Redes Neurais Artificiais

Teoria e Prática

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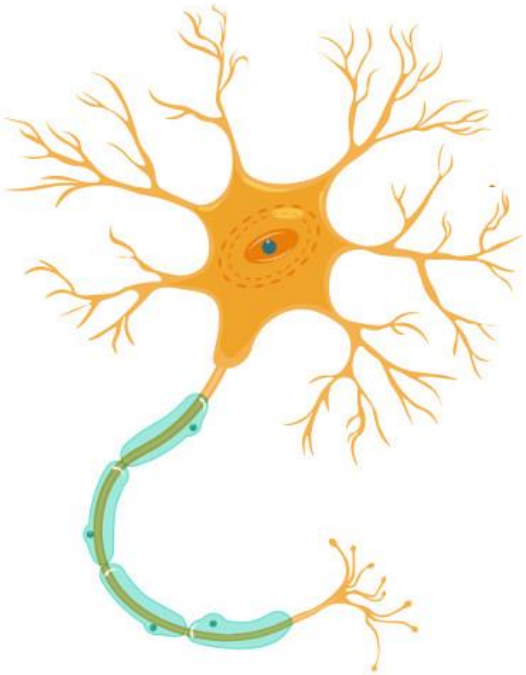
Doutor em Robótica e *Machine Learning* pelo ICMC-USP

Redes Neurais

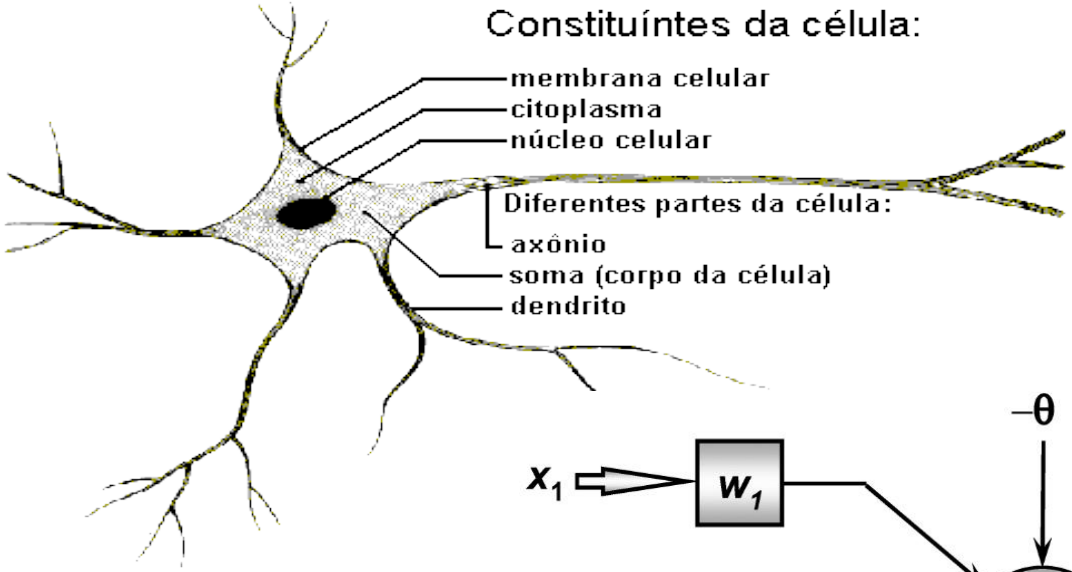
Prof. Dr. Diego Bruno

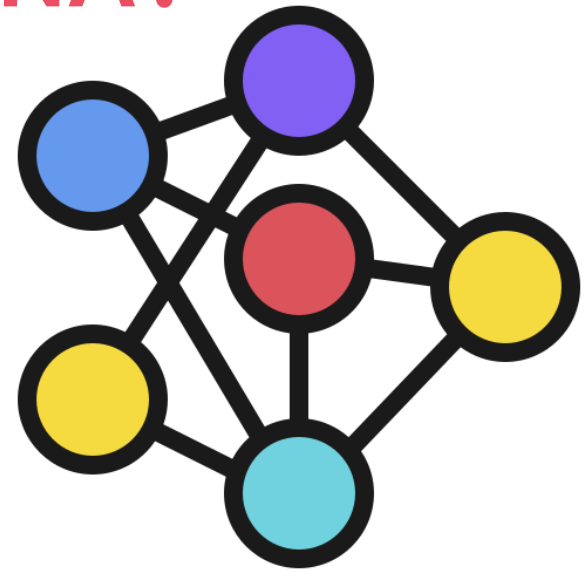
O que são Redes Neurais?

