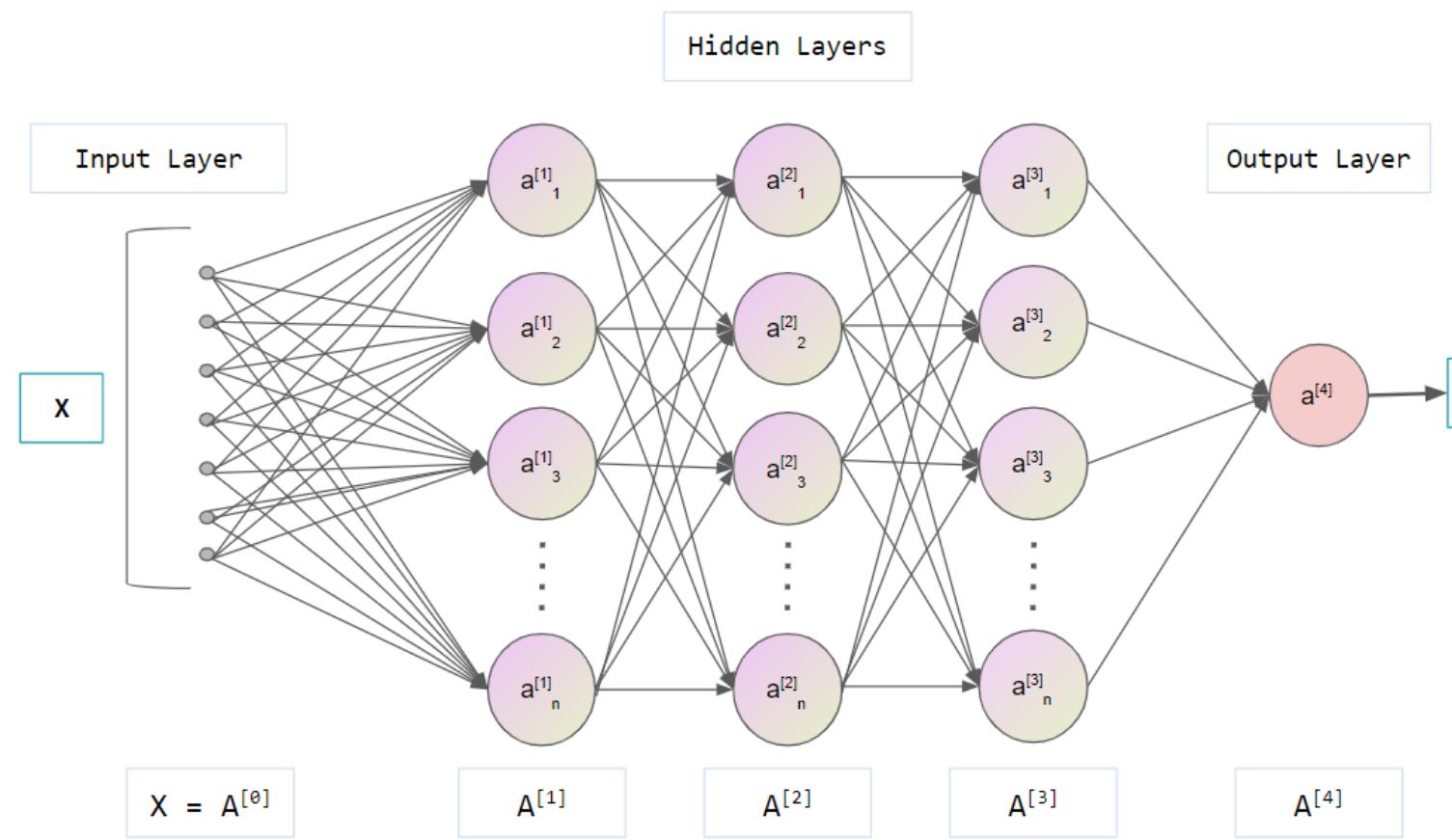


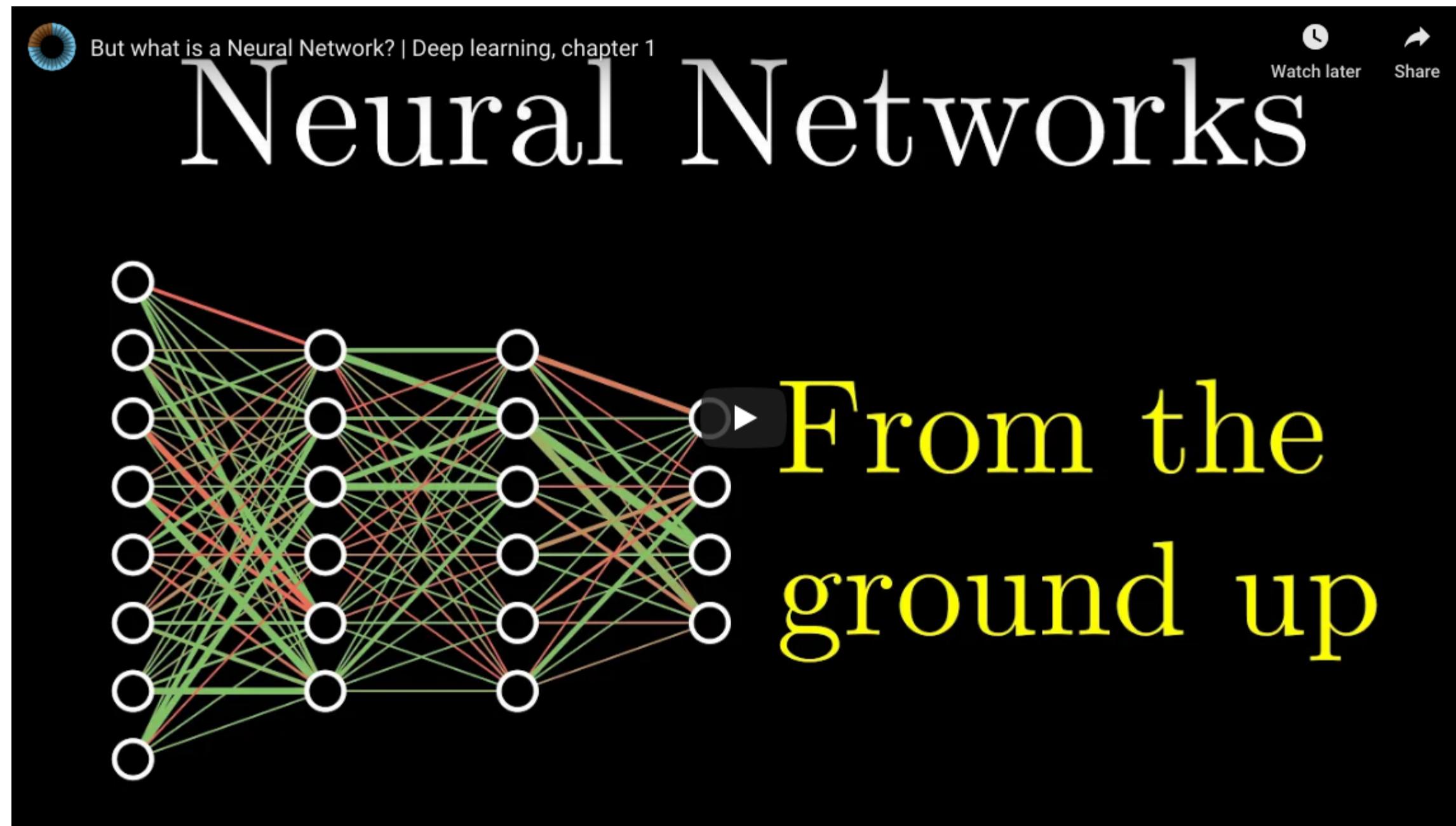
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$$\begin{bmatrix} x_1 & x_2 & \dots & x_n \end{bmatrix} \quad \begin{bmatrix} w_{11} & w_{12} & \dots & w_{1d} \\ w_{21} & \ddots & & \vdots \\ \vdots & & \ddots & \vdots \\ w_{n1} & \dots & \dots & w_{nd} \end{bmatrix} = \begin{bmatrix} y_1 & y_2 & \dots & y_d \end{bmatrix}$$

