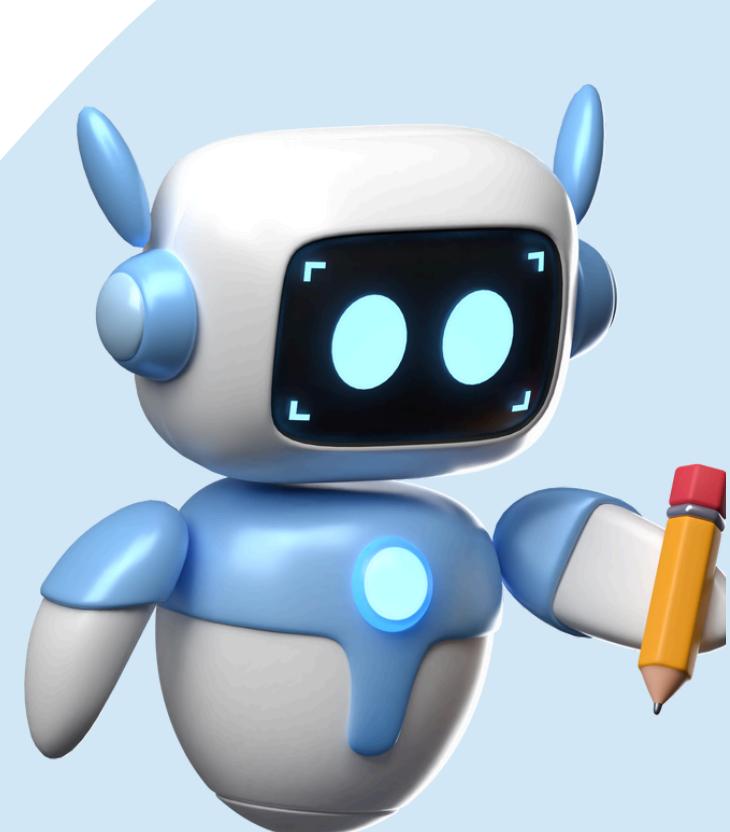


# Journal Club

## *Fundamentos de Machine Learning*



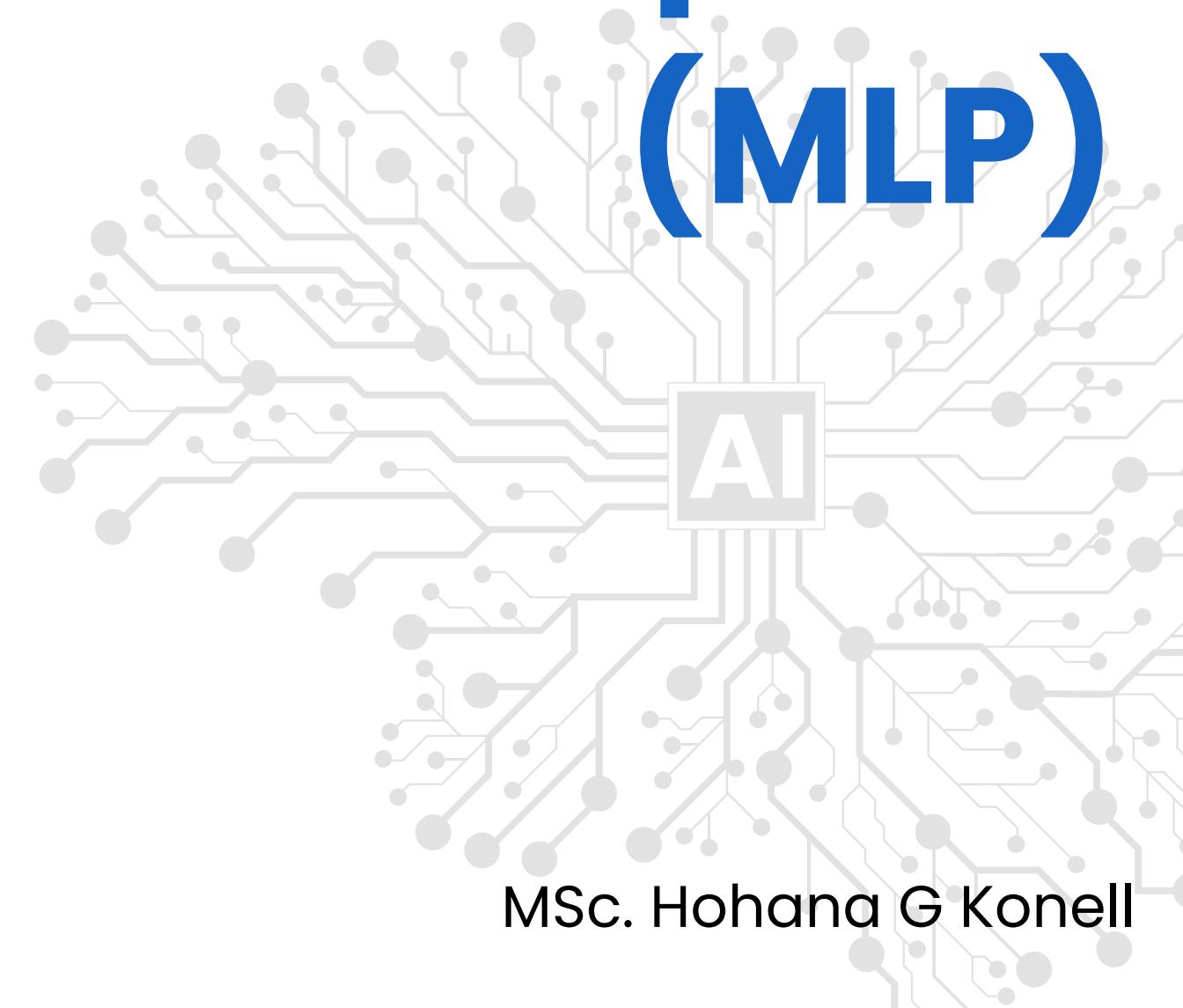
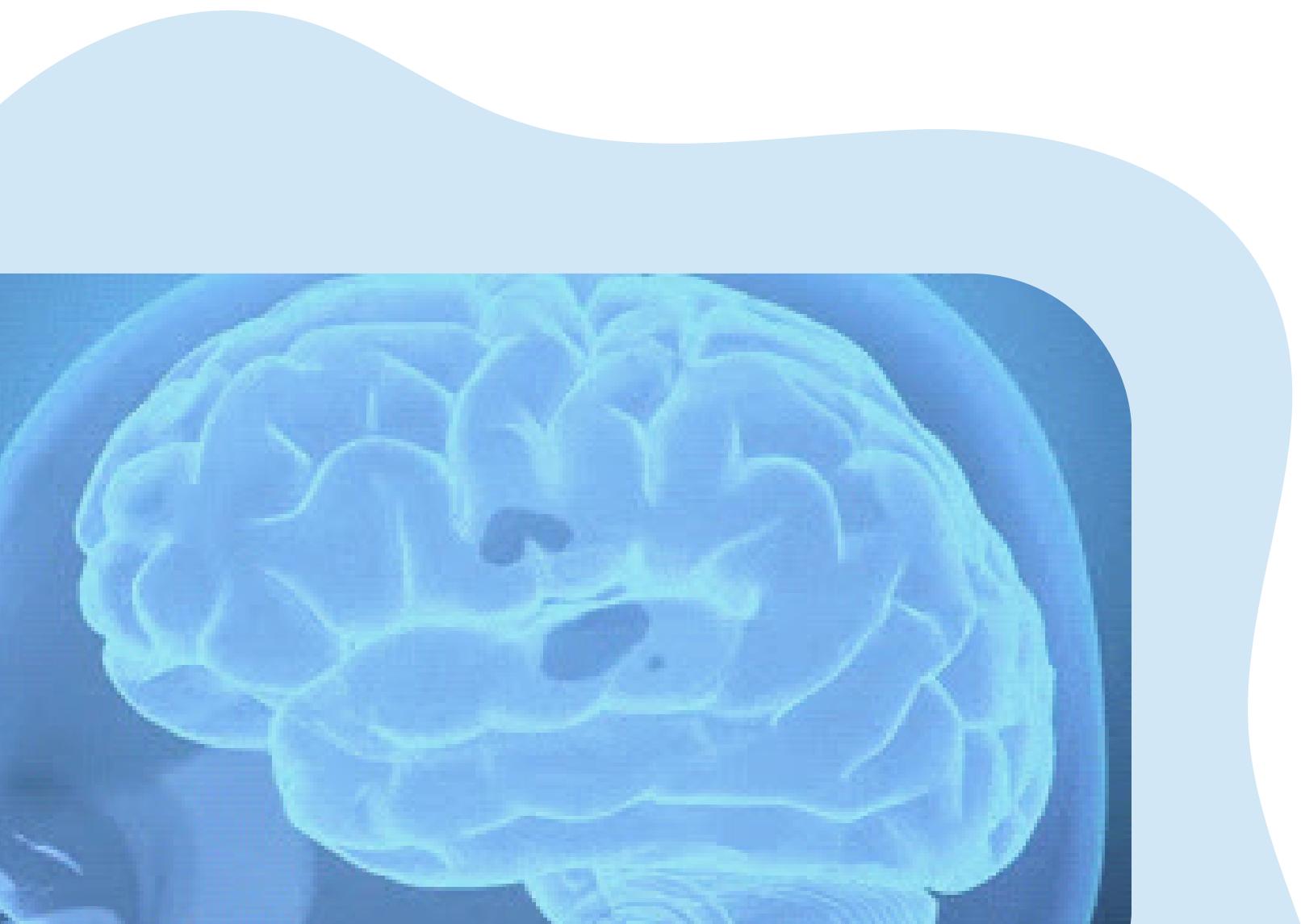
Liaa  
Onco



06 de fevereiro 2025

# Journal Club

## Multi-Layer Perceptron (MLP)



MSc. Hohana G Konell

# Artigos

cancer + MLP

Liaa  
Onco

RESULTS BY YEAR

785 results

<< < Page 1 of 79 > >>



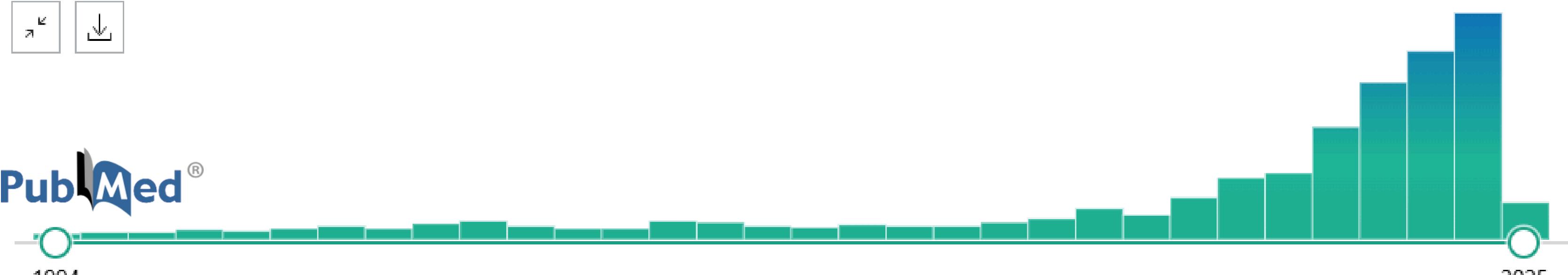
PubMed®



1994



2025



RESULTS BY YEAR

785 results

<< < Page 1 of 79 > >>



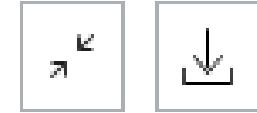
1994

2025

RESULTS BY YEAR

17,229 results

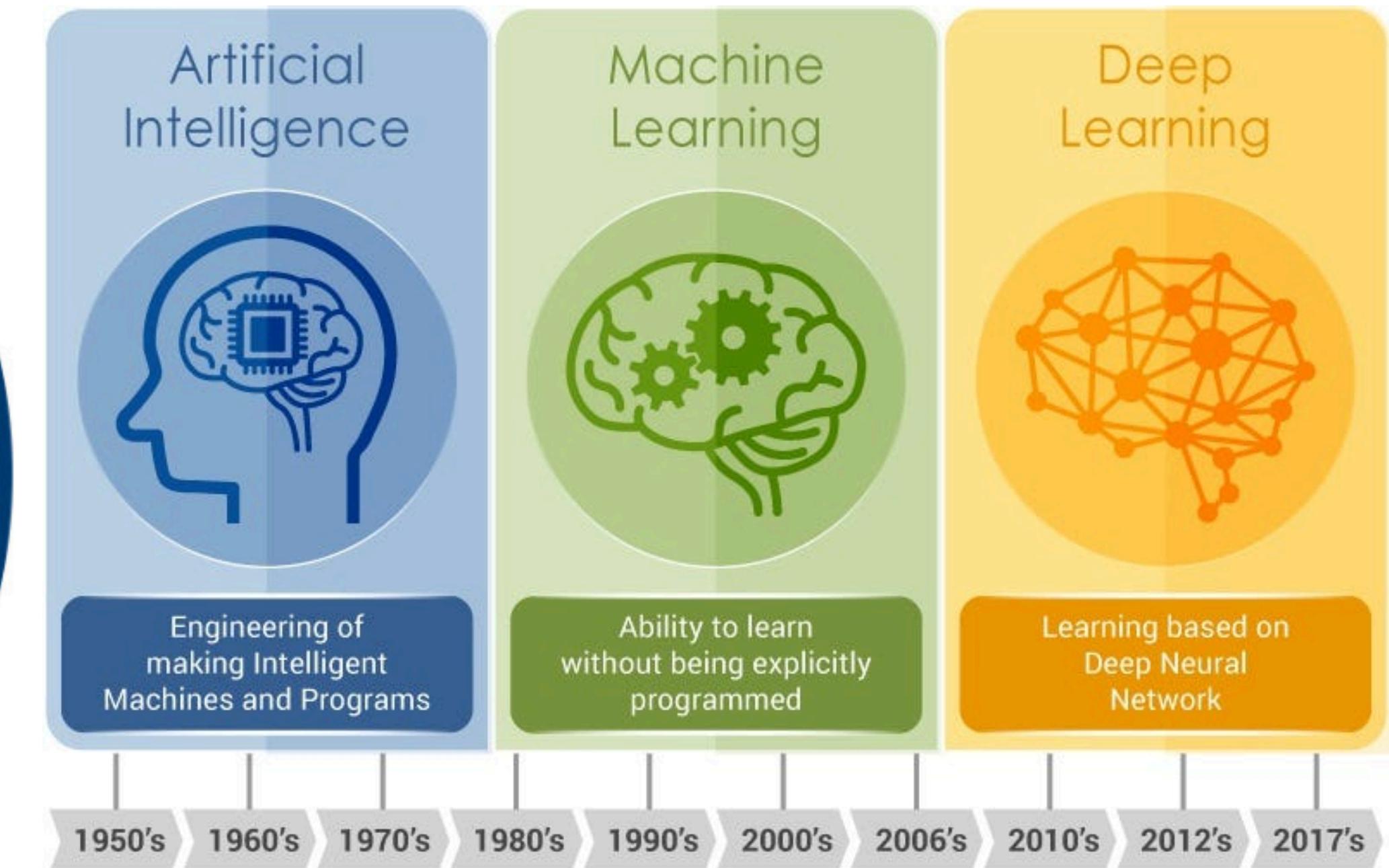
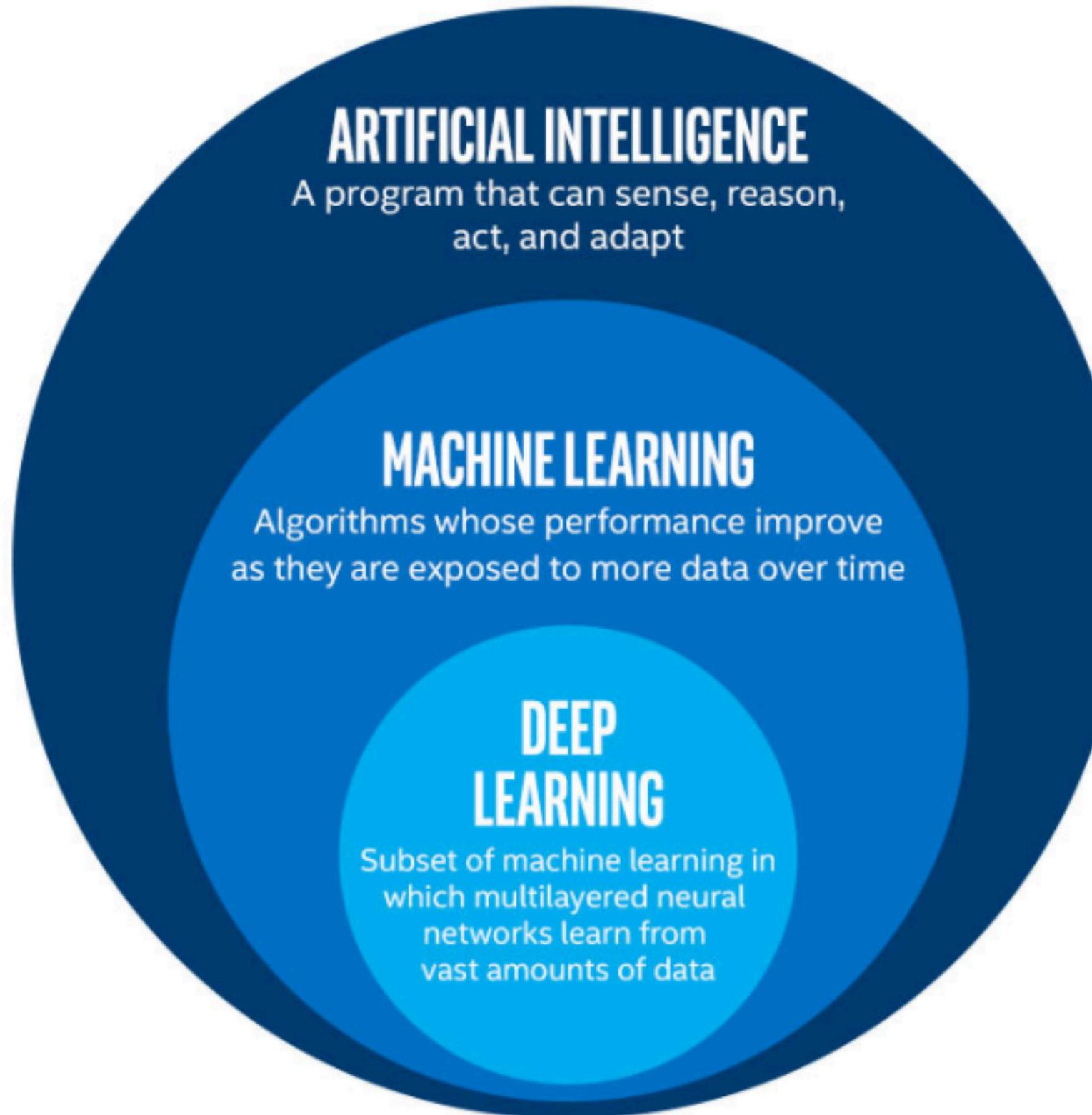
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1975