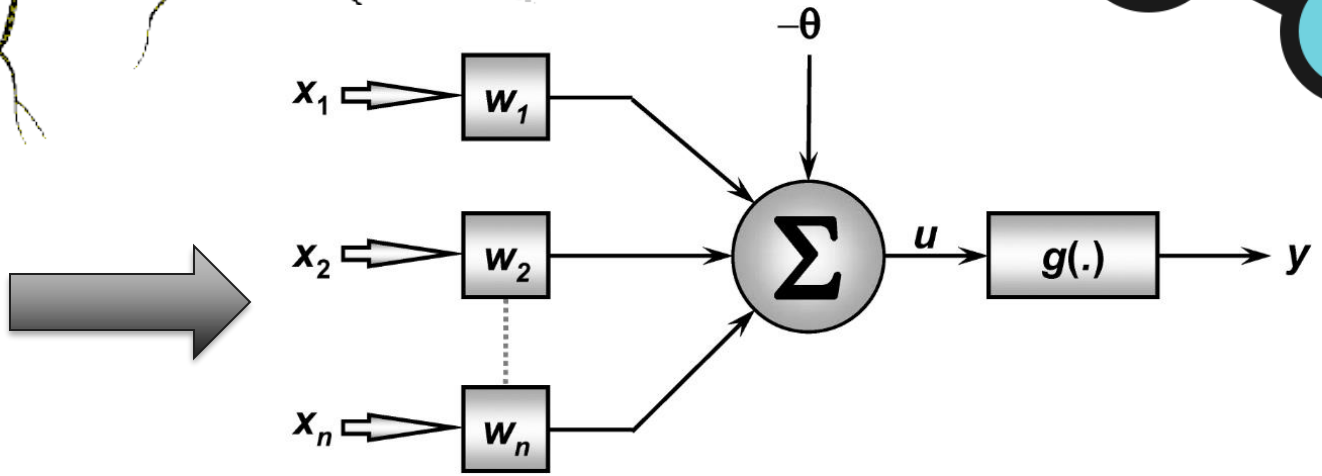
Redes Neurais



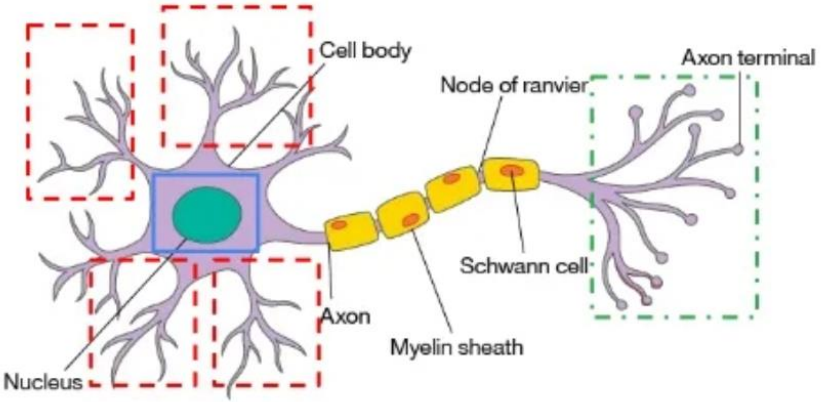
Qual a estrutura de uma RNA?







Redes Biológicas x Arficiais



neurônio

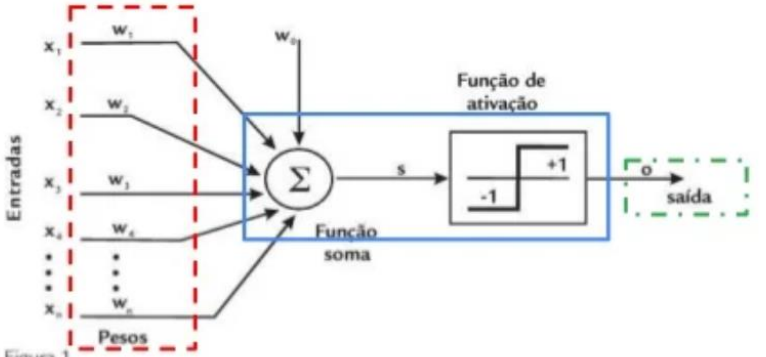


Figura 1
Modelo de um neurônio perceptron de Rosenblatt. Fonte: Adaptado de Medeiros (2006, p. 3).