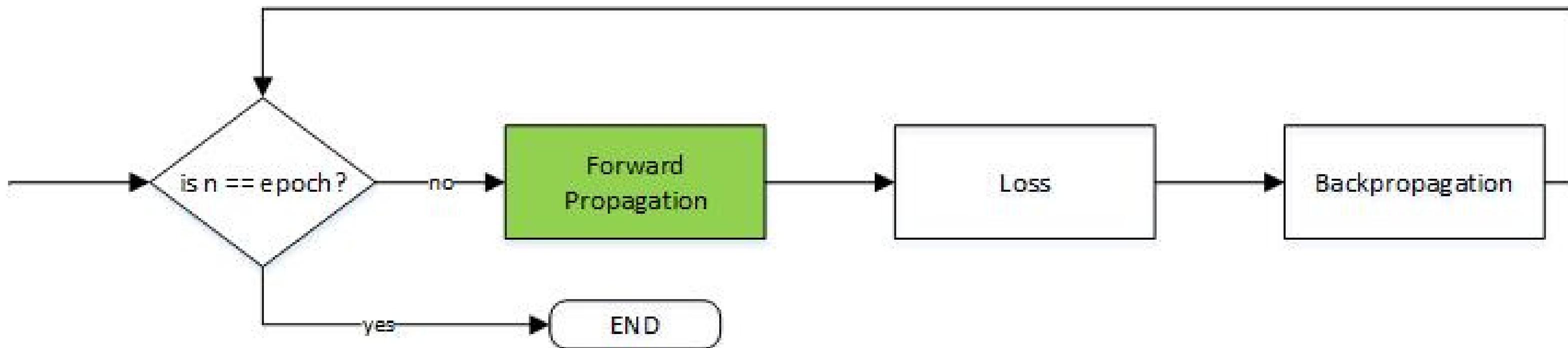
parameter

Parameter adalah variable yang valuenya dapat di update pada backpropagation

Forward propagation



Training Neural Network



Loss

Loss merupakan sebuah nilai yang menyatakan kedekatan antara hasil prediksi dari model dengan real valuenya , loss digunakan sebagai nilai untuk mengukur seberapa baik model bekerja.

Loss function

1

Linear Regression :
Mean Square Error atau Mean Absolute Error

2

Classification :
Cross Entropy atau Binarry Cross Entropy

Backpropagation

Bagaimana cara mengupdate parameter ?

$$\theta_{\text{new}} = \theta_{\text{old}} - \alpha \frac{\partial L}{\partial \theta}$$