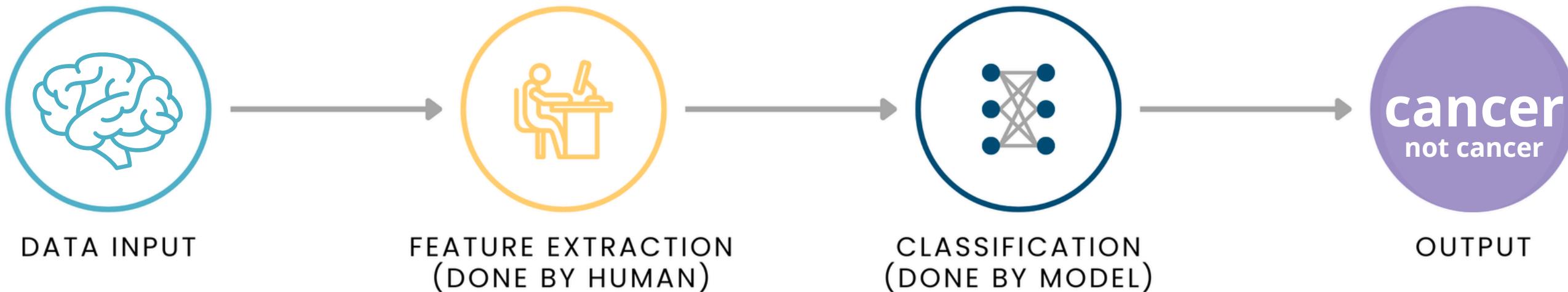
2025

# Deep learning

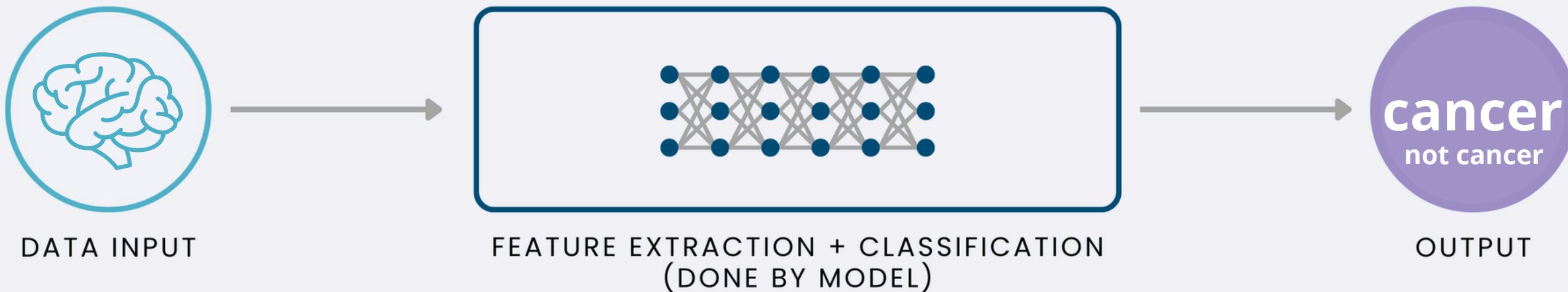


# Deep learning

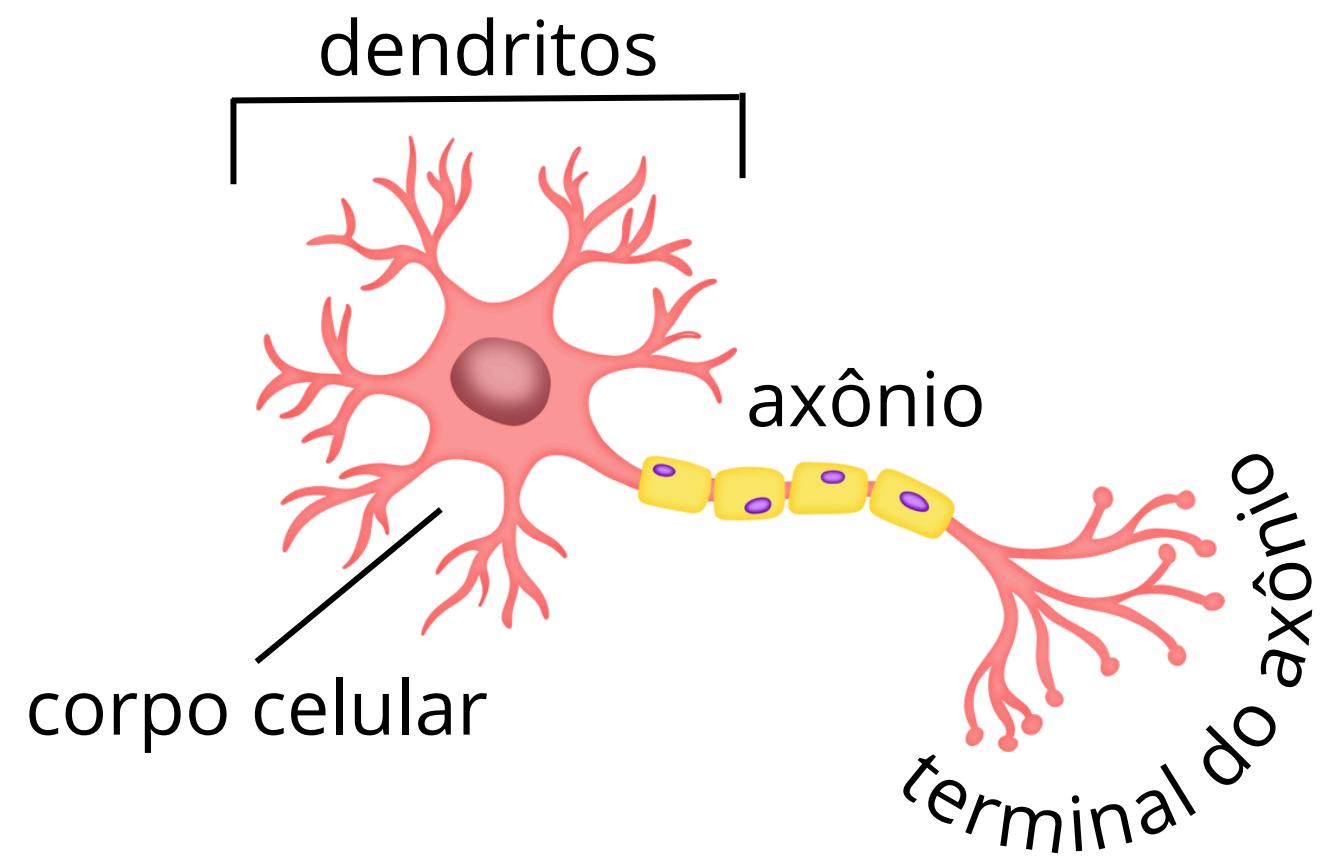
## Machine Learning



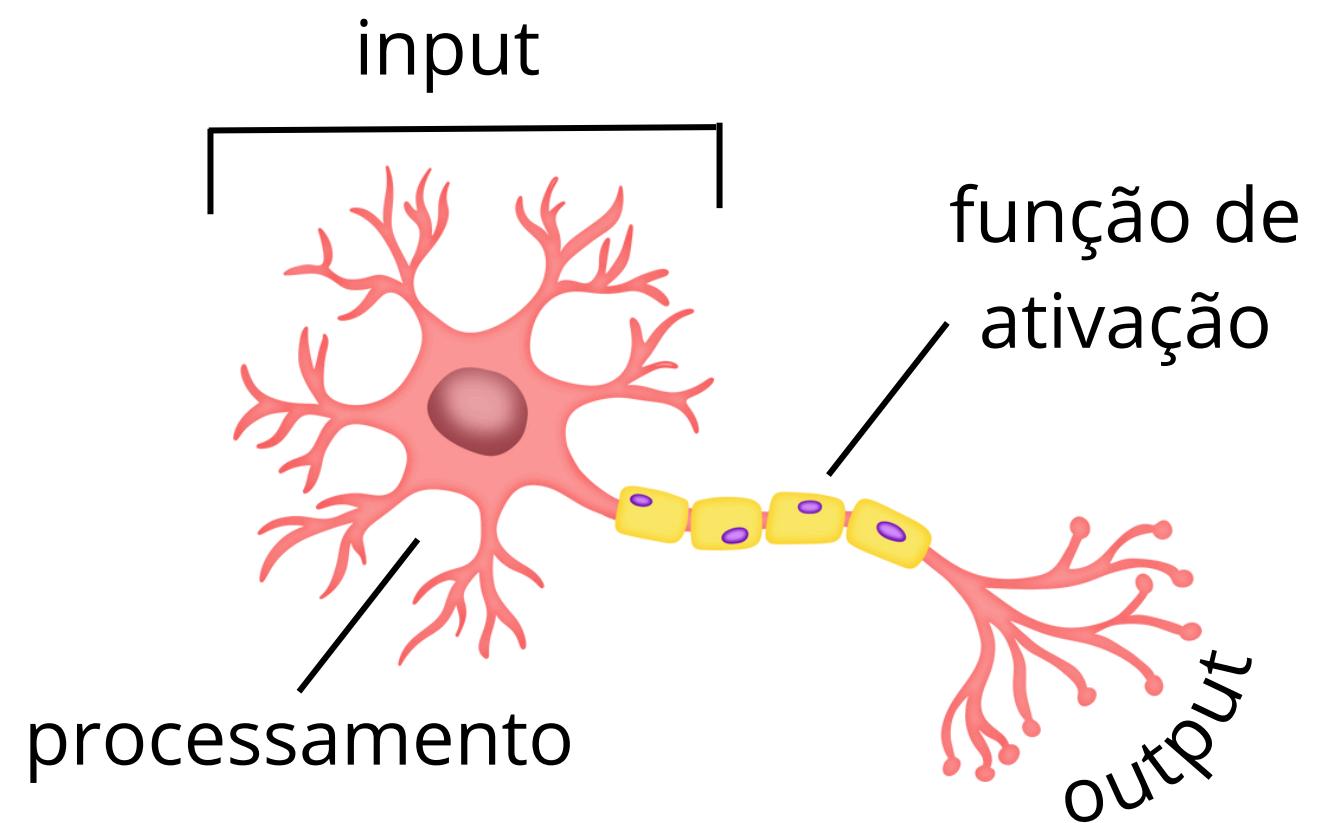
## Deep Learning



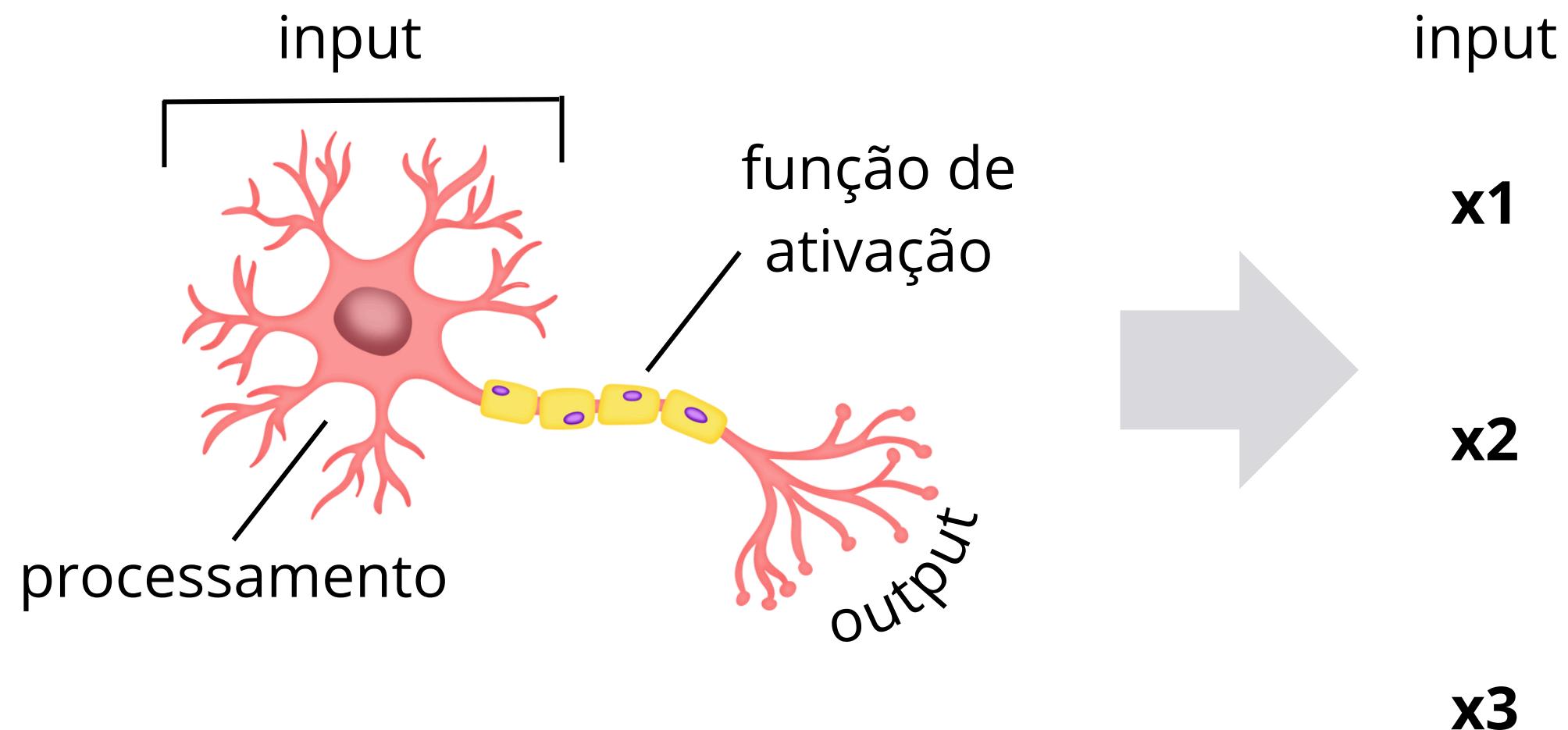
# Redes Neurais Artificiais



# Redes Neurais Artificiais



# Redes Neurais Artificiais



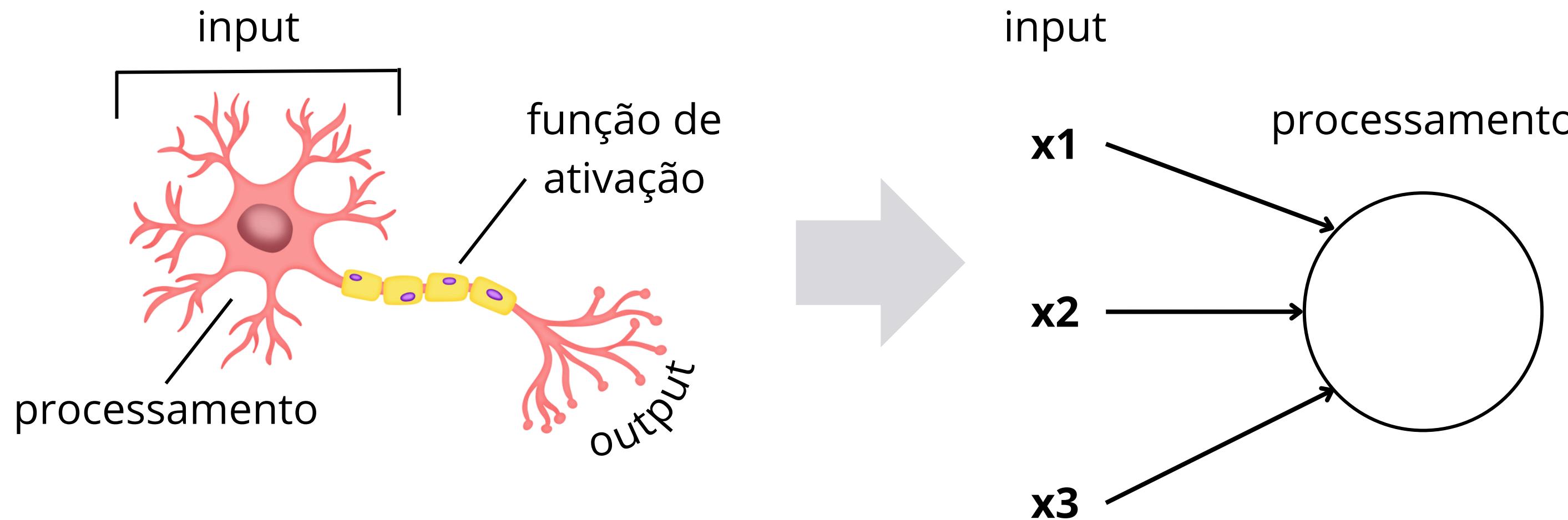