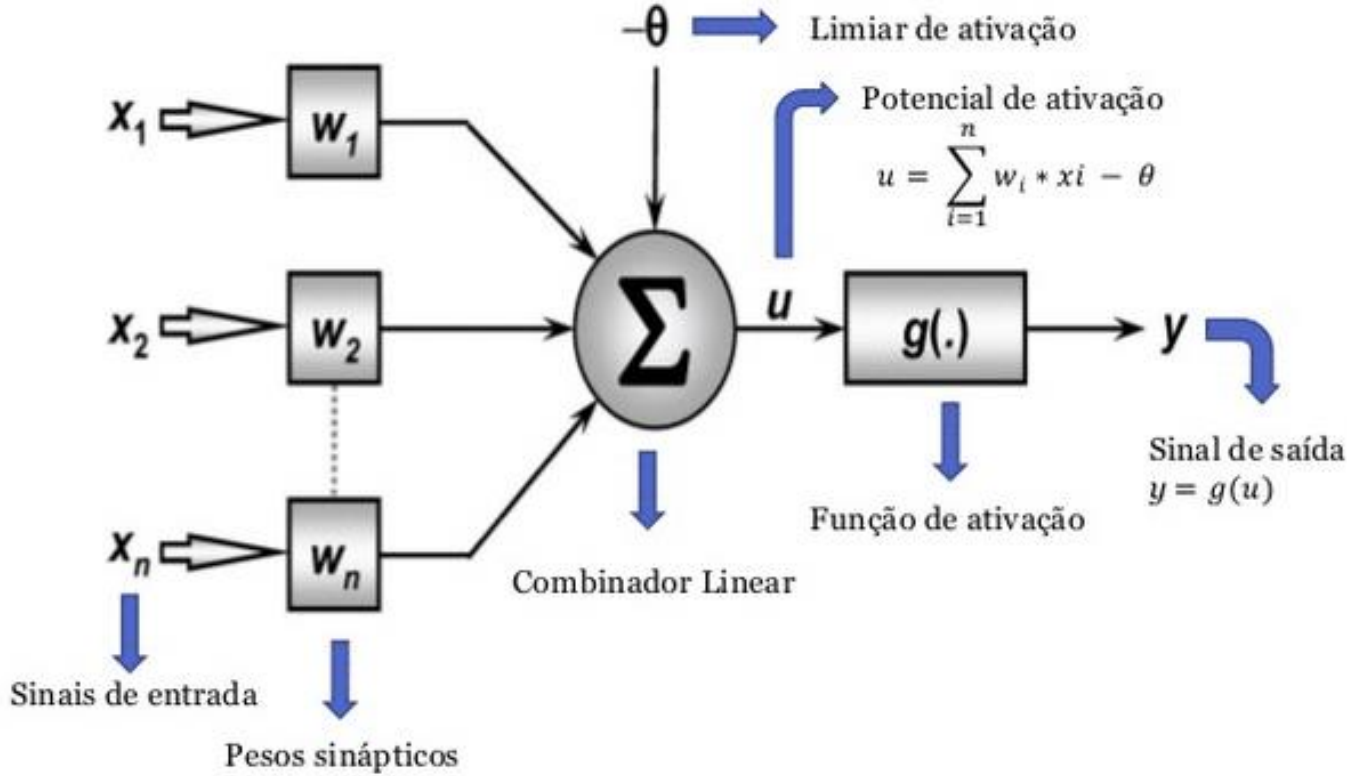
neurônio artificial

dendritos / pesos

núcleo / unidade

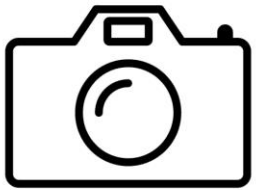
axônio+sinapse / saída

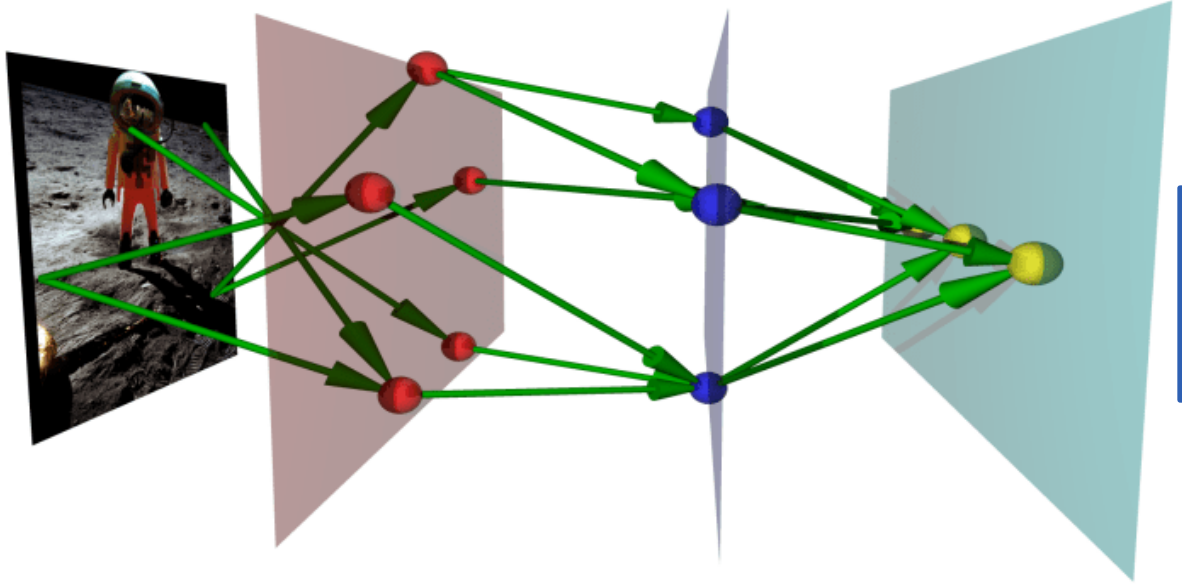
Neurônio Artificial



Dados de entrada e saída