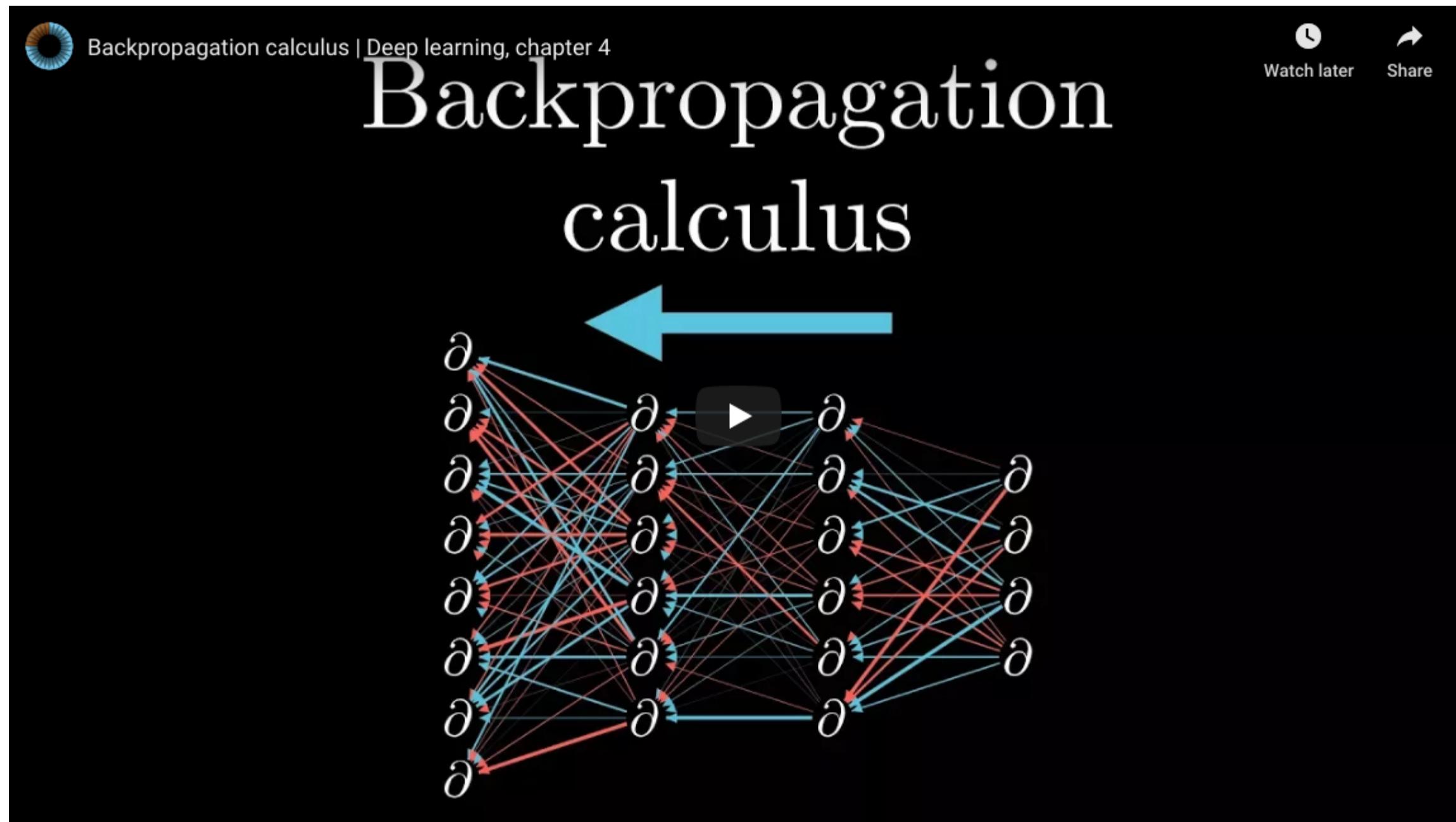
θ = parameter yang mau diupdate

α = learning rate

$\frac{\partial L}{\partial \theta}$ = derivative Loss terhadap parameter θ

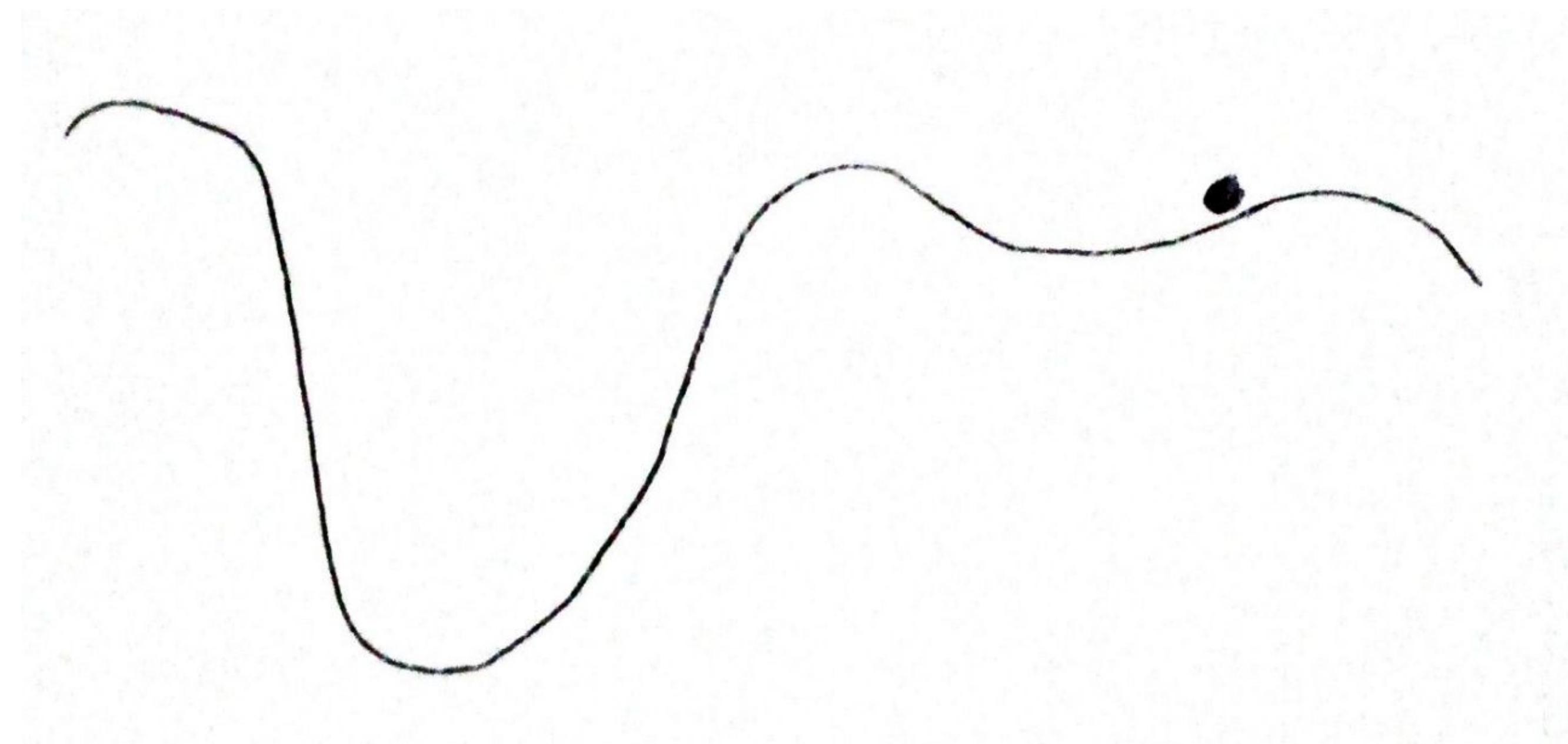
Backpropagation

Bagaimana cara menghitung derivative Loss terhadap parameter ?