input

$x_1$

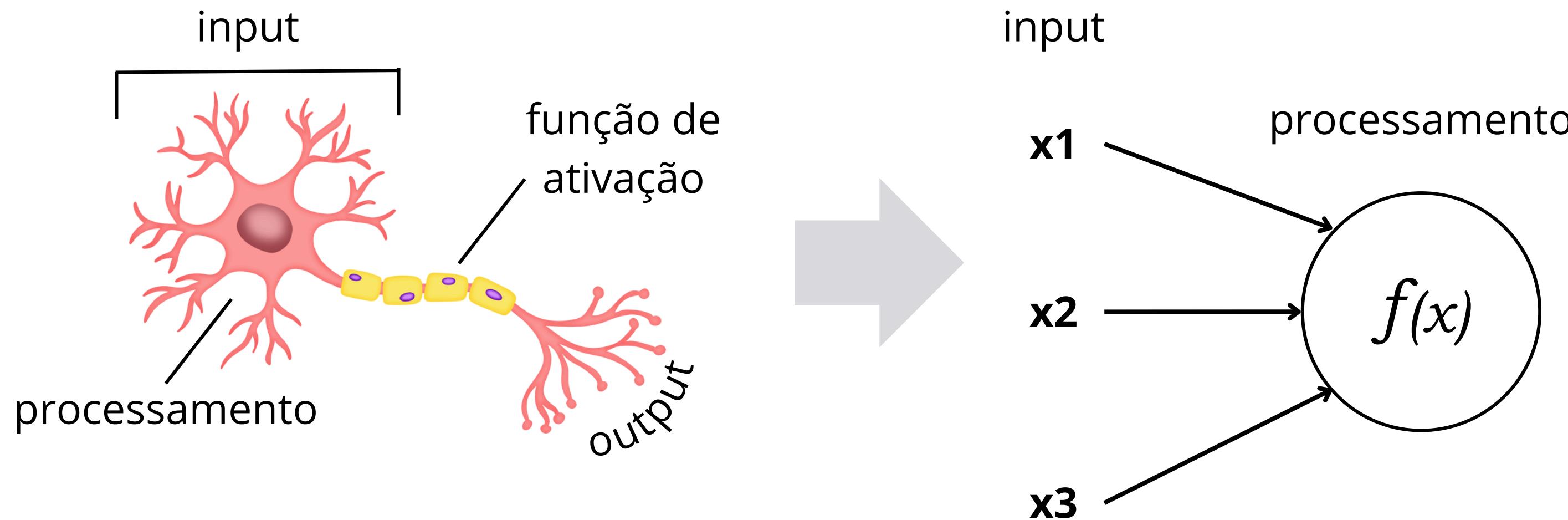
$x_2$

$x_3$

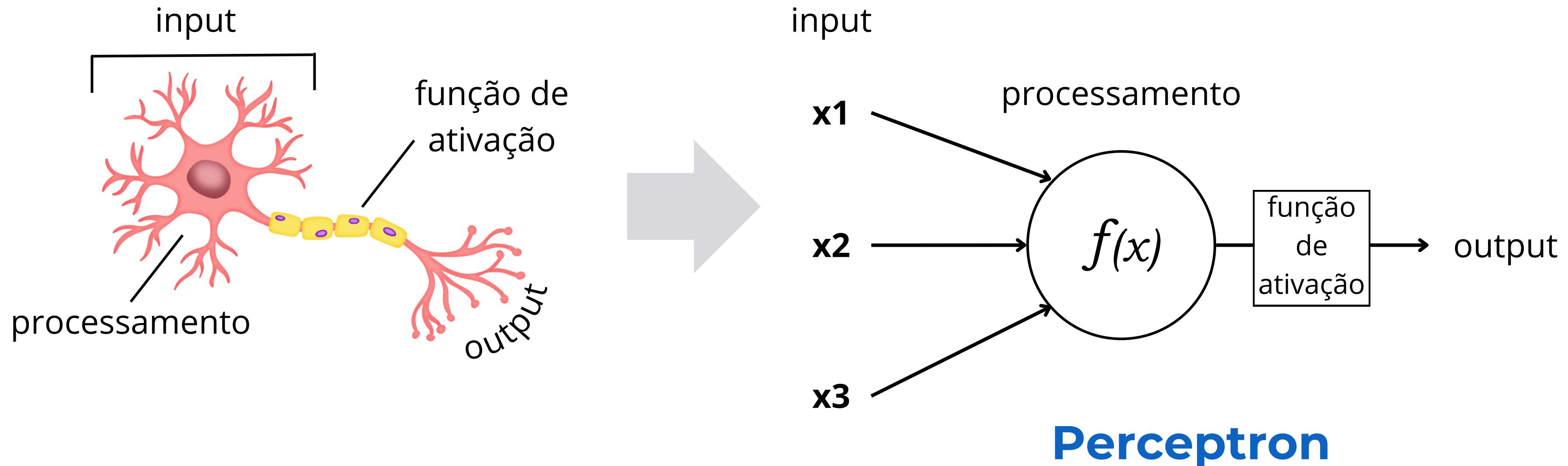
# Redes Neurais Artificiais



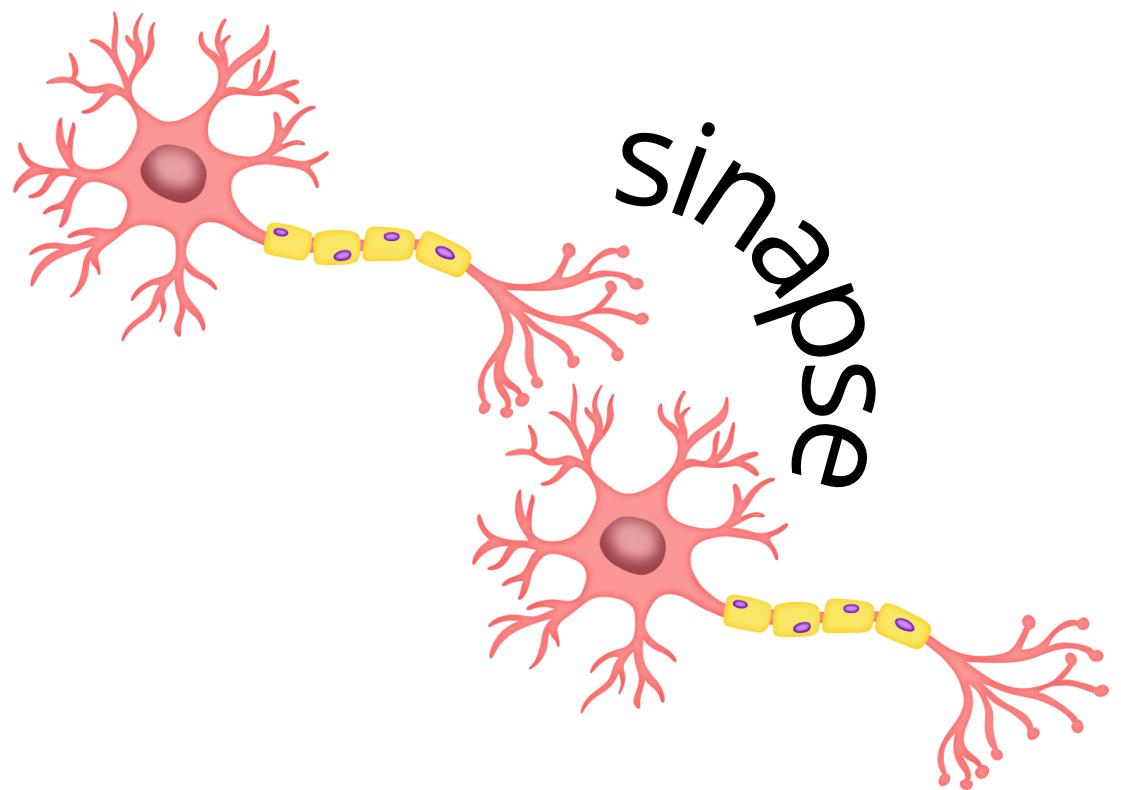
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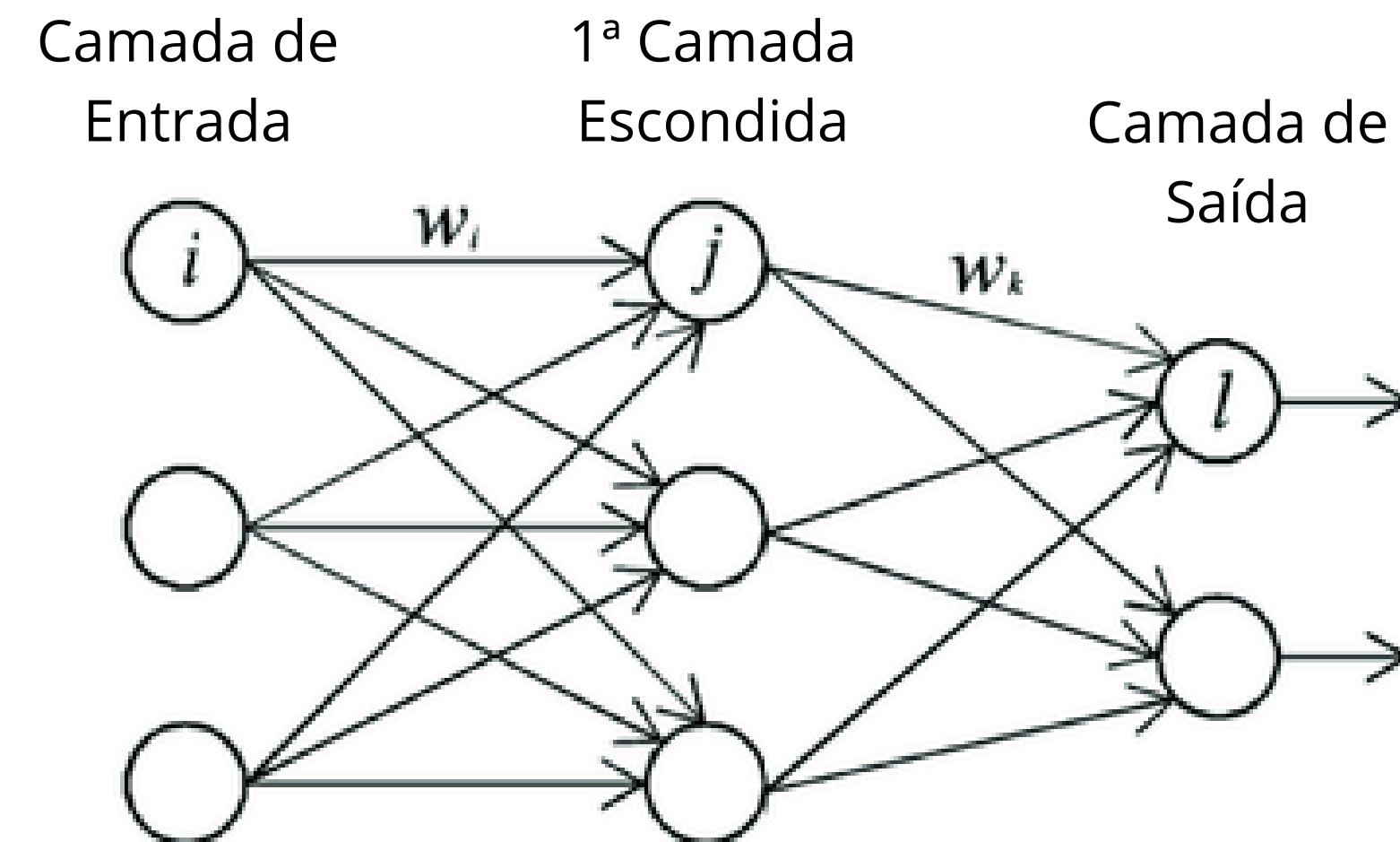
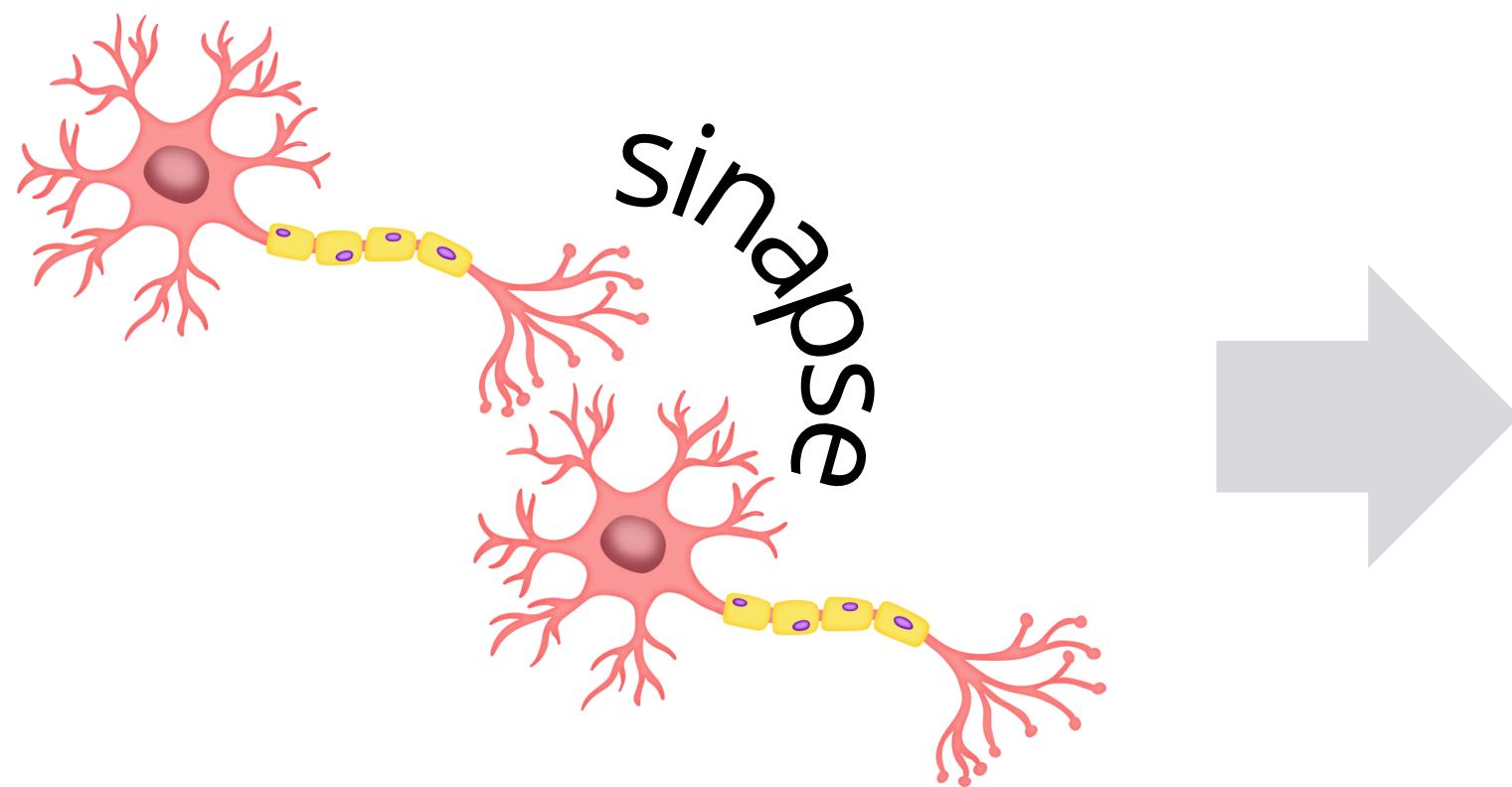
# Redes Neurais Artificiais