Redes Neurais Biológicas x Arficiais





Dados interpretados na saída

Entrada

Processo

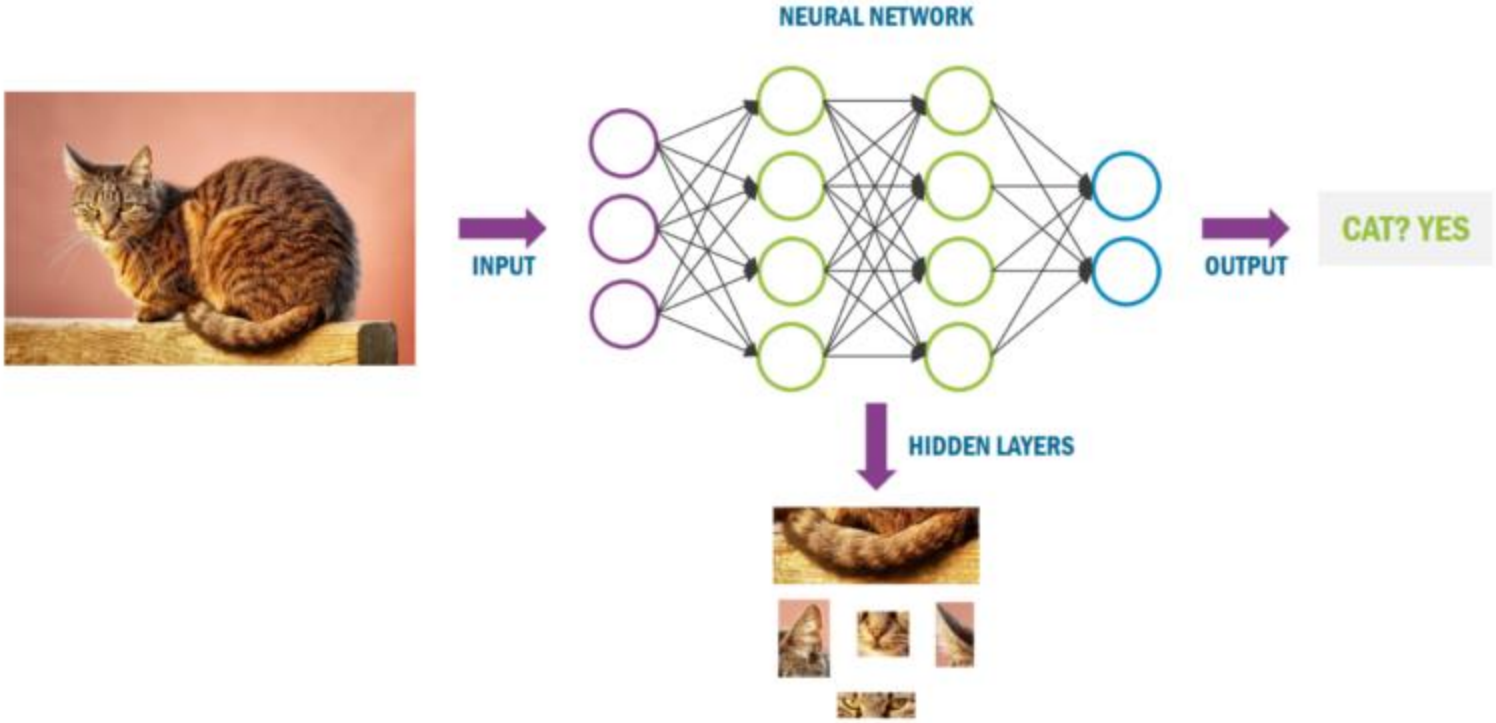
Relação de entrada e saída

Imagem de Entrada

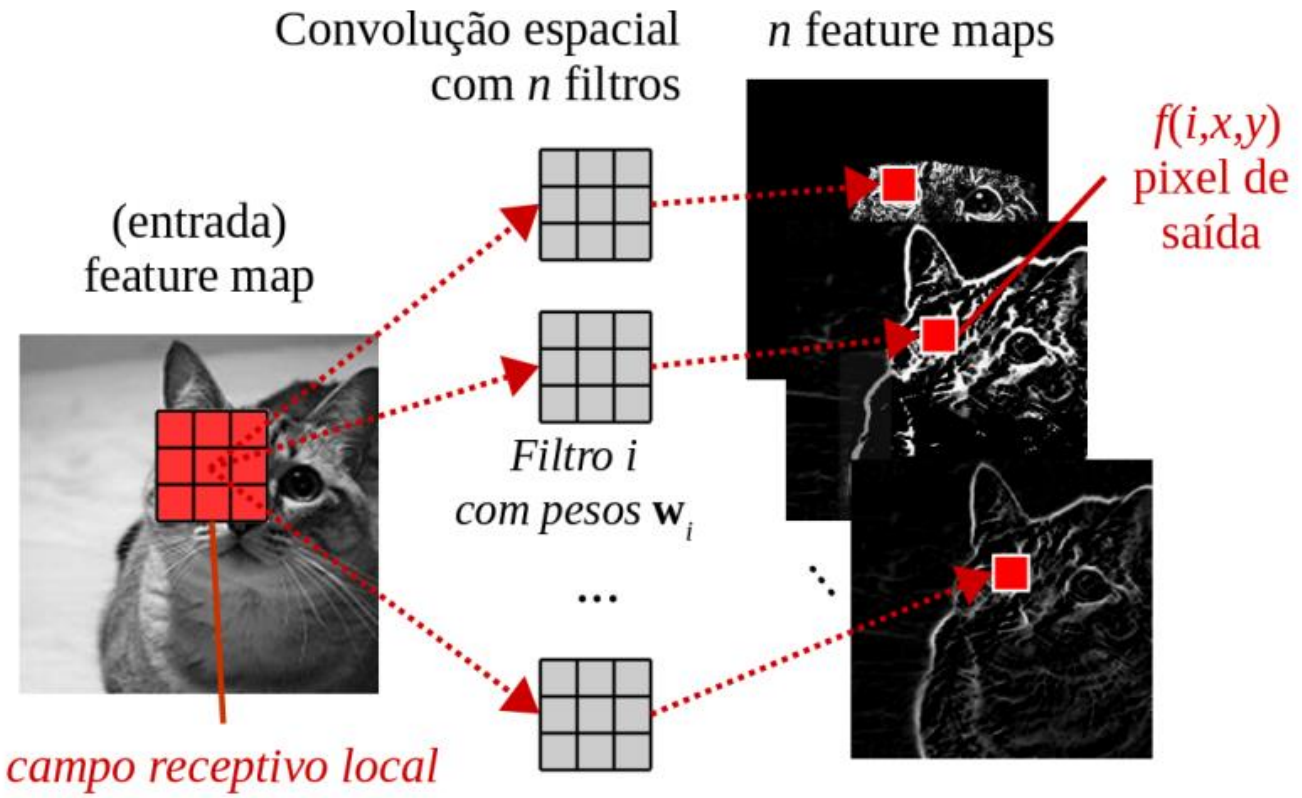
Dados gerados

Análise de Características (*Features*)