Backpropagation

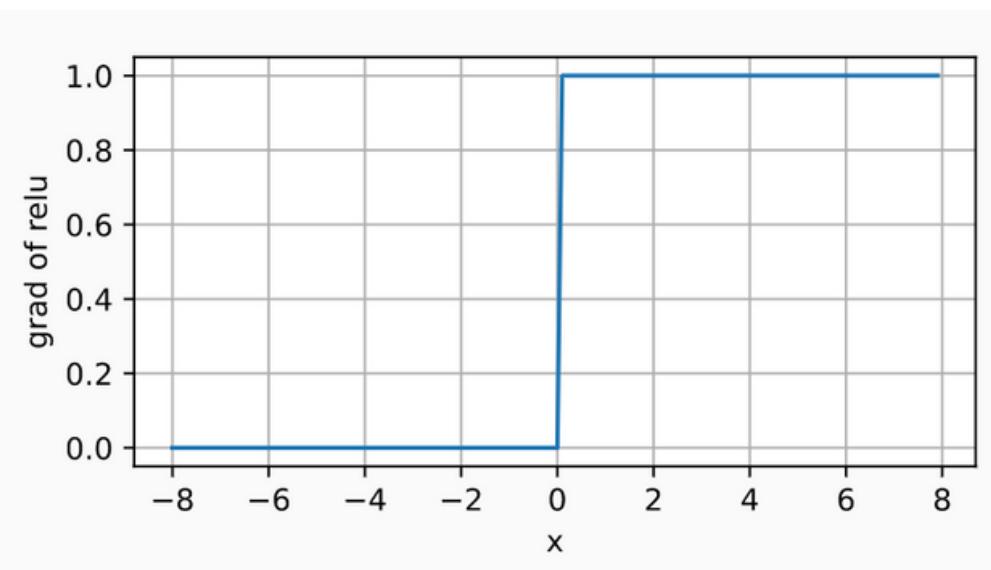
bagaimana peran hyperparameter learning rate ?



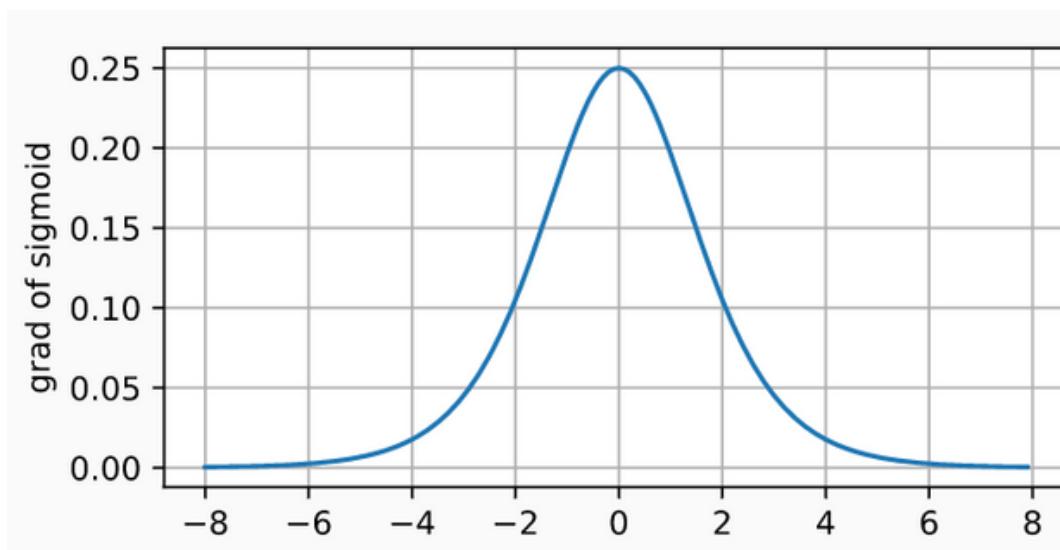
Backpropagation

bagaimana peran fungsi aktivasi dalam backpropagation ?