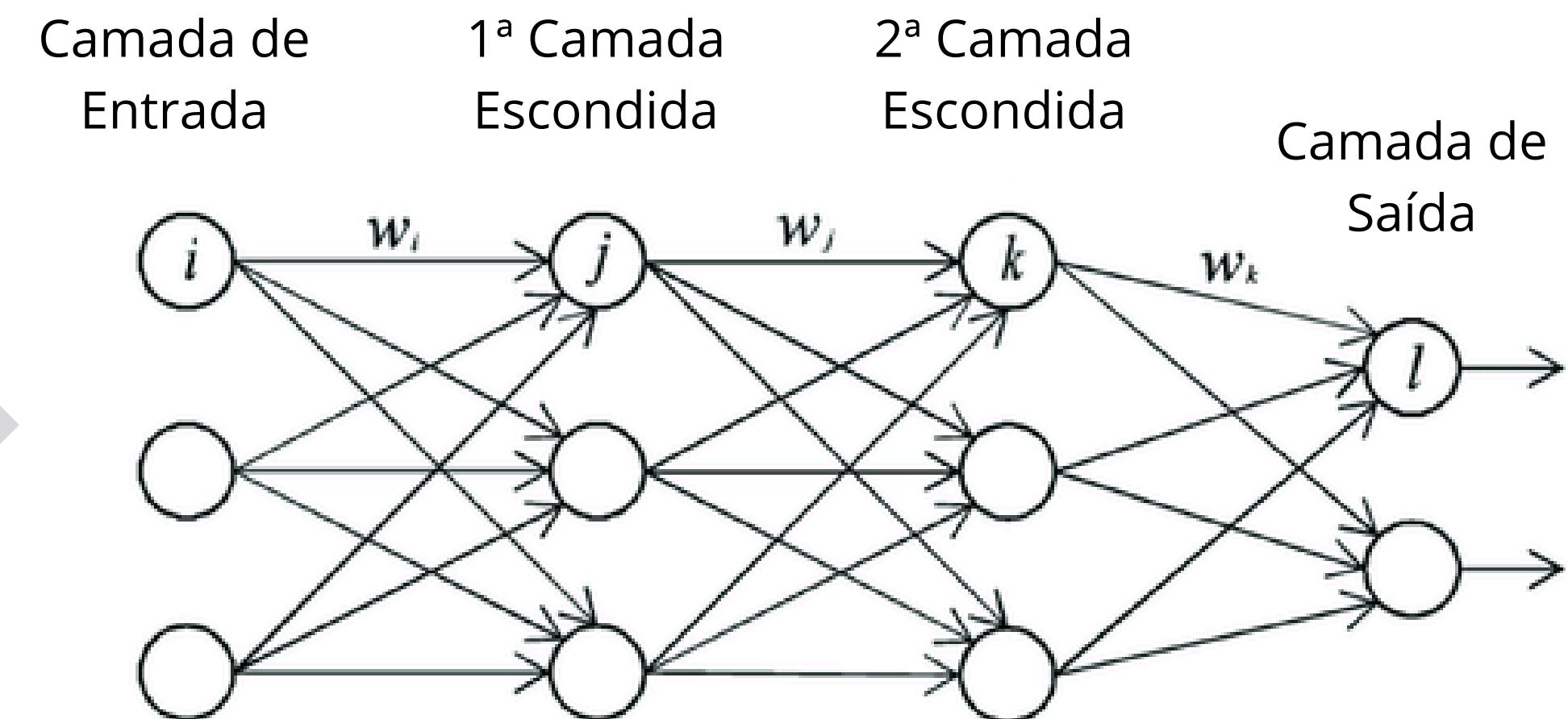
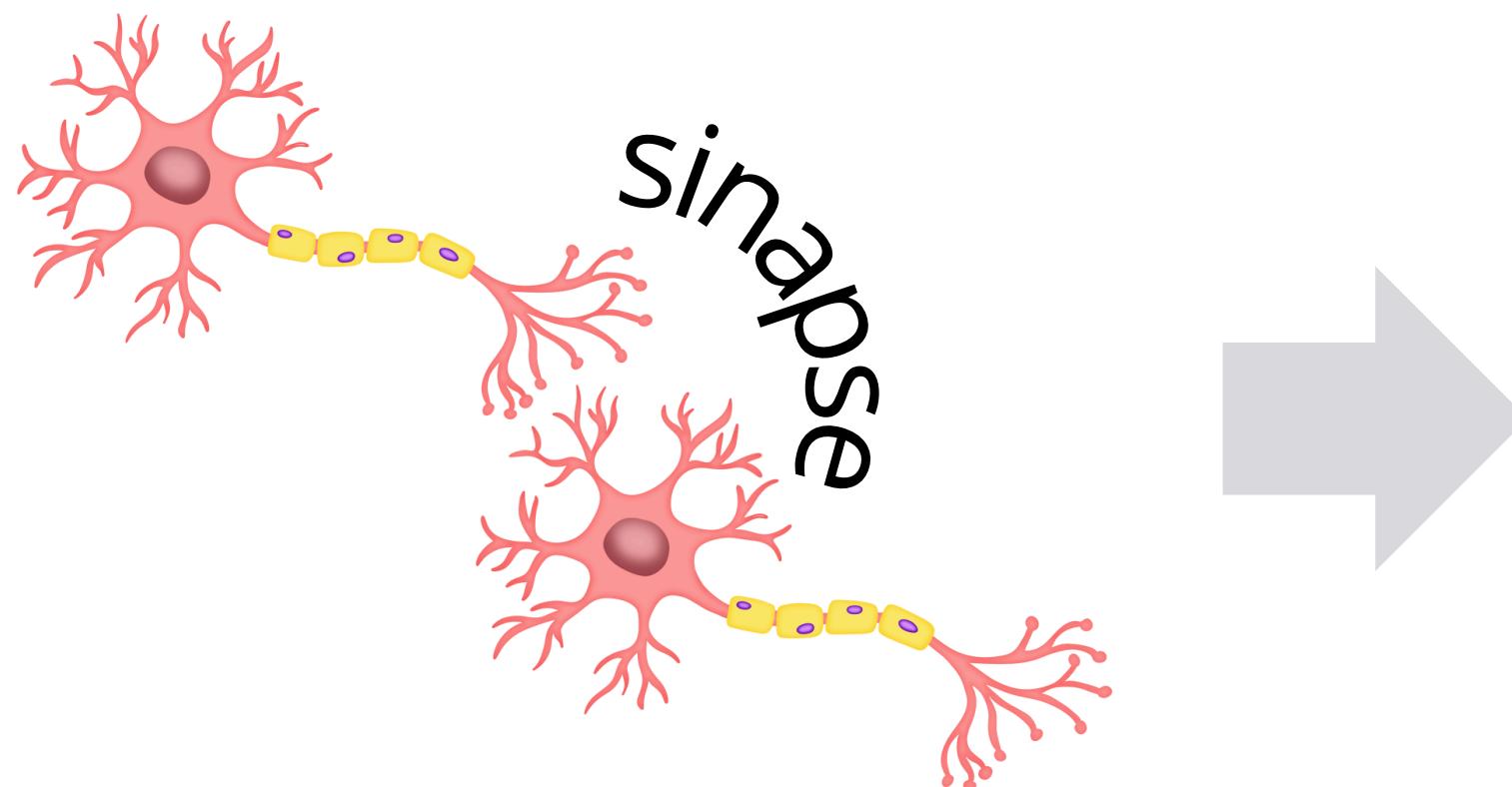
# Redes Neurais Artificiais



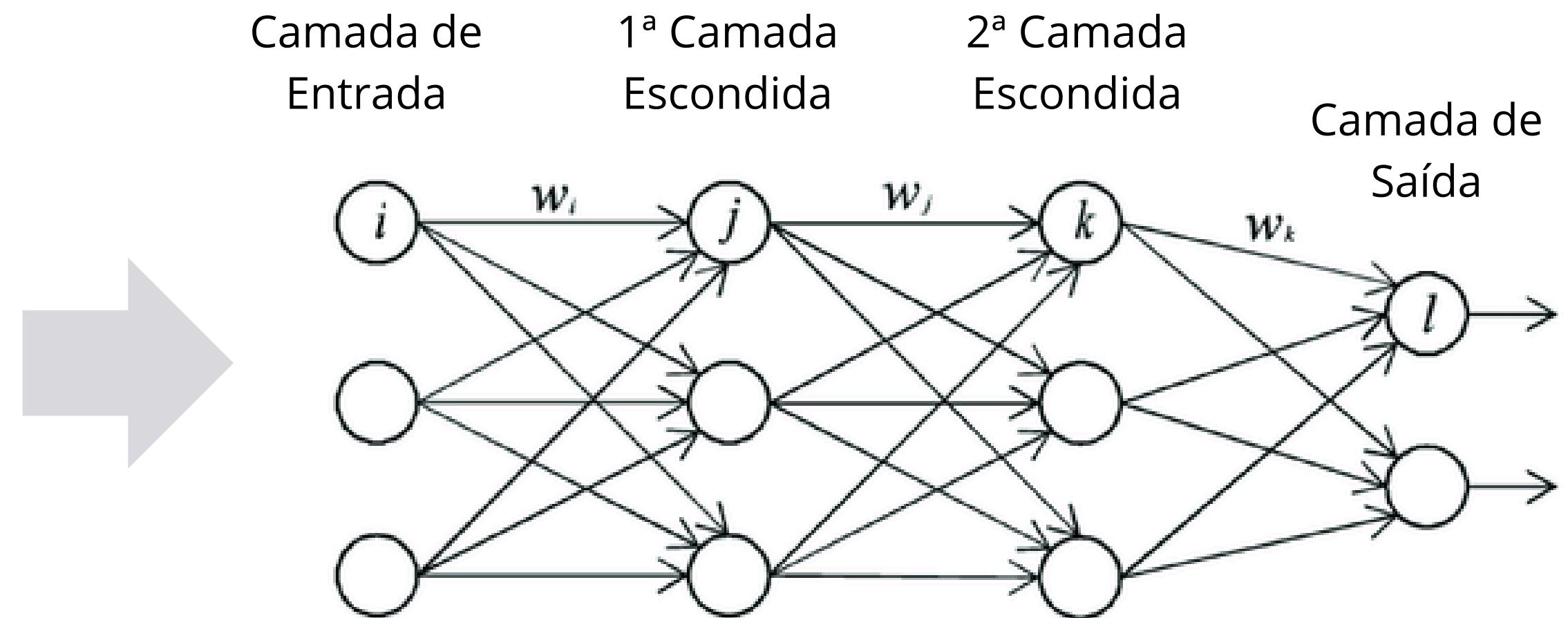
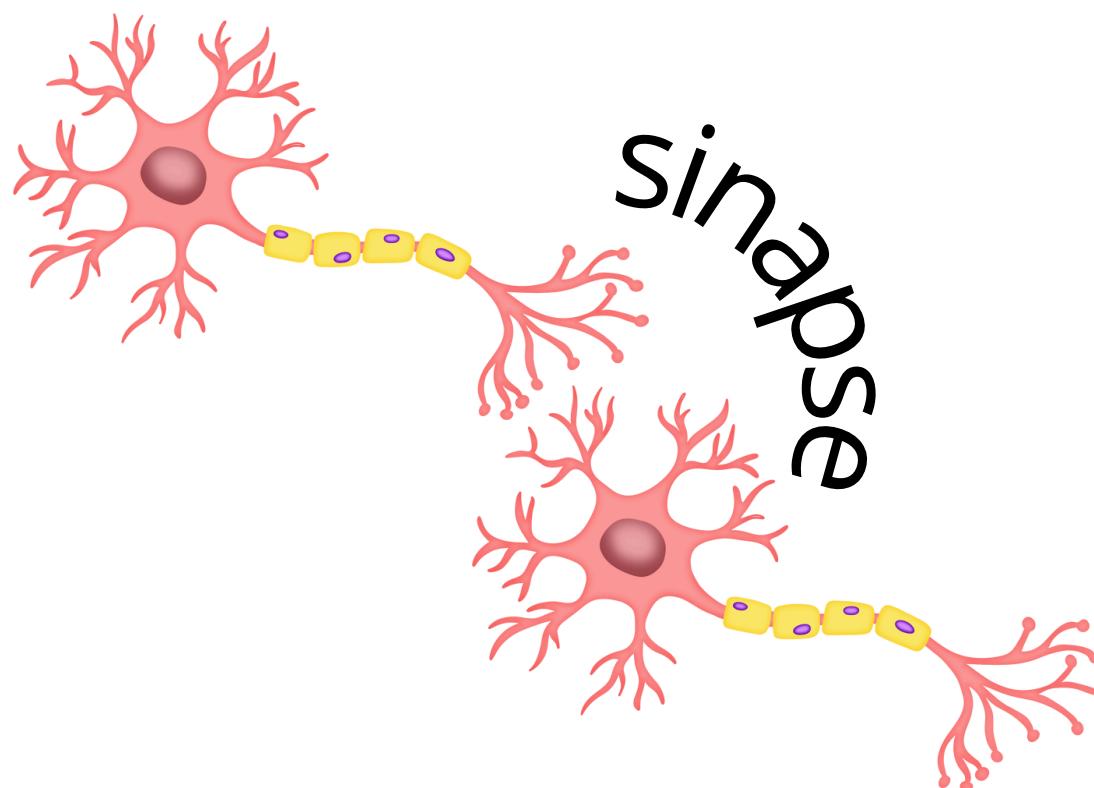
# Redes Neurais Artificiais



# Redes Neurais Artificiais

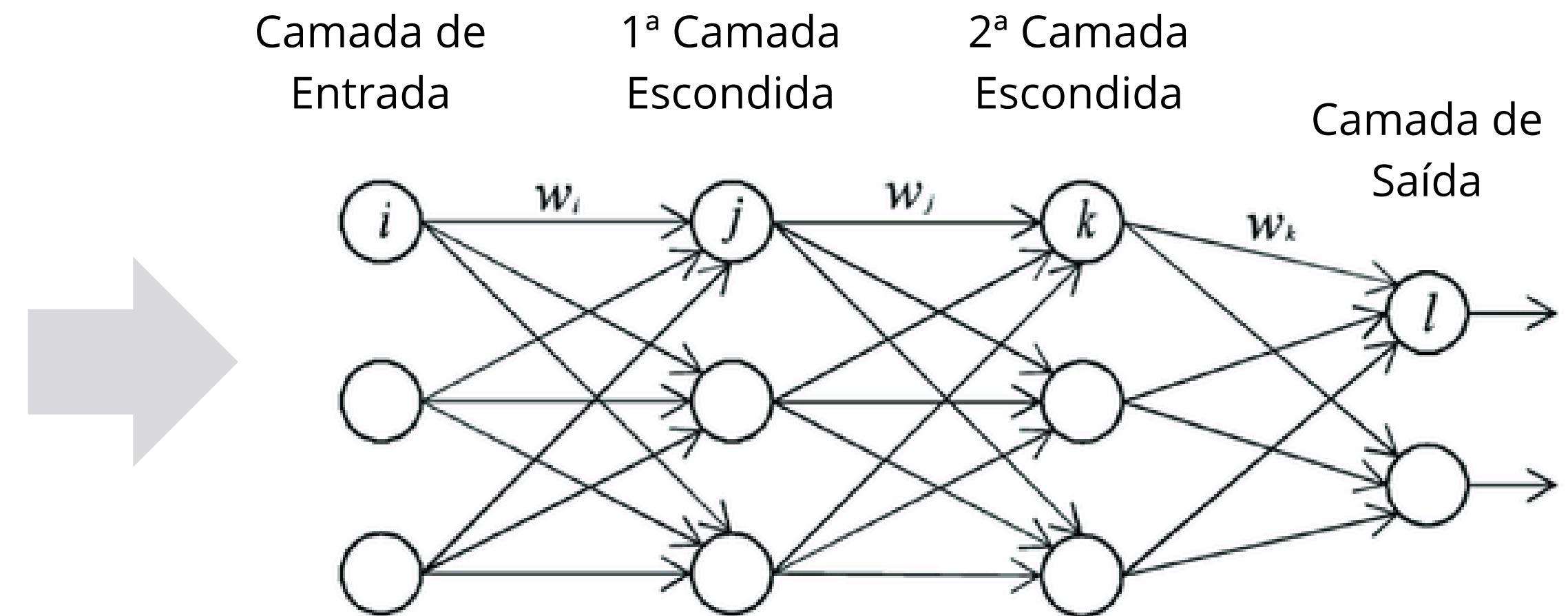
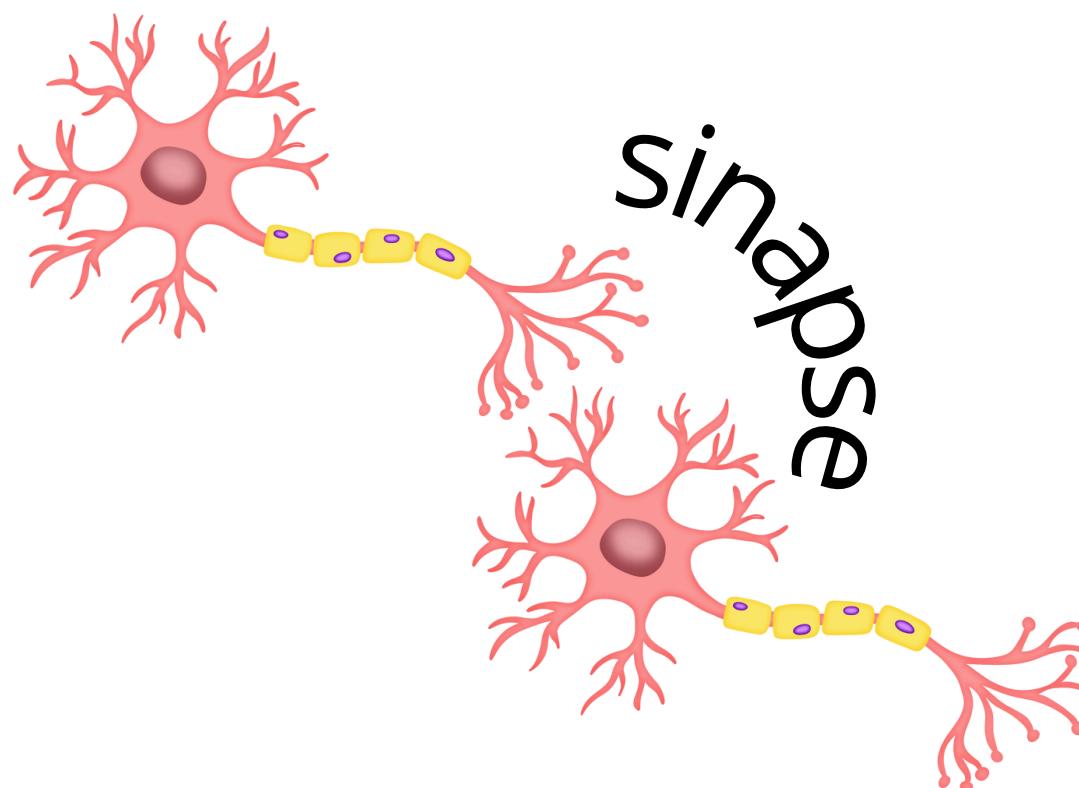