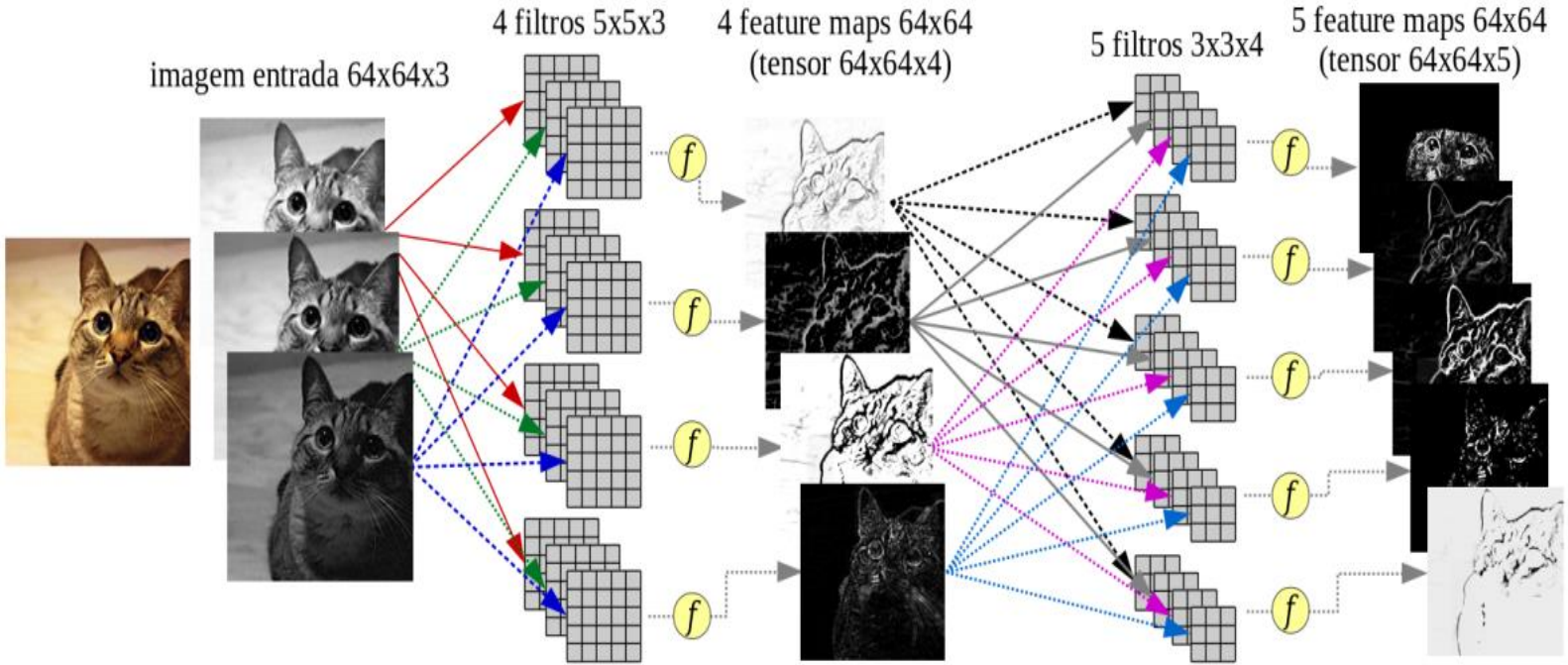
Redes Neurais Artificiais



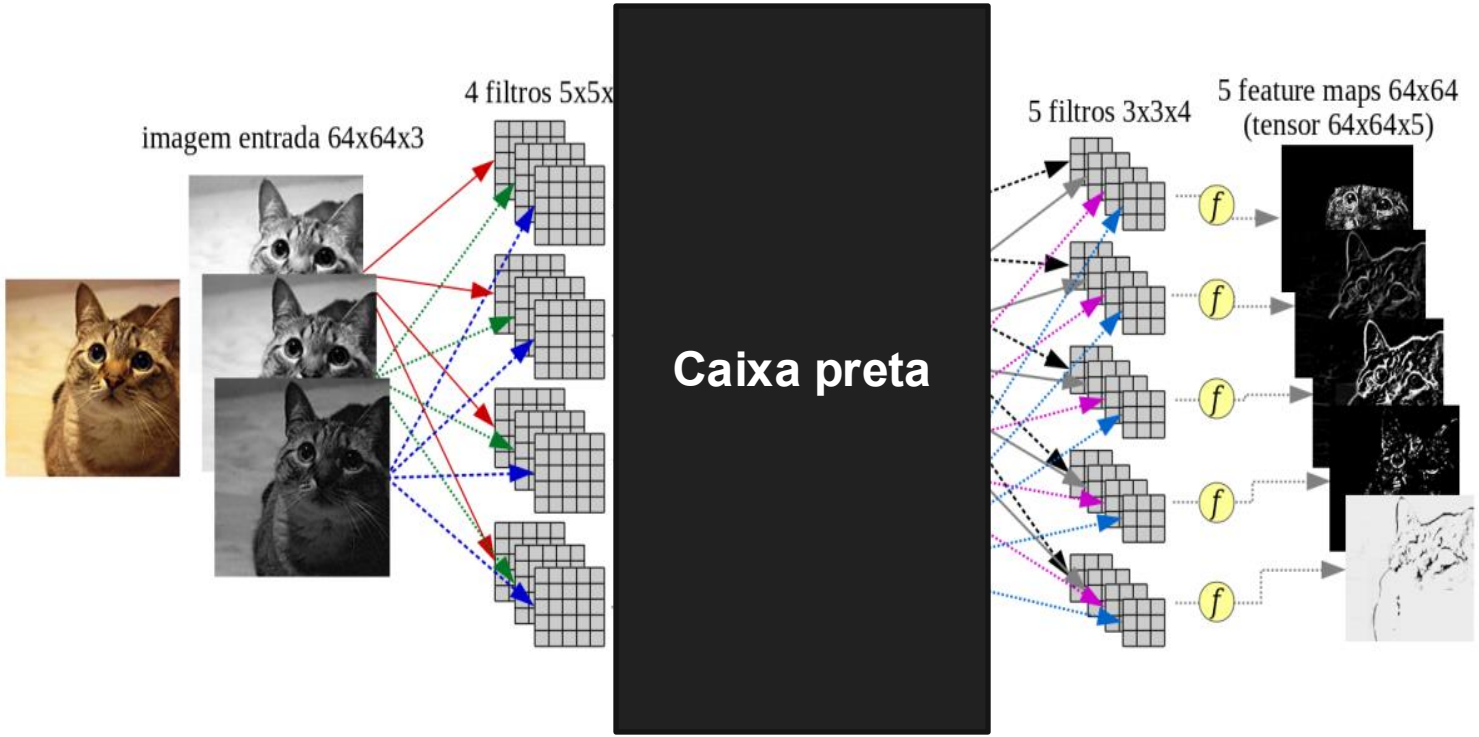
Dados a serem interpretados



Análise de características (*features*)



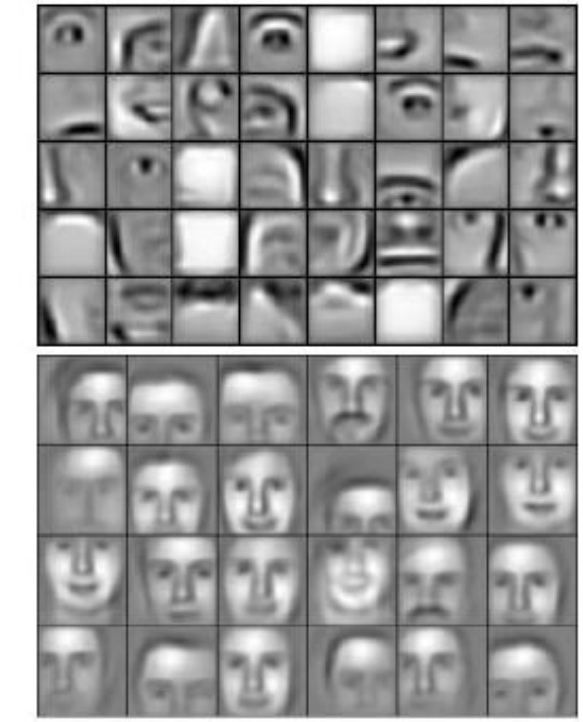
Caixa preta gerada no treino



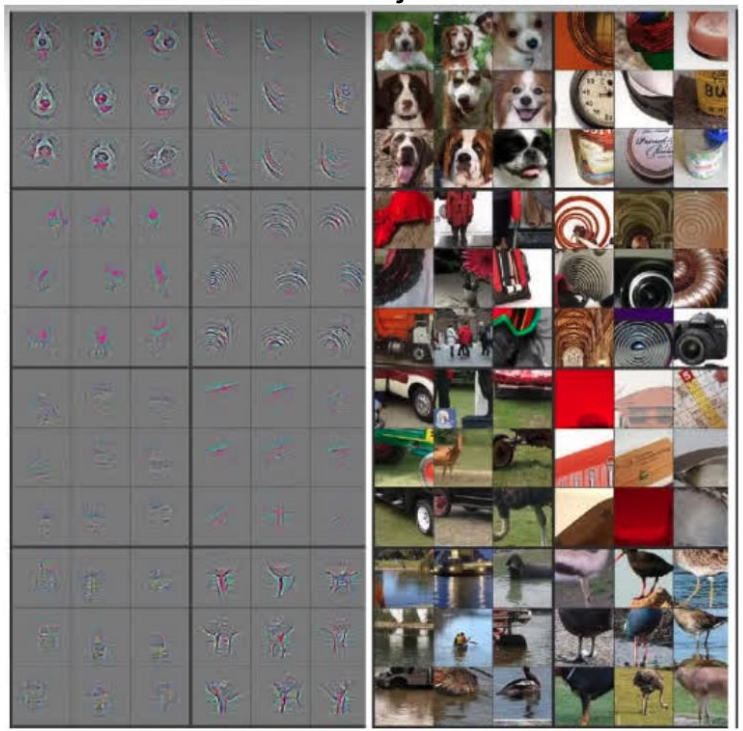
Mas como são as *Features*?