Derrivative Relu



Derrivative Sigmoid



Derrivative tanh

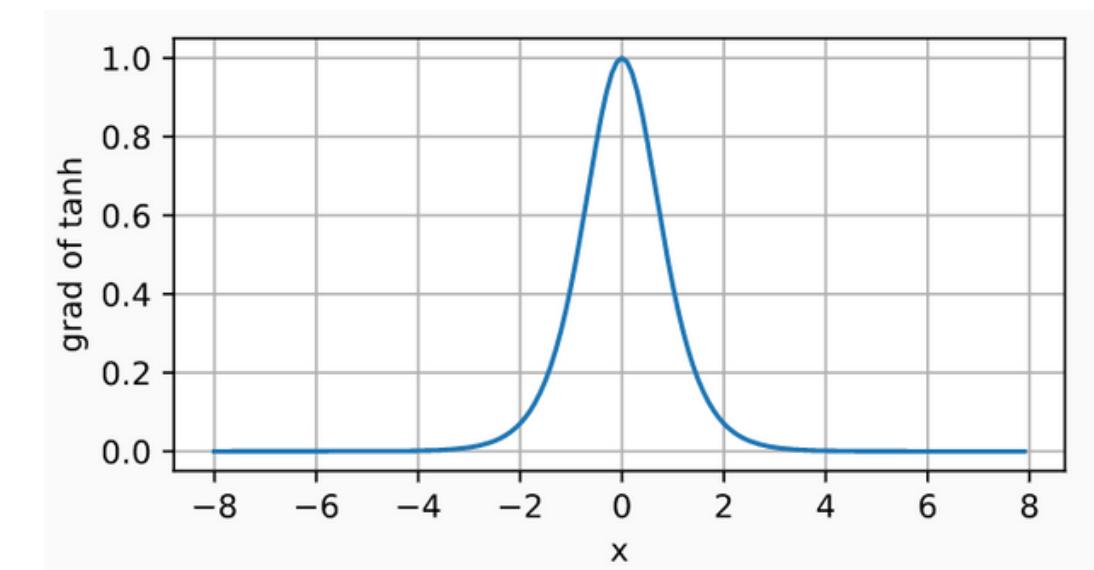


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Optimization

1

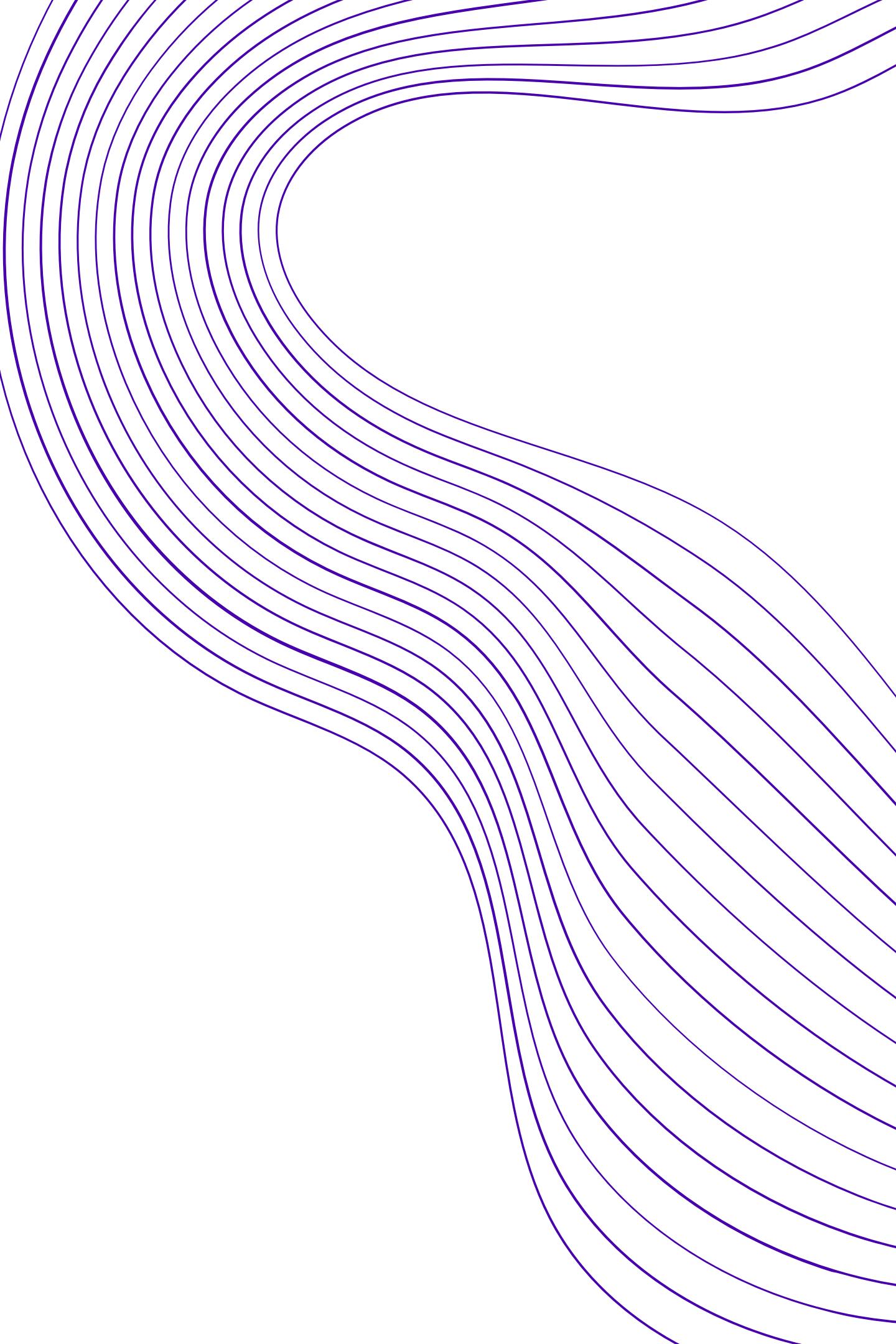
Adam Optimizer

2

SGD + Momentum

Learn More : Book d2l chapter optimization
https://d2l.ai/chapter_optimization/index.html