# Redes Neurais Artificiais



**Multilayer Perceptron**

# Redes Neurais Artificiais

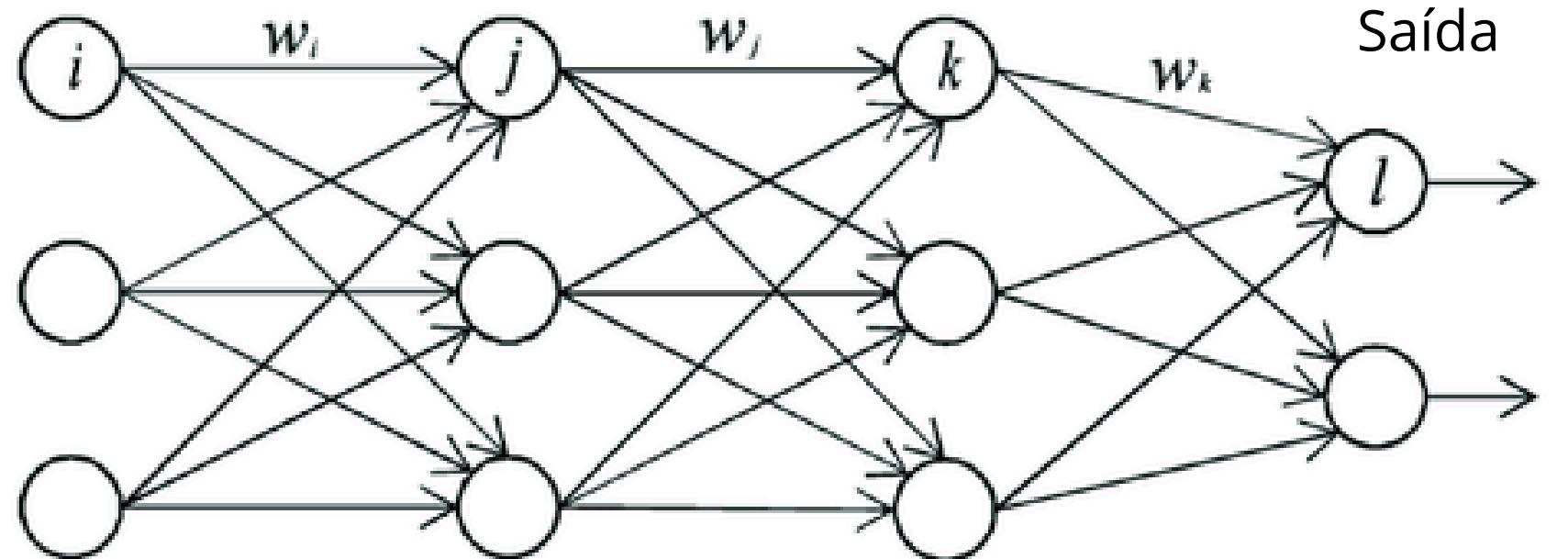


**Multilayer Perceptron**  
Feed-forward  
Fully connected



# Um pouquinho de matemática...

Camada de Entrada      1<sup>a</sup> Camada Escondida      2<sup>a</sup> Camada Escondida      Camada de Saída

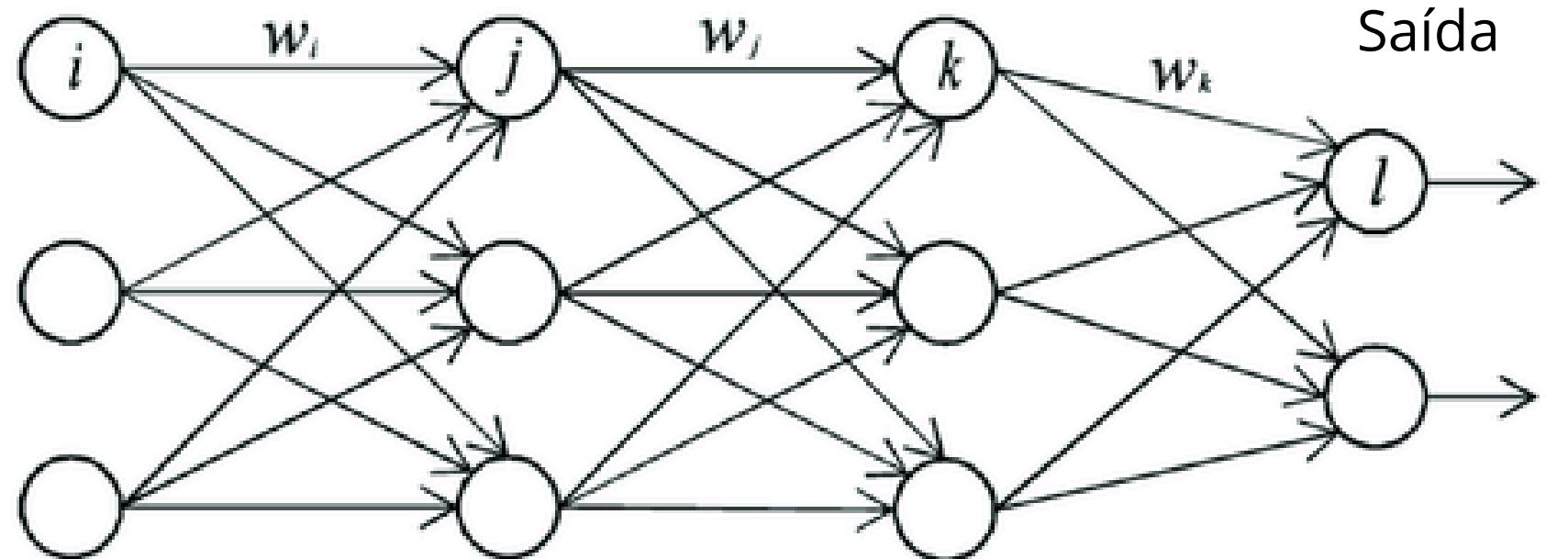


$$\frac{a_j}{\text{output}}$$

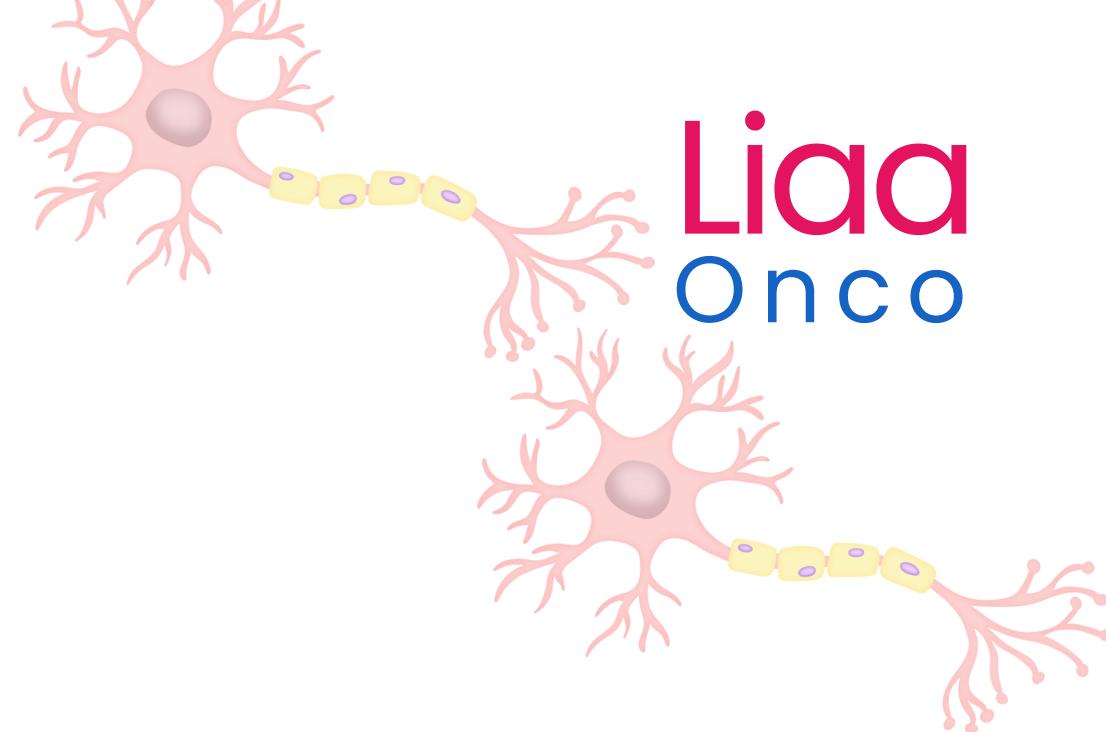


# Um pouquinho de matemática...

Camada de Entrada      1<sup>a</sup> Camada Escondida      2<sup>a</sup> Camada Escondida      Camada de Saída

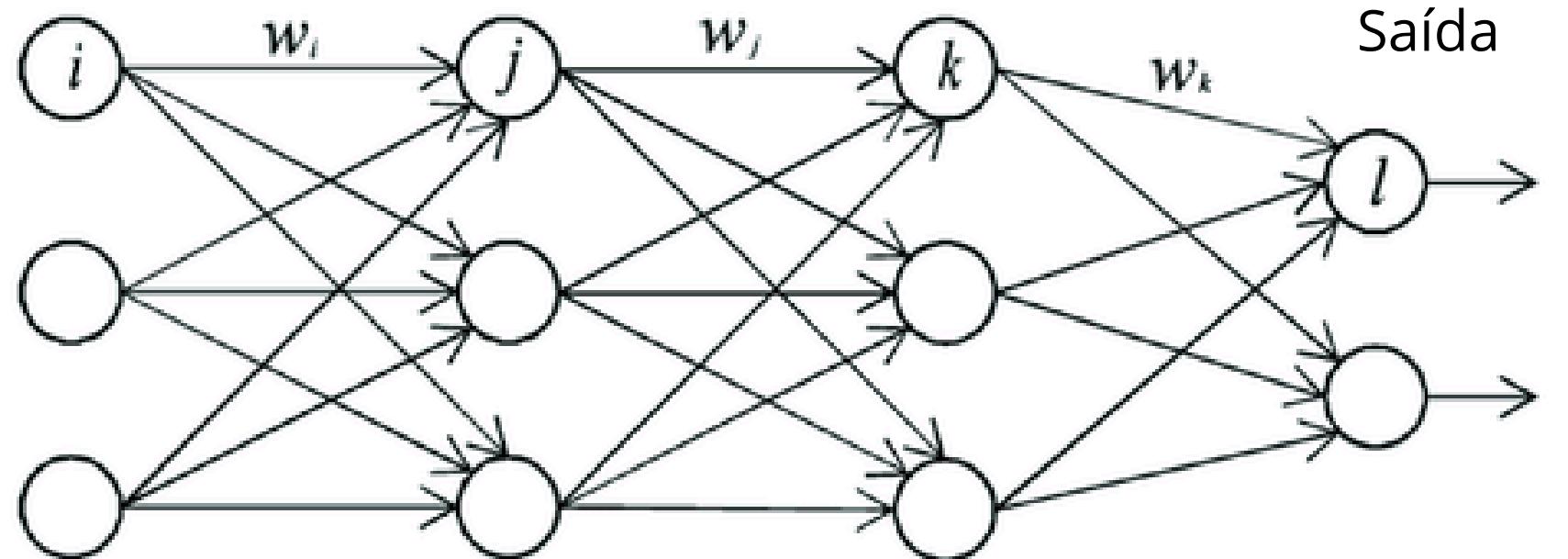


$$a_j = \frac{\text{output}}{\text{input}}$$

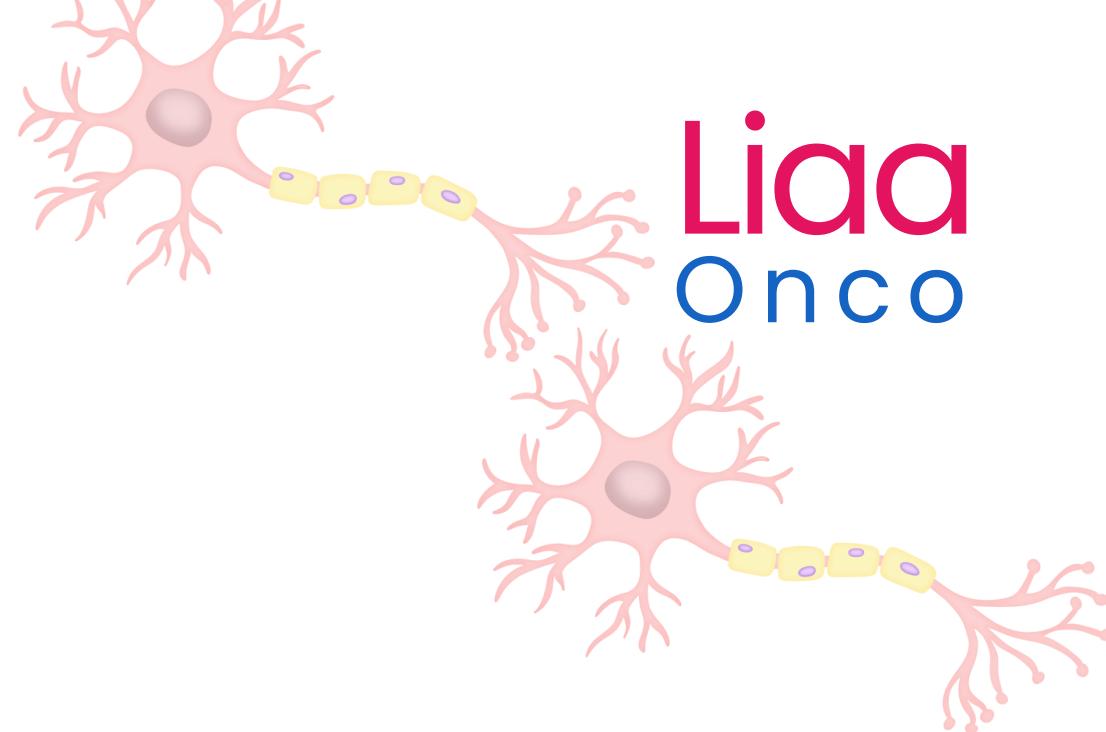


# Um pouquinho de matemática...

Camada de Entrada      1<sup>a</sup> Camada Escondida      2<sup>a</sup> Camada Escondida      Camada de Saída