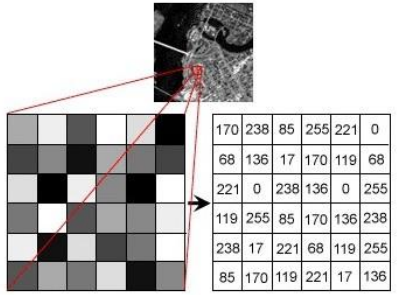
Como são as *features*?

faces



Outros Objetos





$$\begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{pmatrix}$$

Classificação

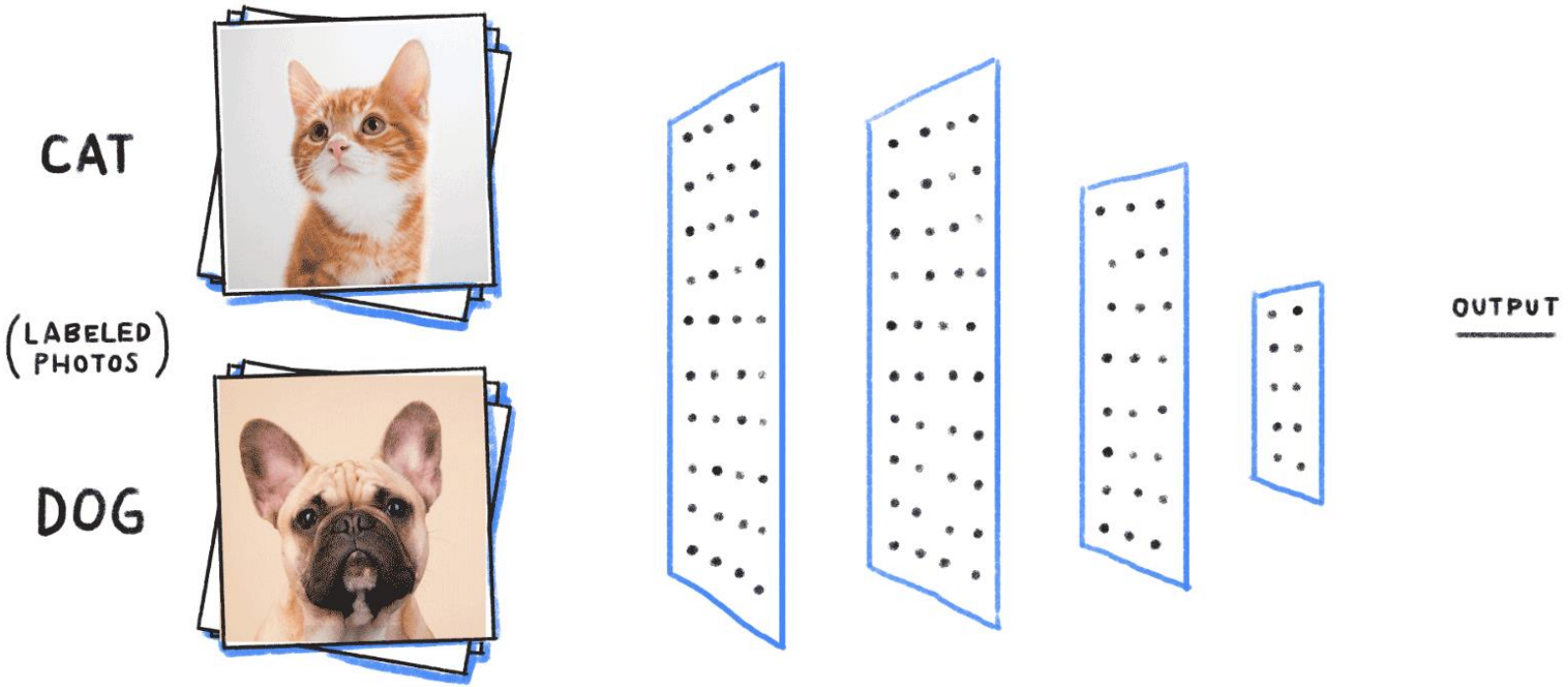
Classificação de objetos

CAT

NOT CAT

Aqui temos duas classes

Dados a serem interpretados

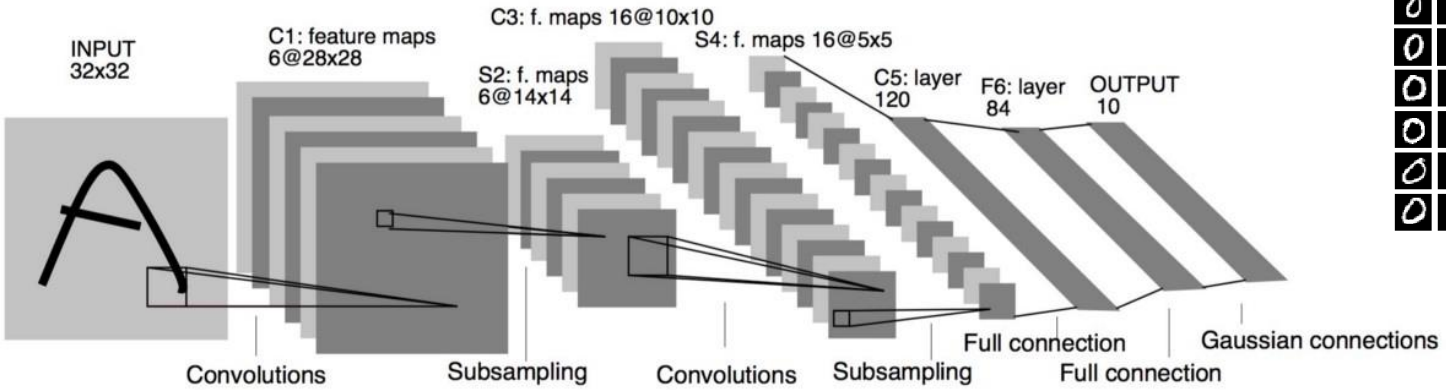