Problem in Deep Learning



Problem in Deep Learning

1

Vanishing Gradient Descent

2

Exploding Gradient Descent

Problem in Deep Learning

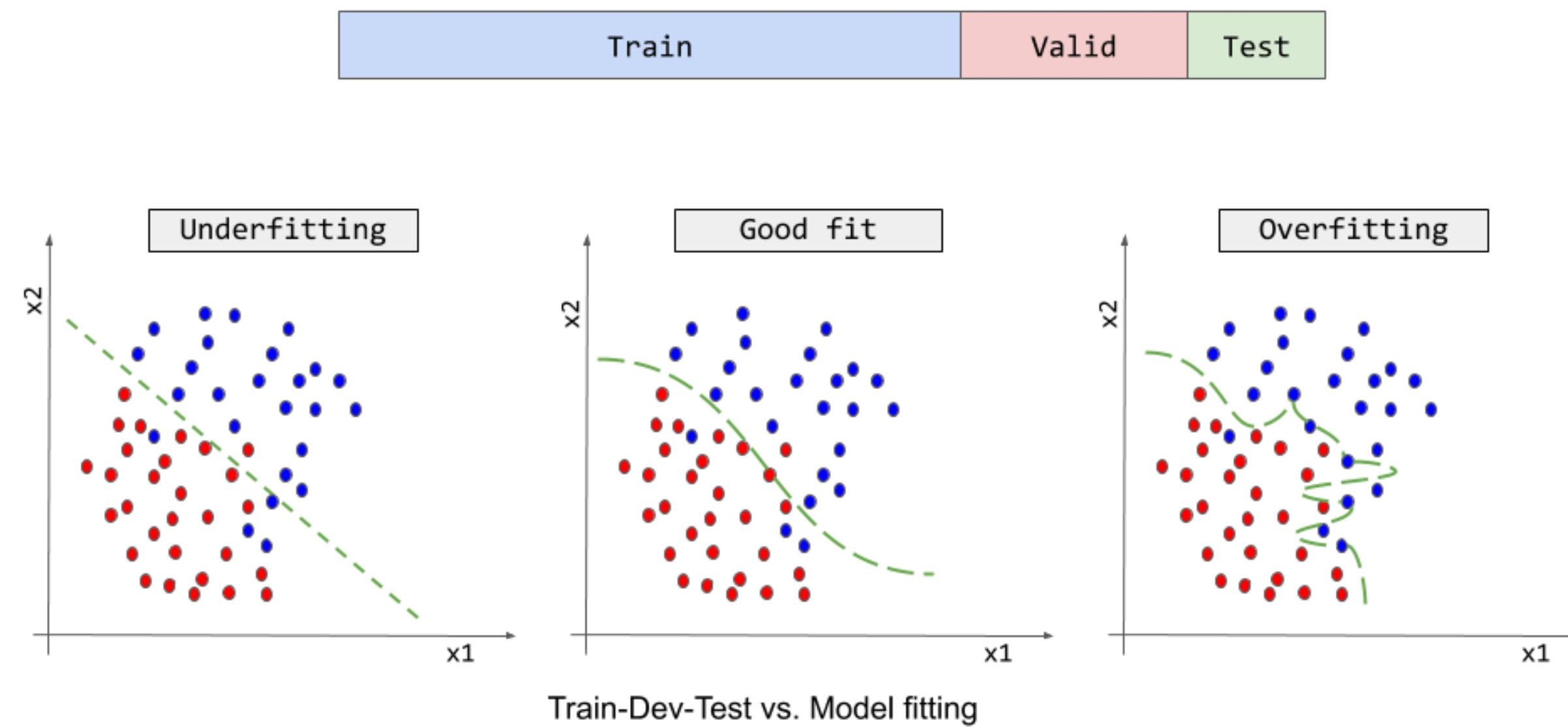
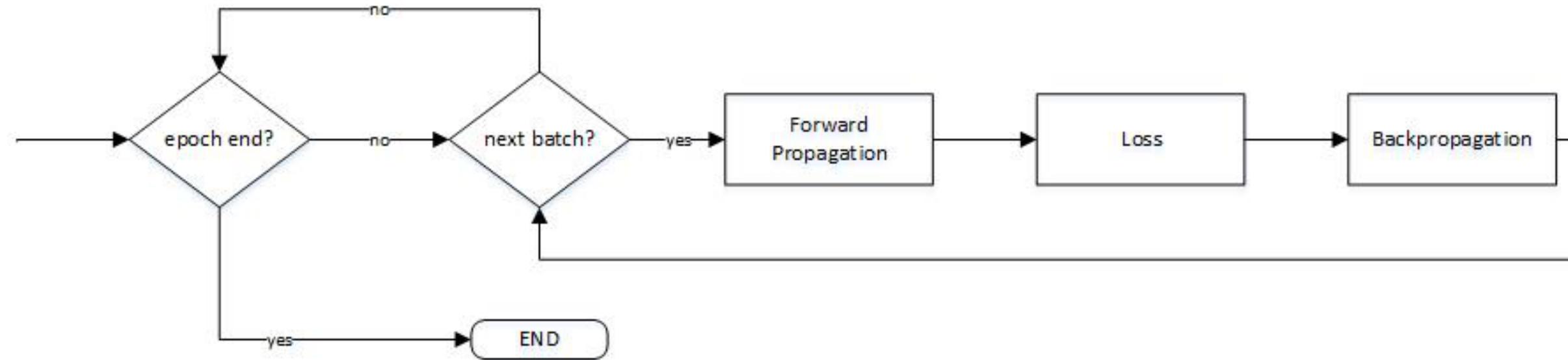


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Batch Size



Regulation

1

L2 Regulation

$$\text{Loss}(y, \hat{y}) = \text{LossFunc}(y, \hat{y}) + \frac{\lambda}{2} \|w\|^2$$

2

Dropout

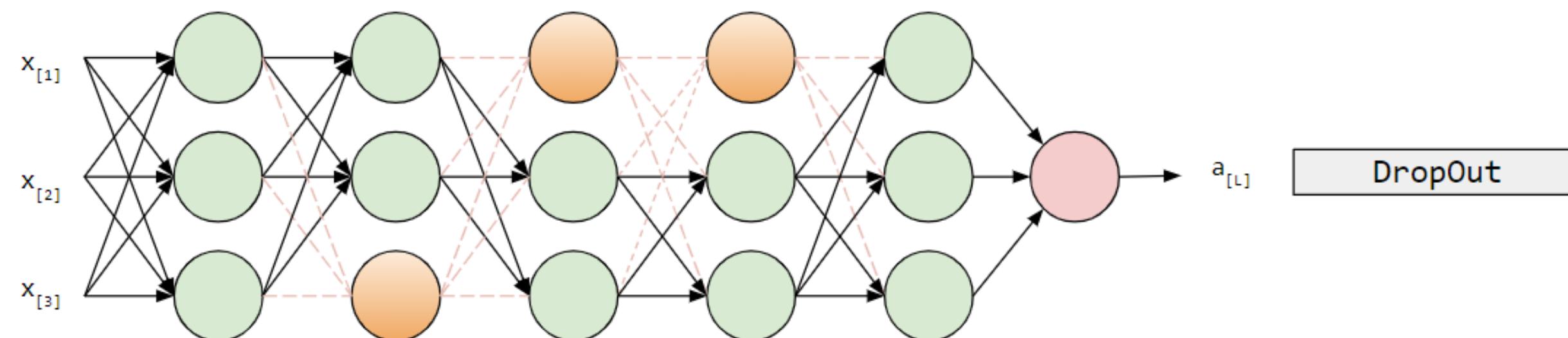
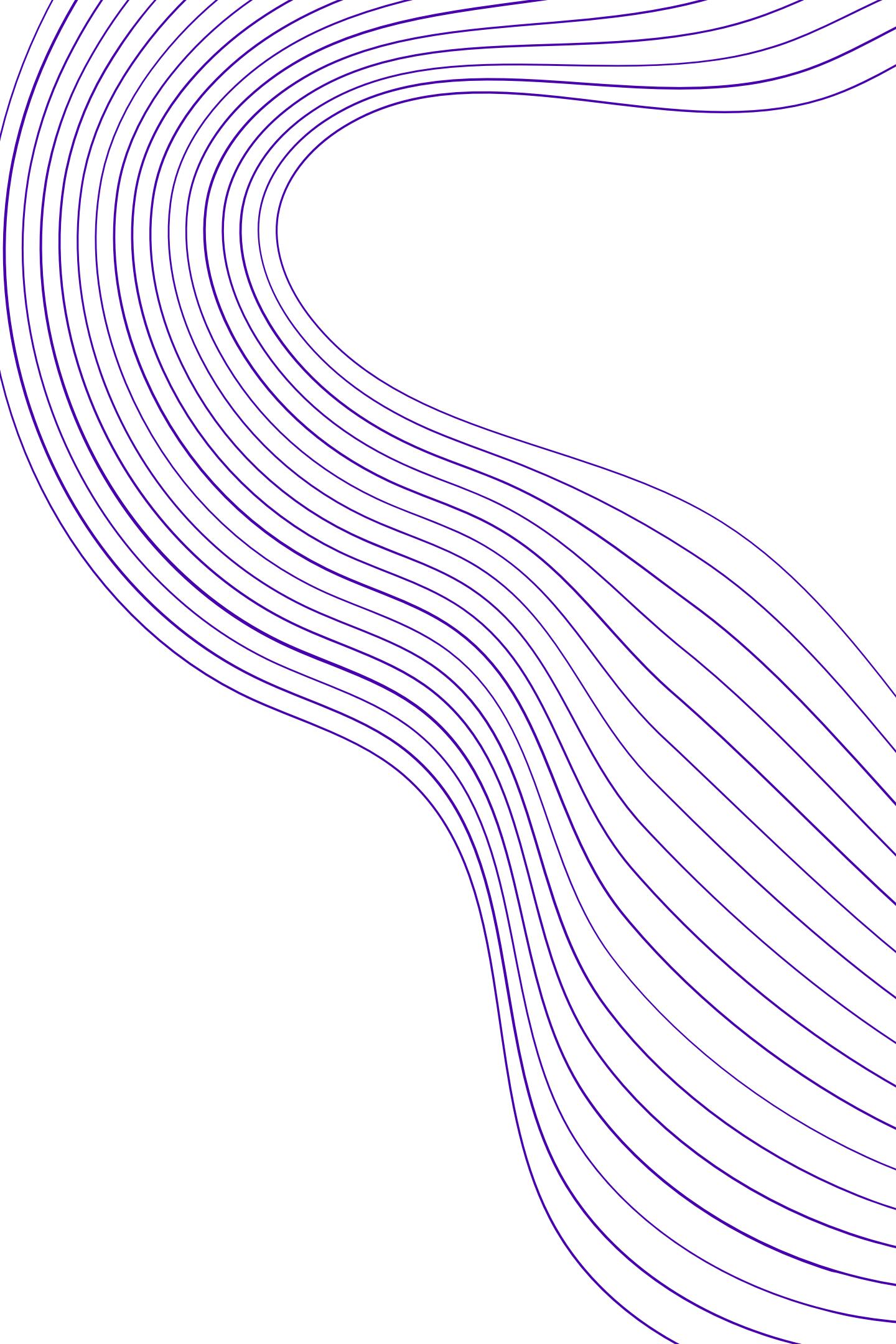