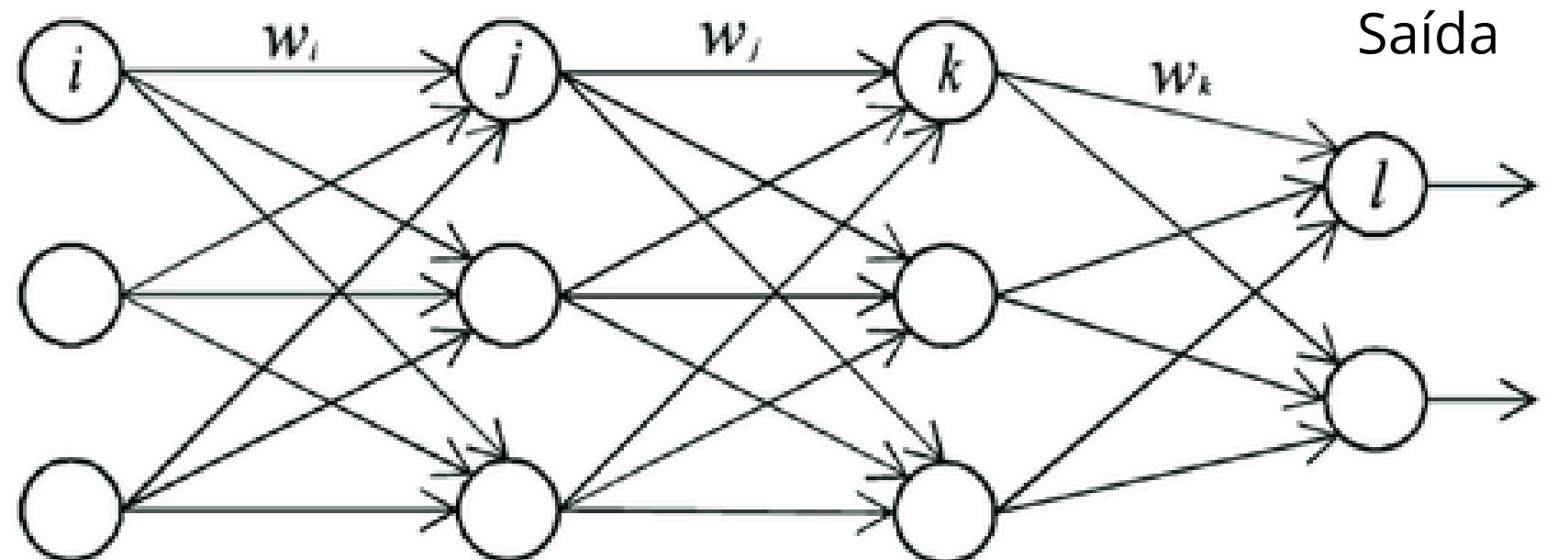


$$a_j = \frac{w a_i}{\text{peso}}$$



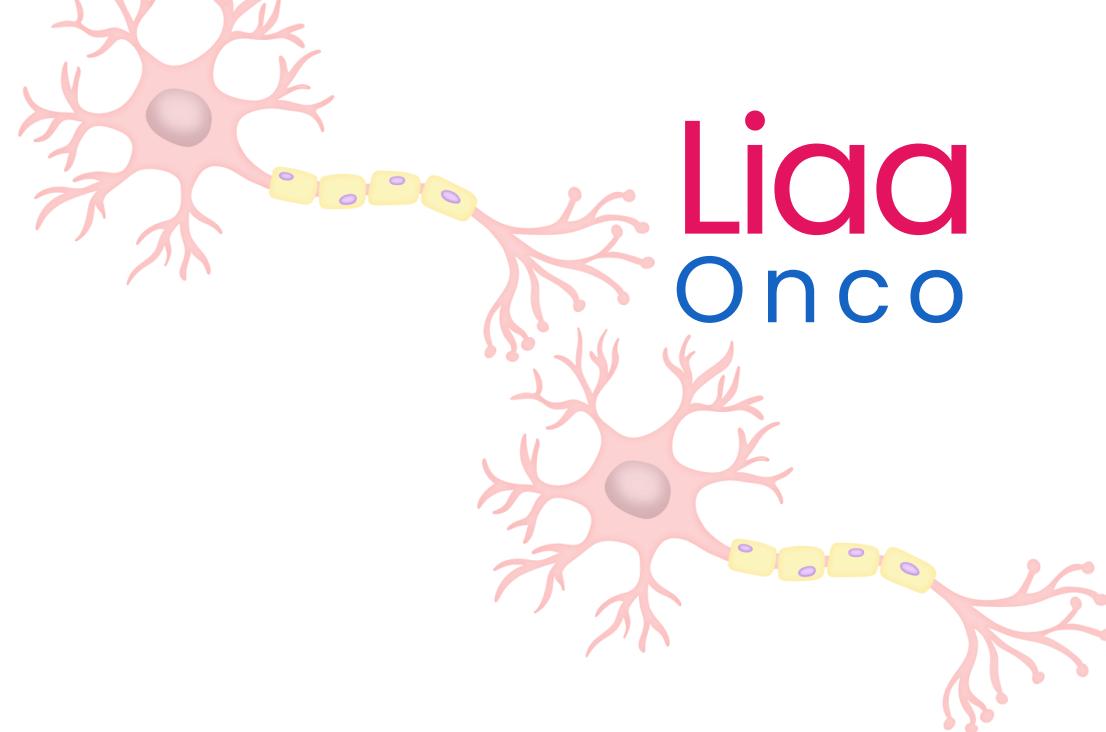
# Um pouquinho de matemática...

Camada de Entrada      1<sup>a</sup> Camada Escondida      2<sup>a</sup> Camada Escondida      Camada de Saída



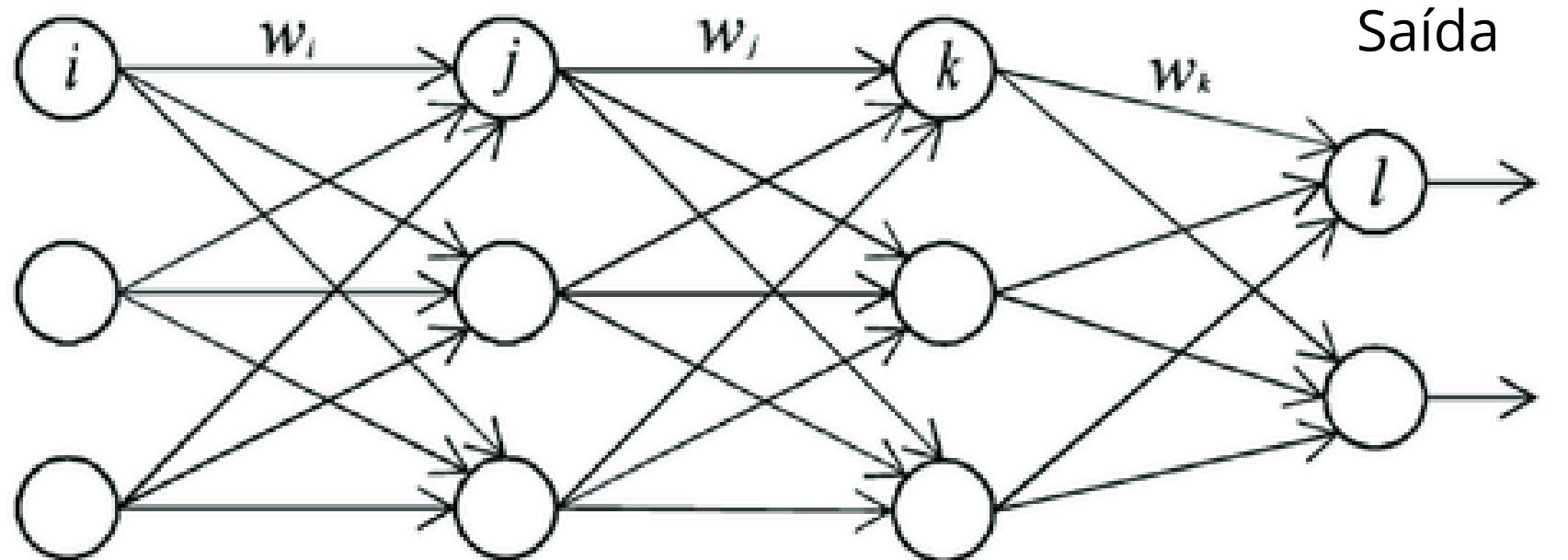
$$a_j =$$

$$\frac{wa_i + b}{\text{erro}}$$



# Um pouquinho de matemática...

Camada de Entrada      1<sup>a</sup> Camada Escondida      2<sup>a</sup> Camada Escondida      Camada de Saída

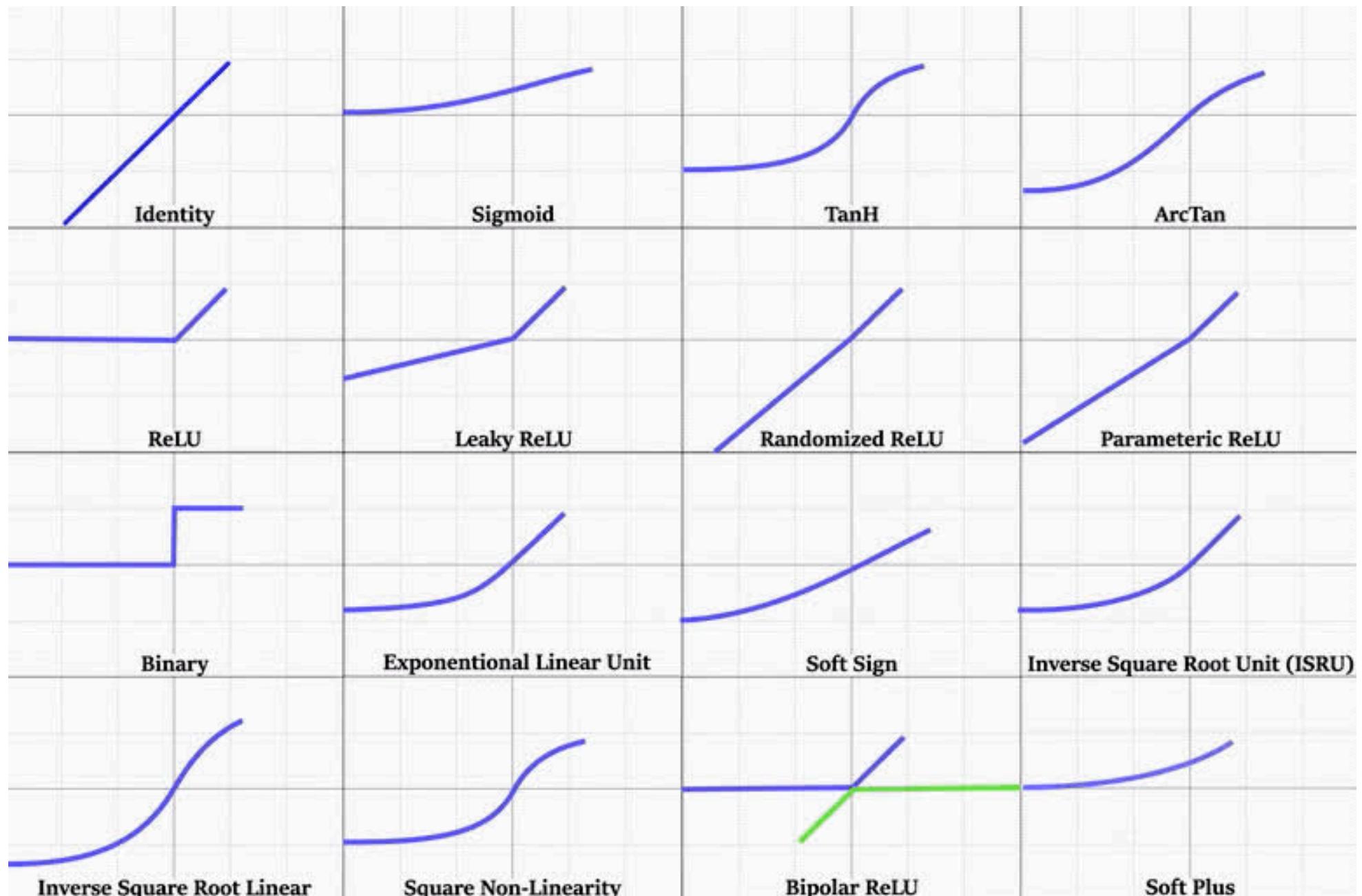


$$a_j = \sigma(wa_i + b)$$

função  
de  
ativação



# Um pouquinho de matemática...



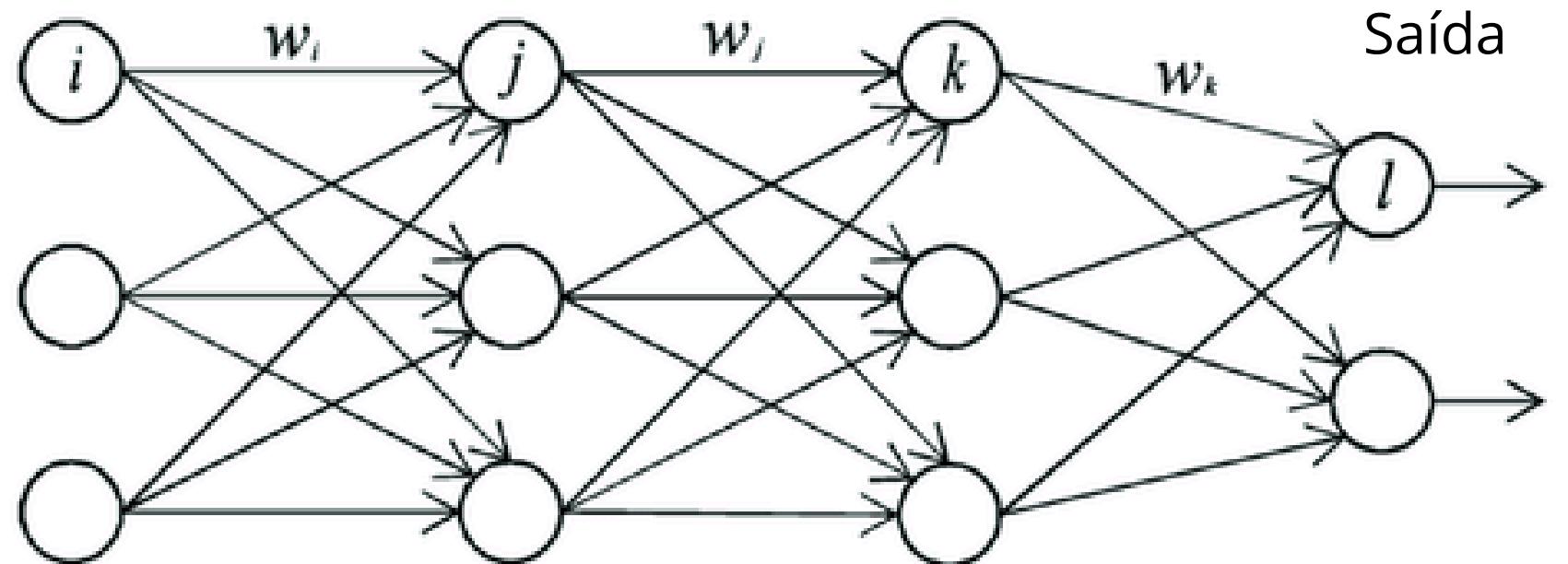
$$a_j = \sigma(wa_i + b)$$

função  
de  
ativação



# Um pouquinho de matemática...

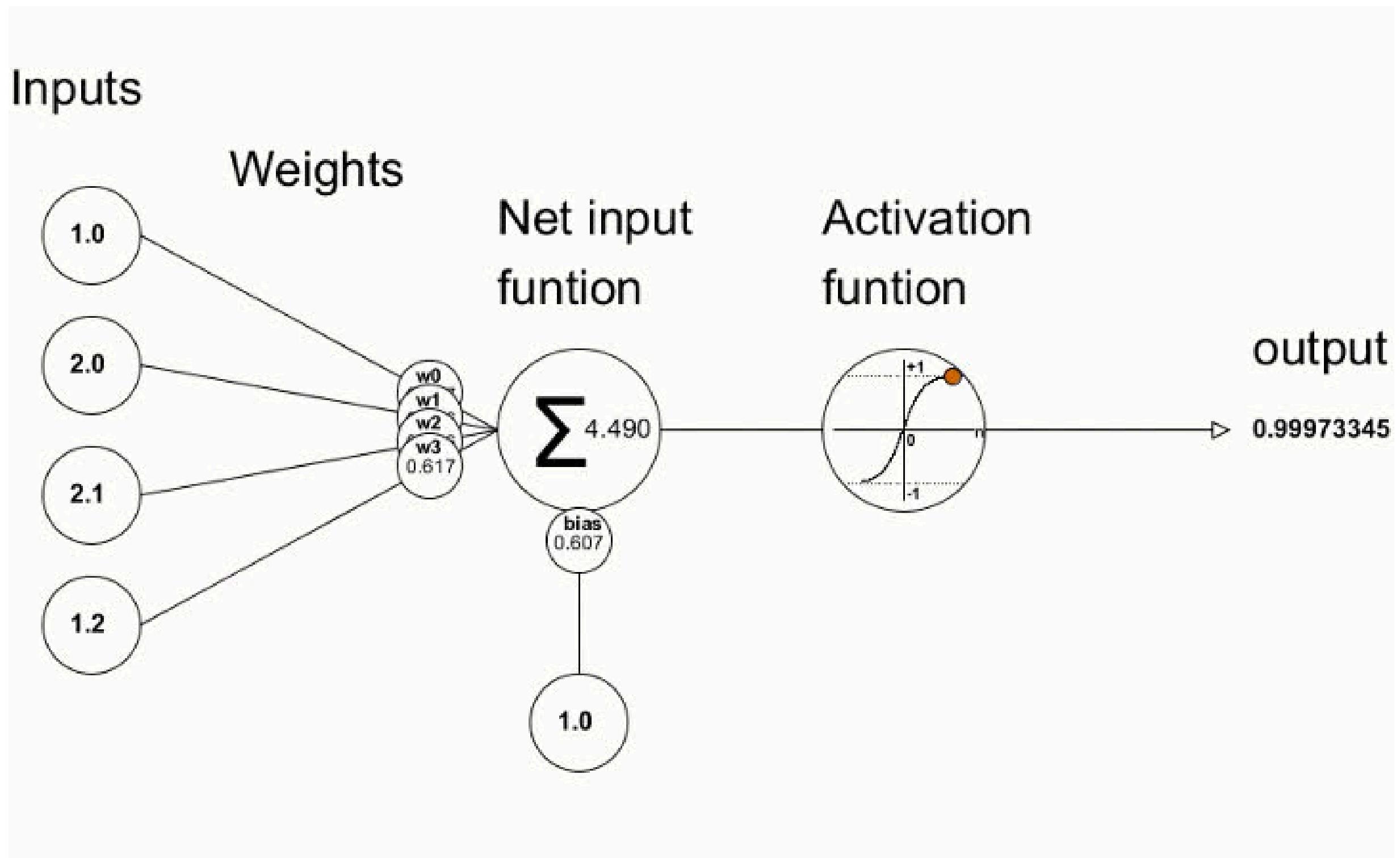
Camada de Entrada      1<sup>a</sup> Camada Escondida      2<sup>a</sup> Camada Escondida      Camada de Saída



output  
 $a_j = \sigma \left( \frac{\text{input}}{\text{peso}} + \text{erro} \right)$   
função de ativação