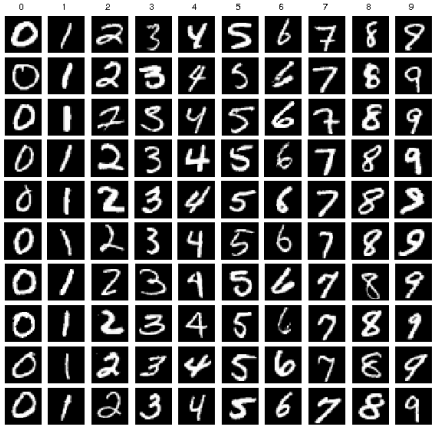
Dados a serem interpretados

Entrada	Rótulo	Classificação
	CAT	
	NOT CAT	 ?
	CAT	

Classificação de objetos

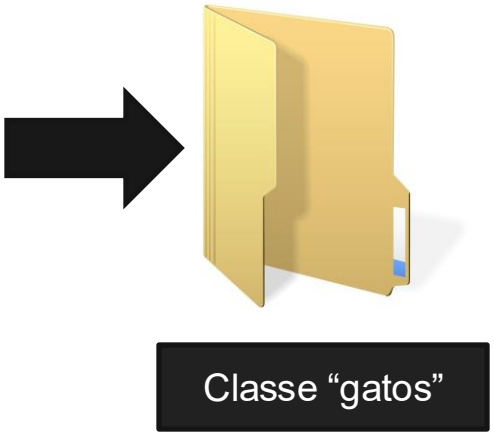
Mnist Dataset





Aqui temos 9 classes

DATASET – Base de treino

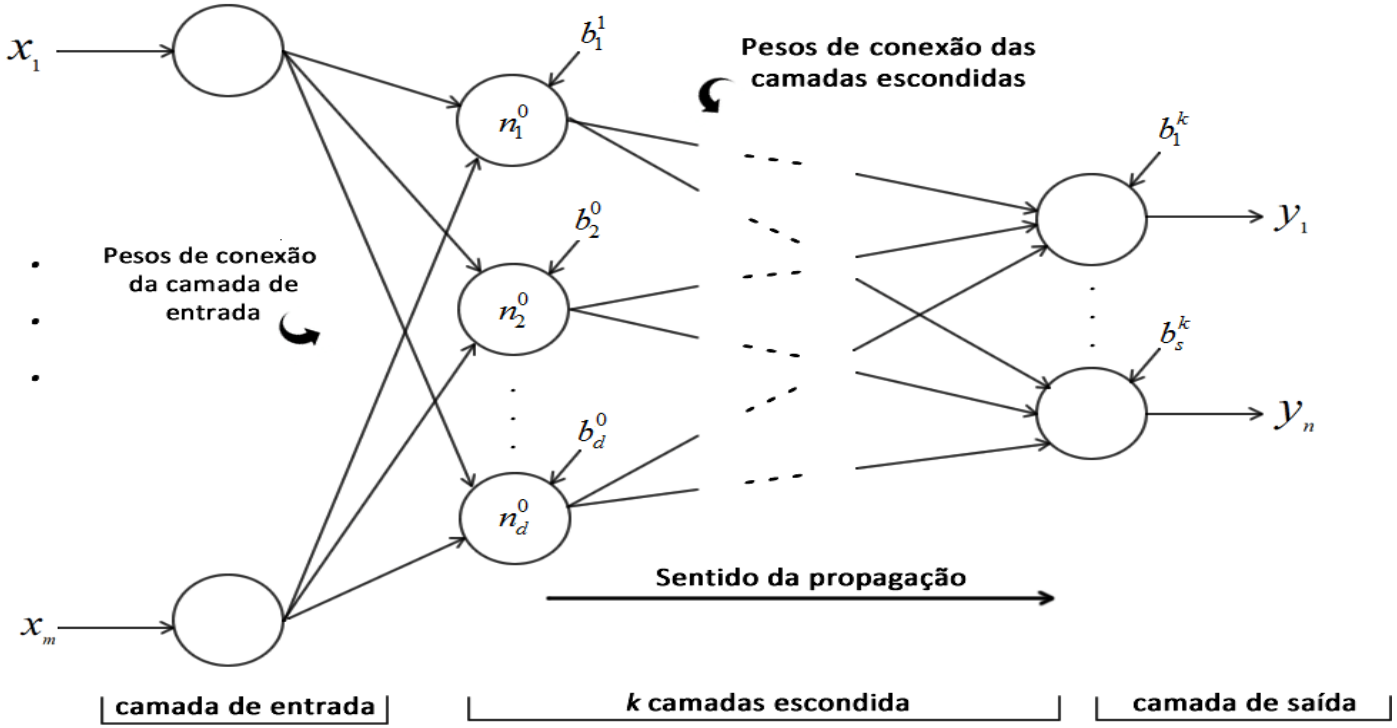


Classe “gatos”

Mas o que gera um Treinamento?