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Study Case



Mnist Dataset

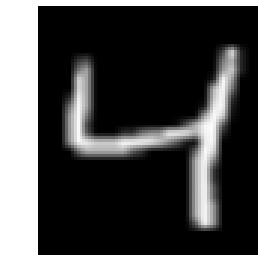
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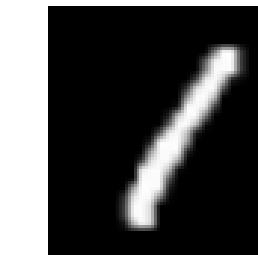
label = 0



label = 4



label = 1



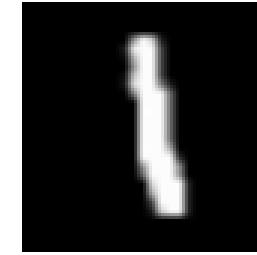
label = 9



label = 2



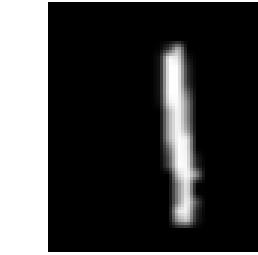
label = 1



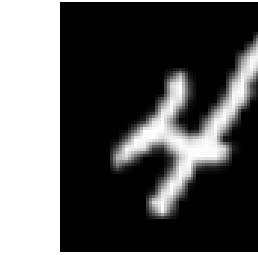
label = 3



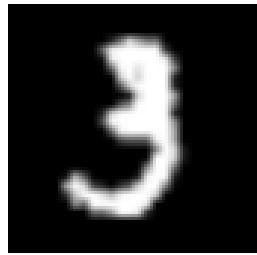
label = 1



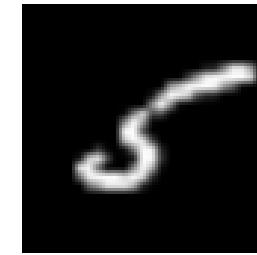
label = 4



label = 3



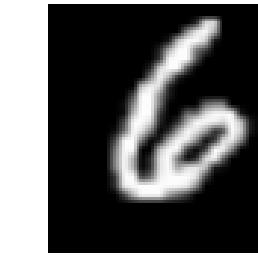
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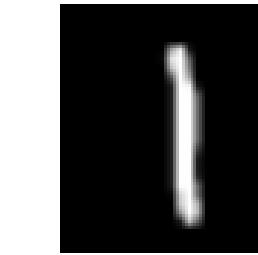
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label = 6