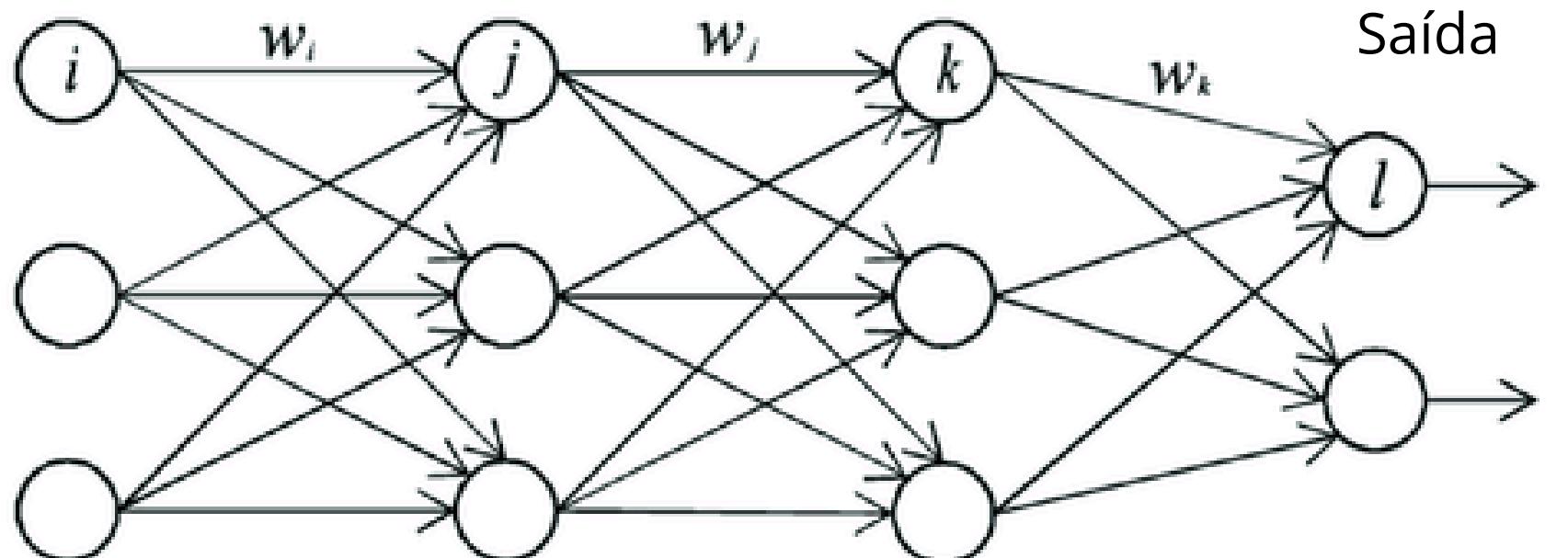
# Um pouquinho de matemática...





# Um pouquinho de matemática...

Camada de Entrada      1<sup>a</sup> Camada Escondida      2<sup>a</sup> Camada Escondida      Camada de Saída



$$a_j = \sigma(wa_i + b)$$

$$f(a, w) = a_1w_1 + \dots + a_nw_n$$



# Como a rede aprende?

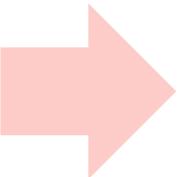
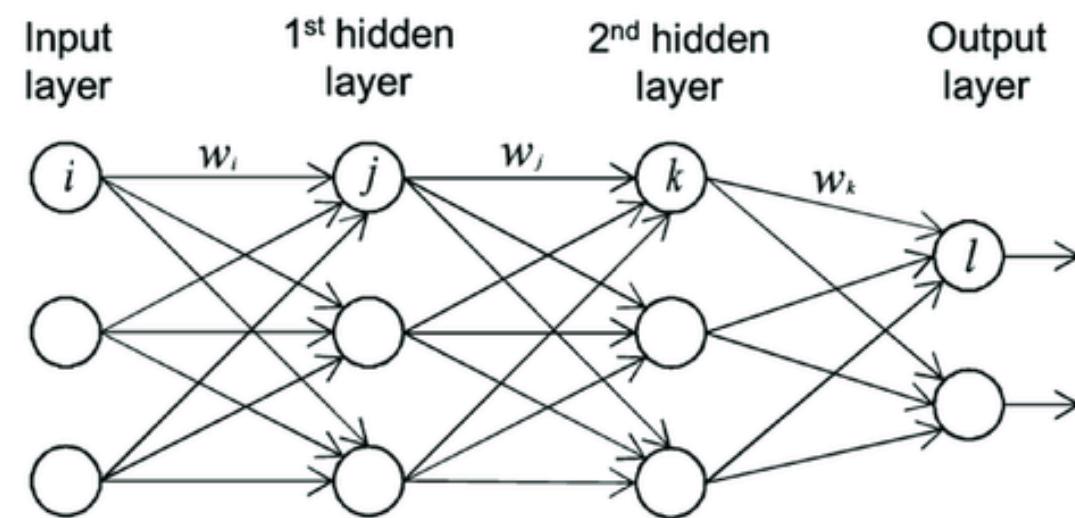
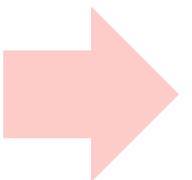
Chiuaua ou muffin?





# Como a rede aprende?

Chiuaua ou muffin?



muffin

muffin

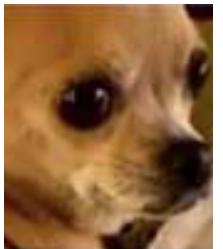
chiuaua

muffin



# Como a rede aprende?

Predição



muffin



muffin



chiuaua



muffin

Verdadeiro



chiuaua



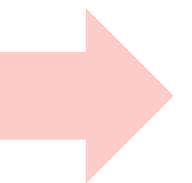
muffin



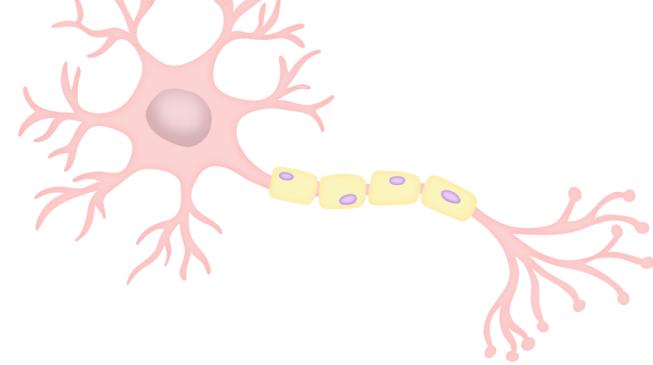
chiuaua



muffin

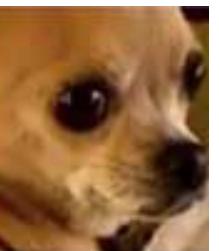


função de perda



# Como a rede aprende?

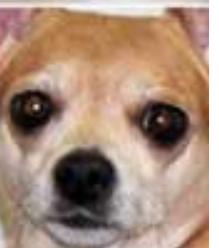
Predição



muffin



muffin

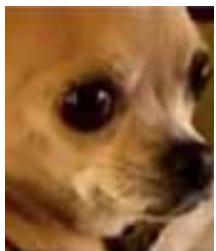


chiuaua



muffin

Verdadeiro



chiuaua



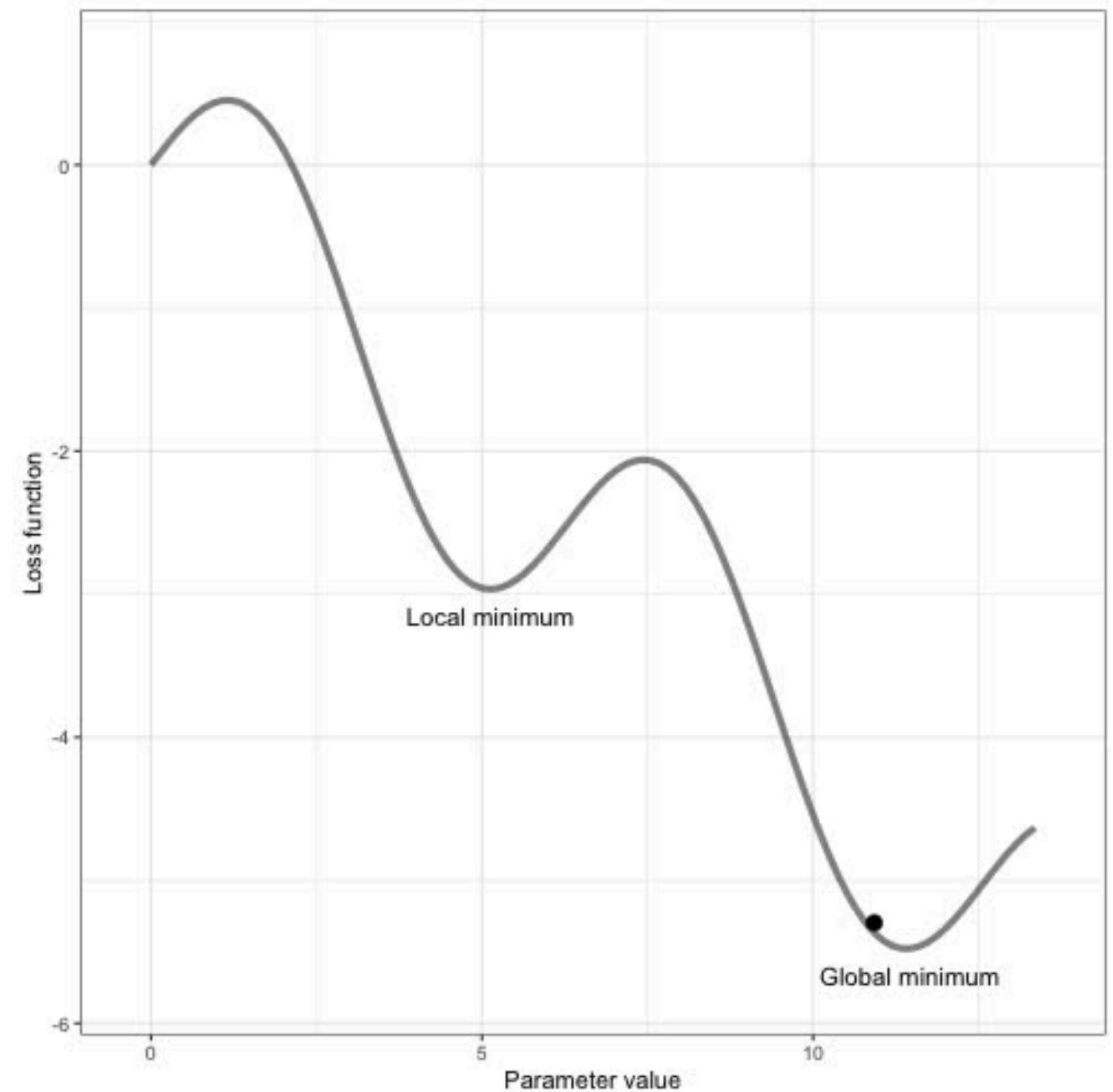
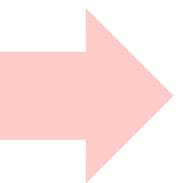
muffin

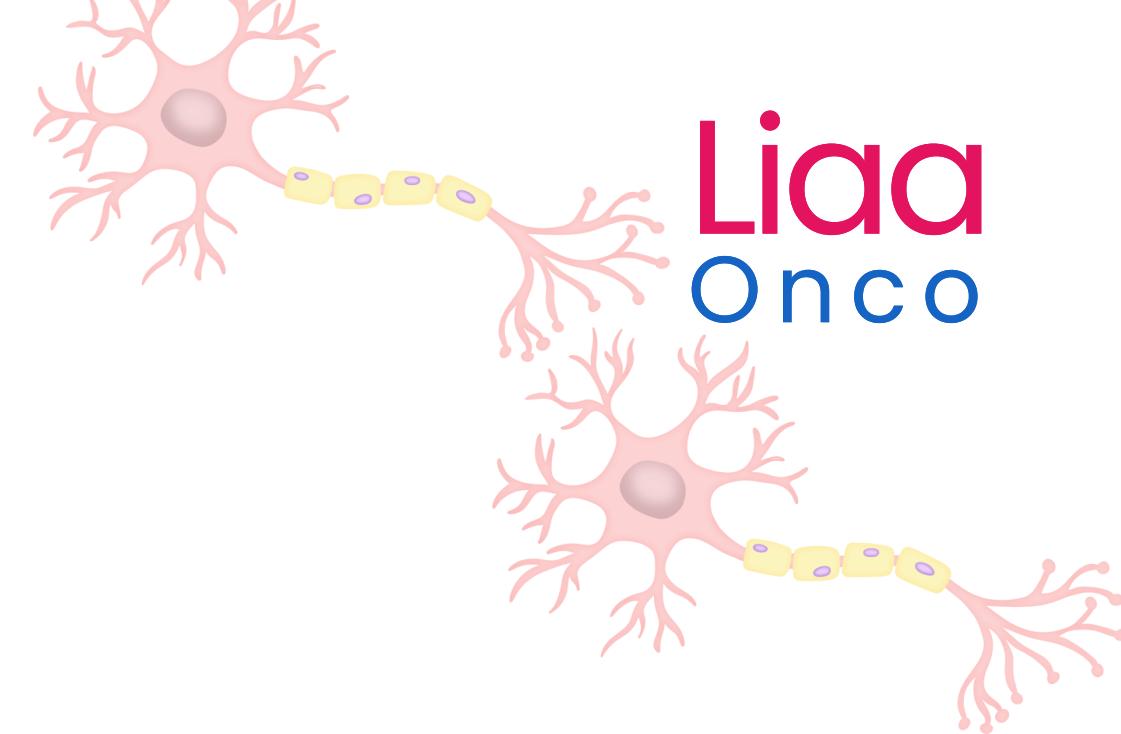


chiuaua



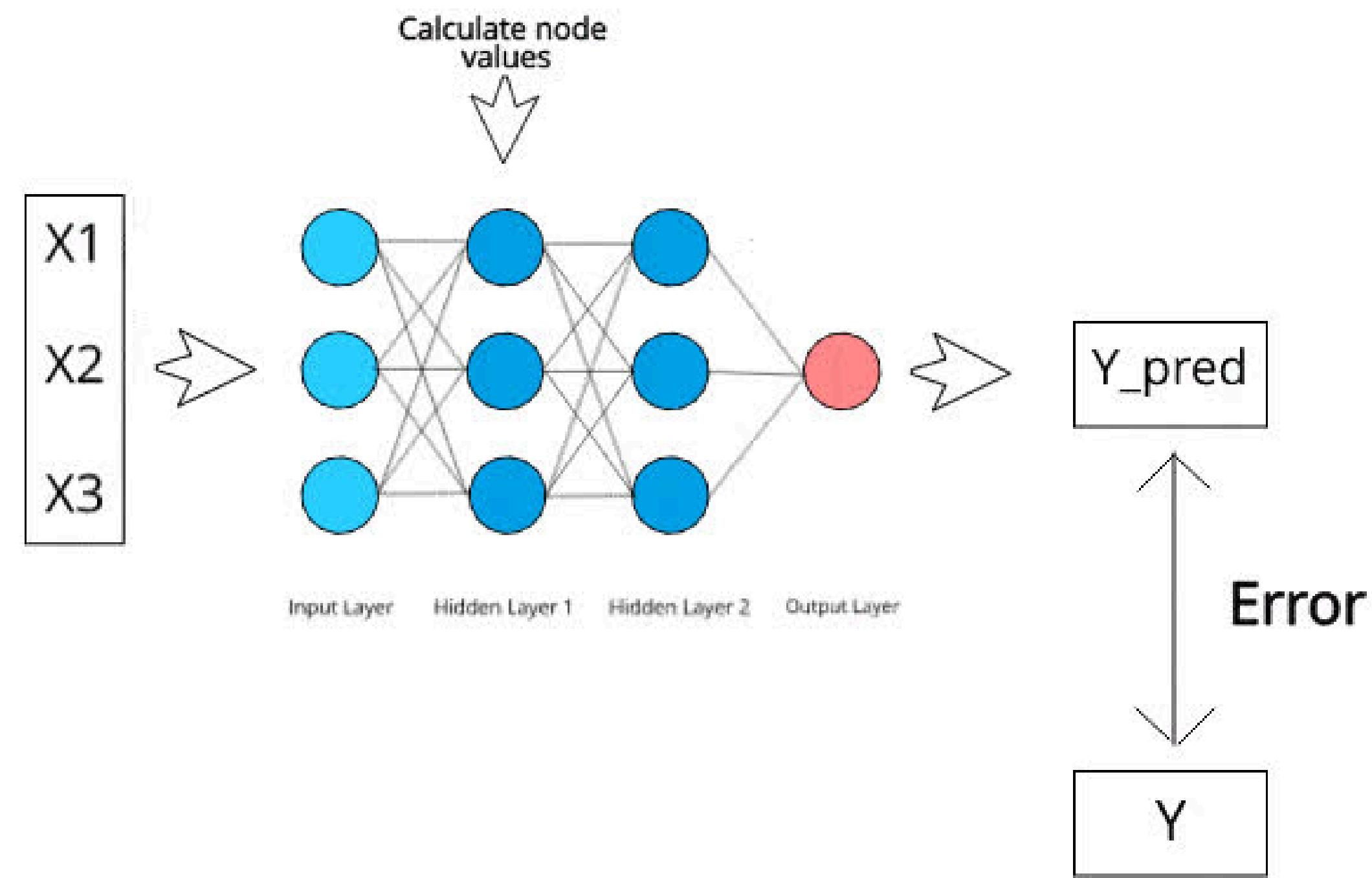
muffin

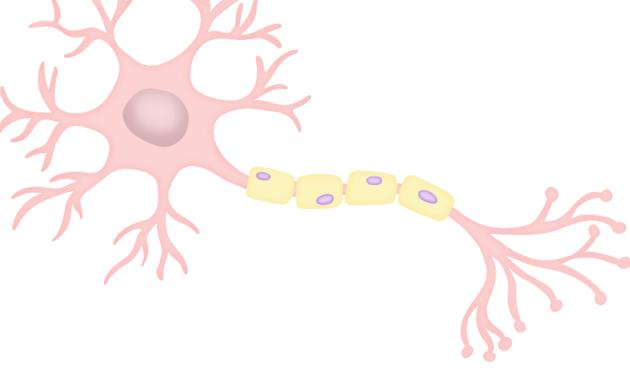




# Como a rede aprende?

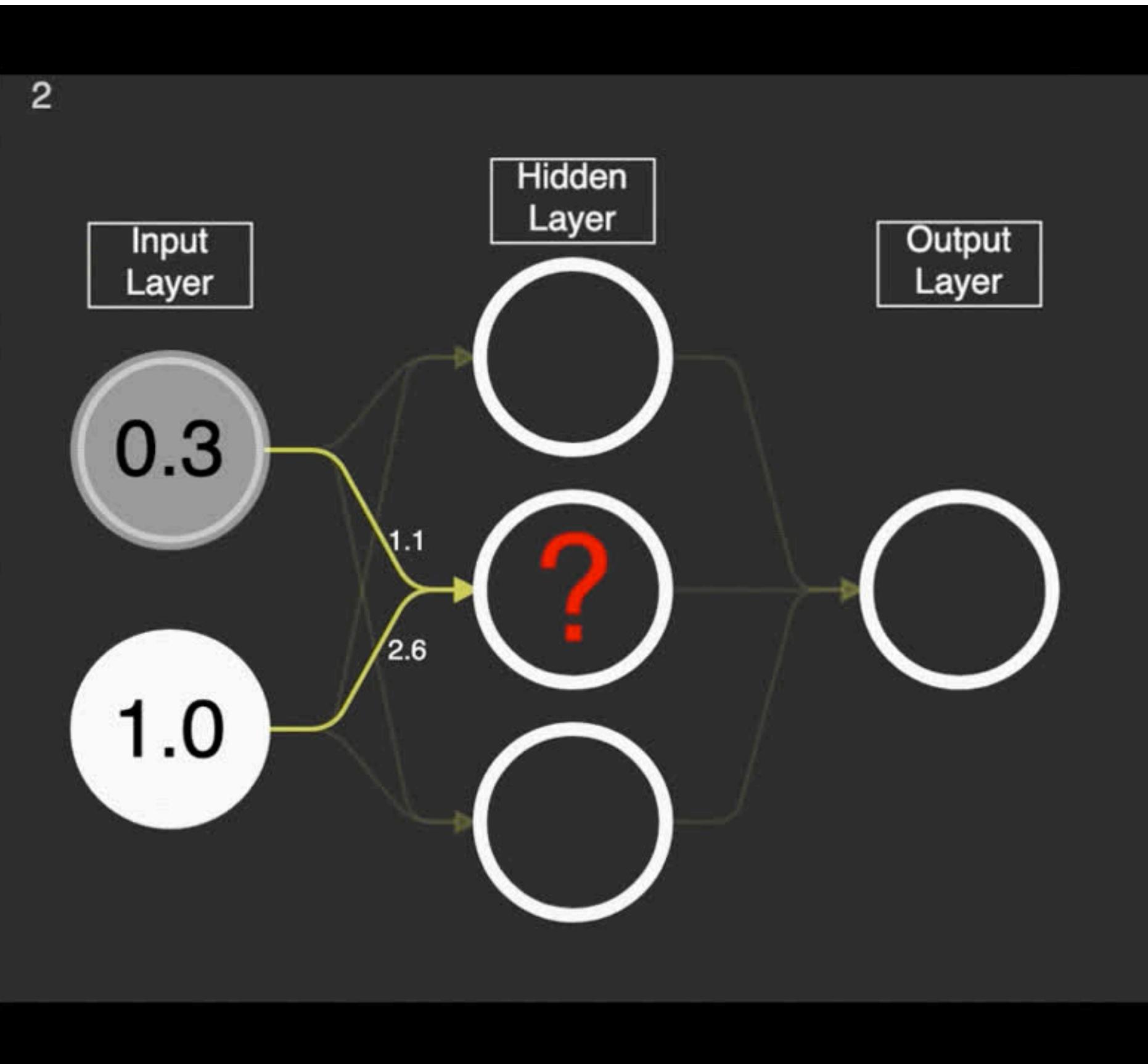
## Backpropagation





# Como a rede aprende? Backpropagation

- Durante a retropropagação, a rede **ajusta seus pesos** e tendências propagando o erro da camada de saída para a camada de entrada.
- Isso é feito calculando o **gradiente** (a derivada) do erro em relação a cada peso usando a regra da cadeia.
- Usando os gradientes, os pesos são atualizados na **direção que reduz** o erro (gradient descent).



# Alguns hiperparâmetros

Hiperparâmetro	Descrição	Valores Típicos / Faixa
Número de Camadas Ocultas	O número de camadas entre a camada de entrada e a camada de saída.	1, 2, 3, 4, ... (comumente 1-3 para MLPs básicos)
Número de Neurônios por Camada	O número de neurônios (unidades) em cada camada oculta.	10, 50, 100, 200, 500, etc.
Função de Ativação	A função aplicada à saída de cada neurônio para introduzir não-linearidade. Isso ajuda a rede a aprender padrões complexos.	ReLU, Sigmoid, Tanh, LeakyReLU, ELU
Taxa de Aprendizado	O tamanho do passo em cada iteração ao mover em direção ao mínimo da função de perda.	0.001, 0.01, 0.1, 0.0001, etc.
Épocas	O número de passes completos pelos dados de treinamento.	50, 100, 200, 500 (depende do dataset)
Dropout	Uma técnica de regularização para evitar overfitting.	0.2, 0.3, 0.5, etc.
Early Stopping	Uma estratégia para interromper o treinamento quando a perda de validação parar de melhorar.	paciencia = 10 épocas ou baseado no desempenho da validação

# Porque usar?

## Vantagens

Combina dados de várias fontes (texto, imagens, áudio)

Ajuda a preencher lacunas quando uma modalidade está ruidosa ou ausente

Performance superior para dados mais complexos

## Desvantagens

Complexidade

Requer mais dados

Altamente intensivo em recursos

# Aplicações

1. Reconhecimento de imagem



2. Segmentação de imagens



3. Reconhecimento de fala



4. Processamento de linguagem natural



5. Dados temporais

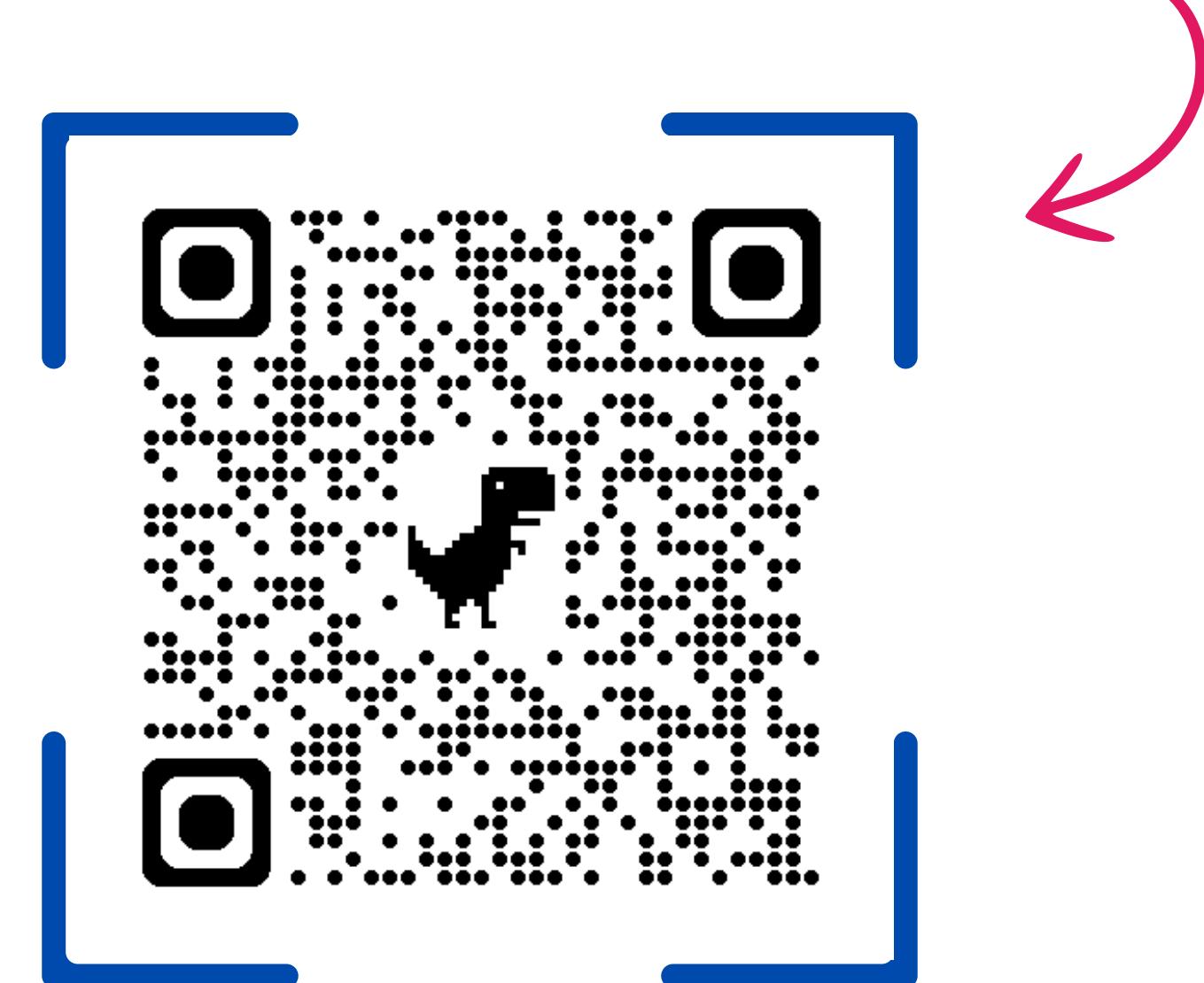


# Mão na massa!

Liaa  
Onco



Roteiro prático aqui



# Take home ideas ...

**Arquitetura MLP:** Como as camadas são estruturadas e como os dados fluem através delas.

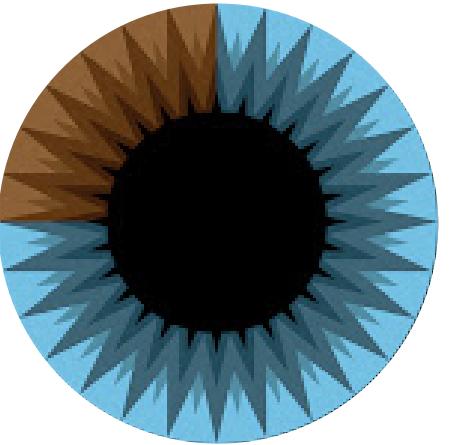
**Backpropagation (Retropropagação):** O processo de aprender com os erros ajustando os pesos com base no erro.

**Descida do Gradiente:** O processo de otimização que minimiza o erro do modelo atualizando os pesos de forma iterativa.

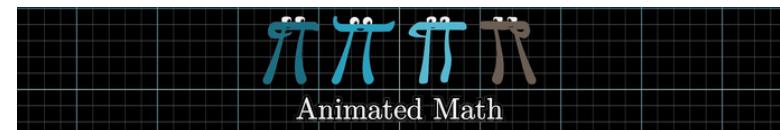
# Indicações

Liaa  
Onco

## Youtube



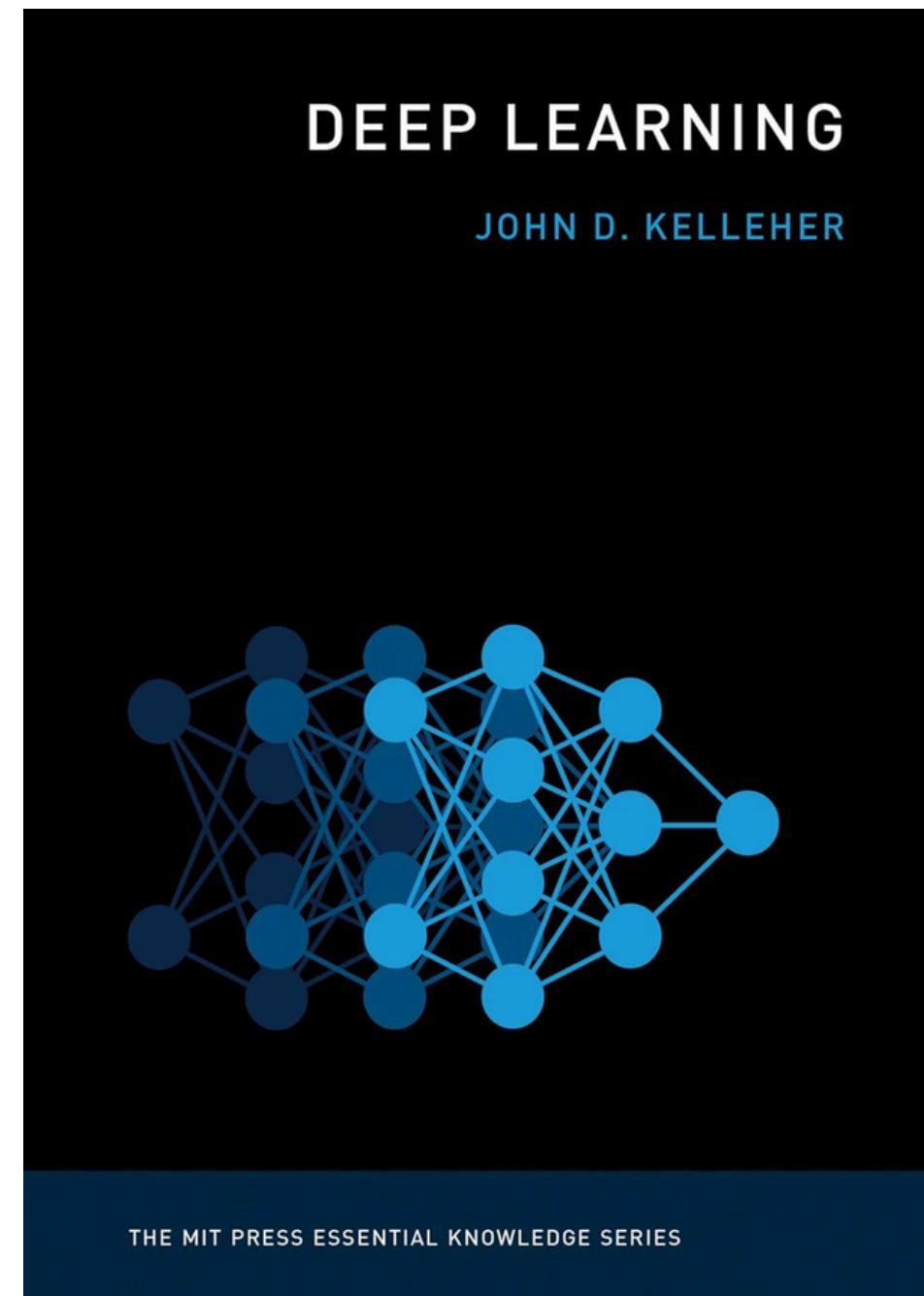
3Blue1Brown



Ciência Todo Dia



## Livros



2ª Edição  
Atualizada com  
a TensorFlow 2

Aurélien Géron



# Obrigada!



**Próximo encontro:**

**Tema:** Redes Neurais  
Convolucionais

*Data: 14/02*