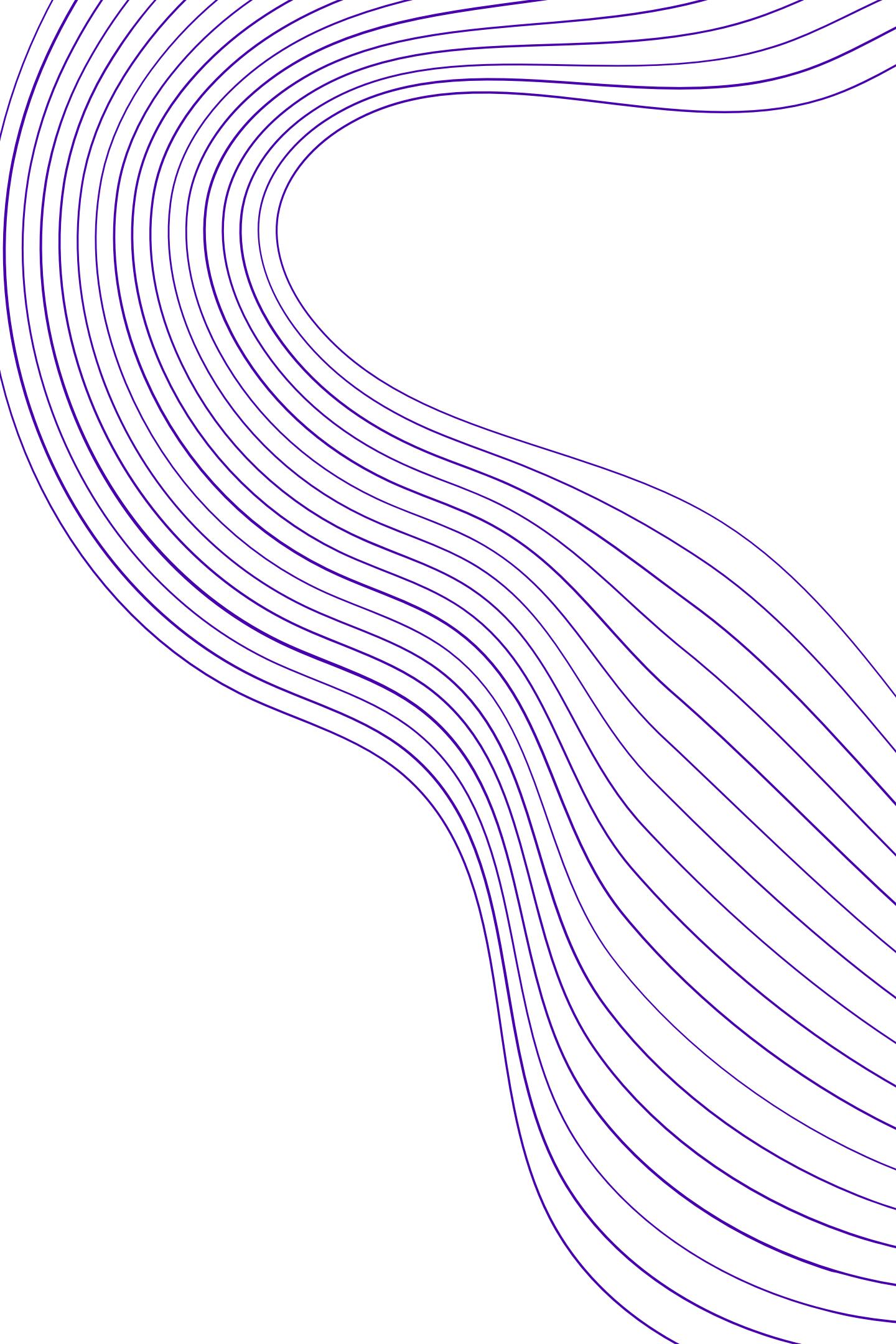


label = 1



Demo

Kenapa pindah ke pytorch lightning?

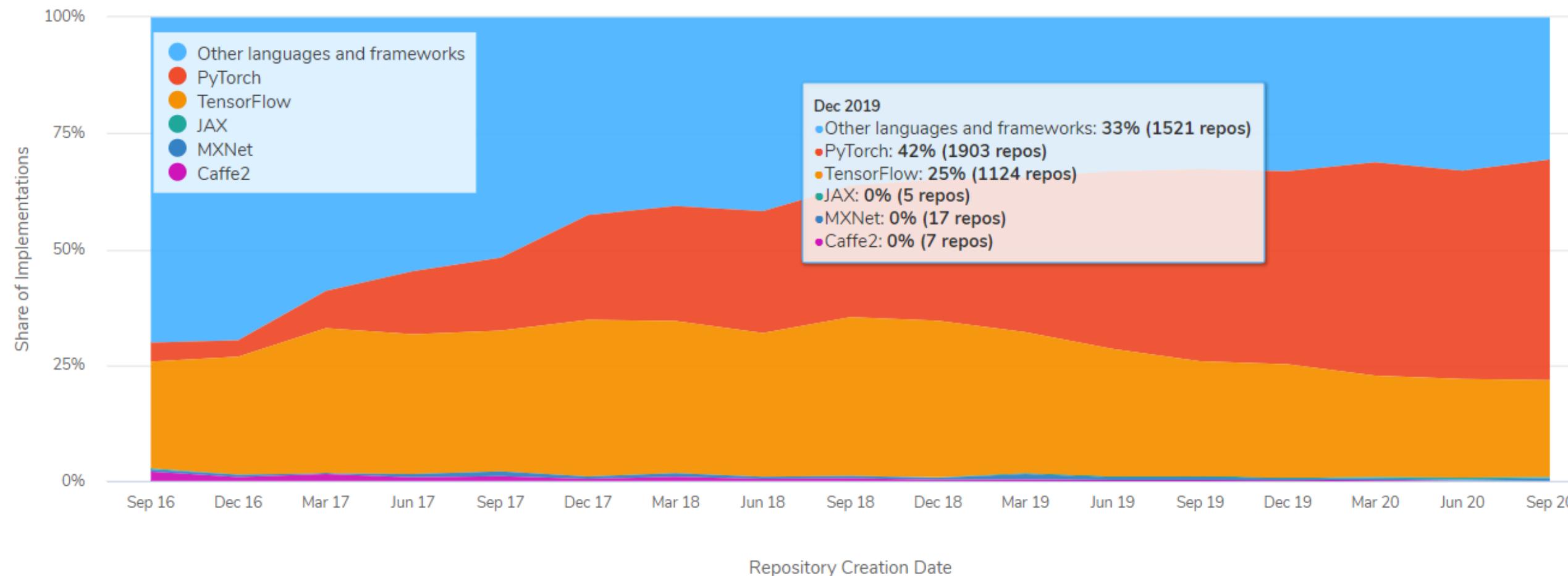


1

Code dalam Reserach Paper kebanyakan menggunakan Pytorch

Frameworks

Paper Implementations grouped by framework



2

pilihlah library yang nyaman kalian pakai

Menggunakan Tensorflow atau pytorch merupakan pilihan yang tepat , pilihlah salah satu yang kalian nyaman menggunakannya.



Twitter

@NaraSurya13

Email Address

ibagungnsd13@gmail.com

Telegram

@Gusagung

Contact

Next Week

Week 1
Neural Network

Week 2
CNN

Week 3
RNN

Week 4
Attention Mechanism &
Transformer

See You...