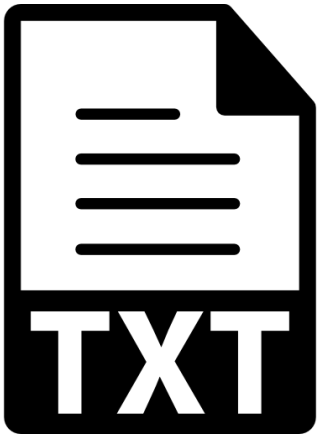
Dados de aprendizado

Pesos gerados no treinamento



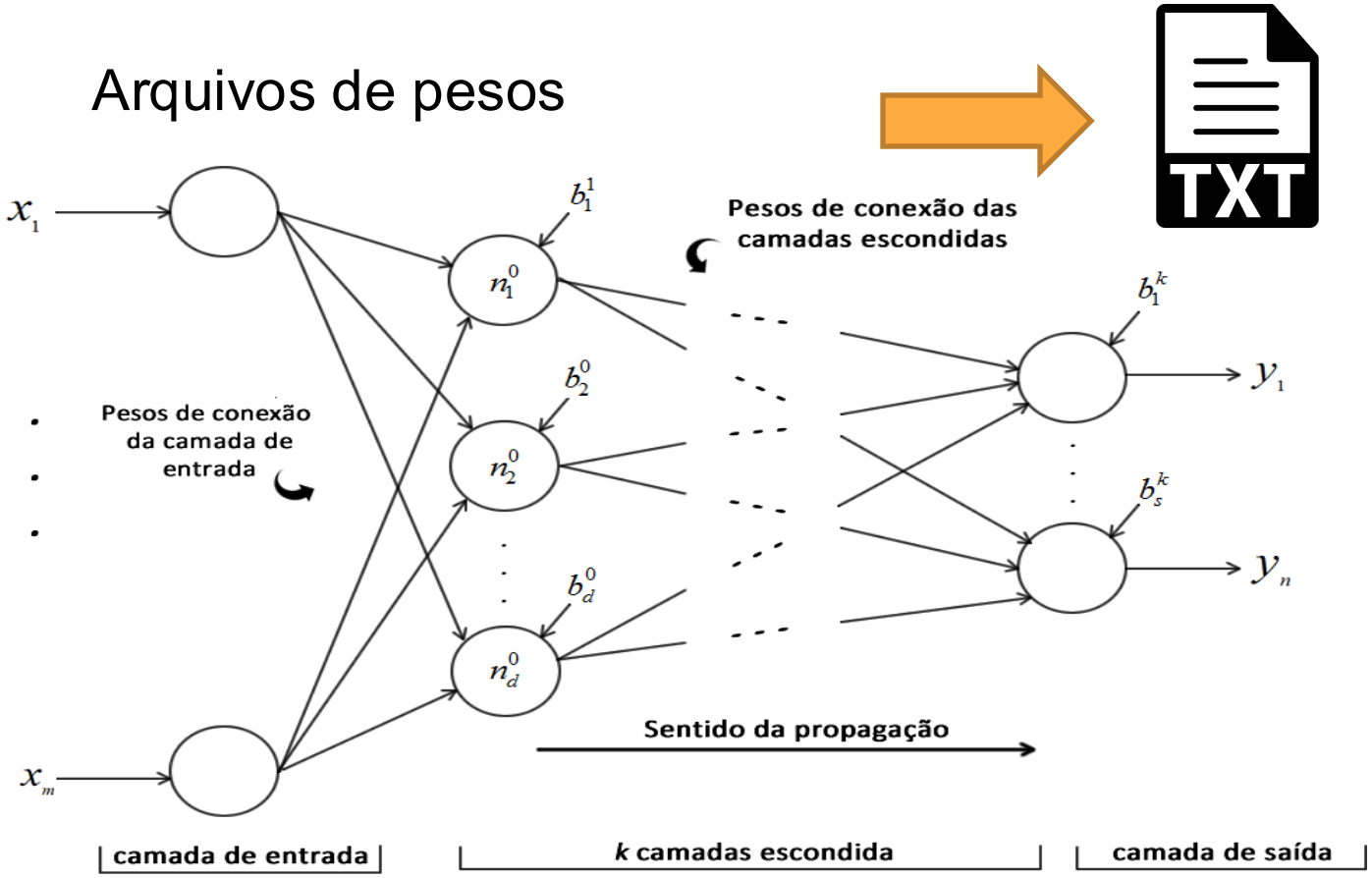
Dados de aprendizado

Arquivos de pesos



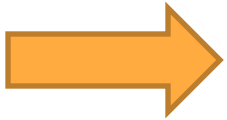
Modelo de treinamento

Arquivos de pesos



Modelo de treinamento

Pesos gerados em uma rede



pesos - Bloco de notas

Arquivo Editar Formatar Exibir Ajuda

```
-163.8
-135.394
-55.5981
138.008
-2.99415
0.00479873
8.2035
38.409
-86.1918
0.207466
143.202
-130.191
-73.5929
-21.1949
```

saida - Bloco de notas

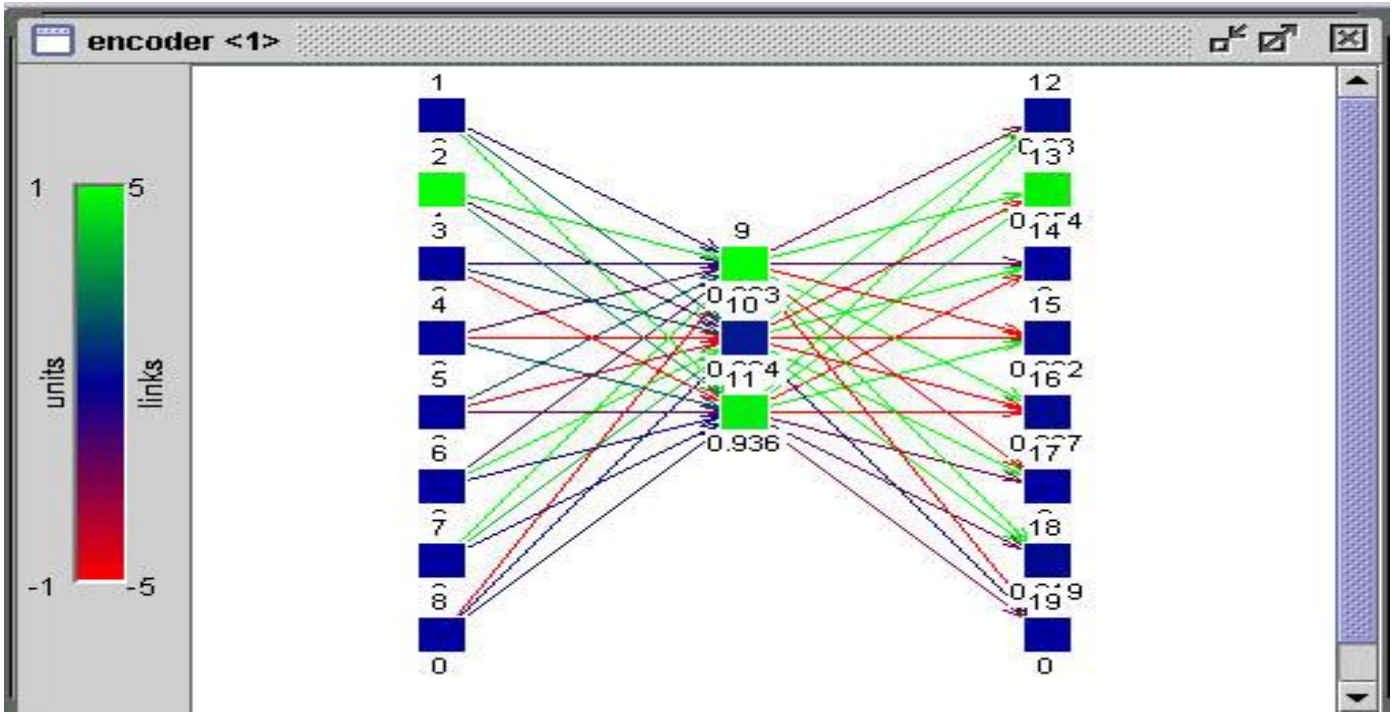
Arquivo Editar Formatar Exibir Ajuda

```
-1
-1
1
-1
```

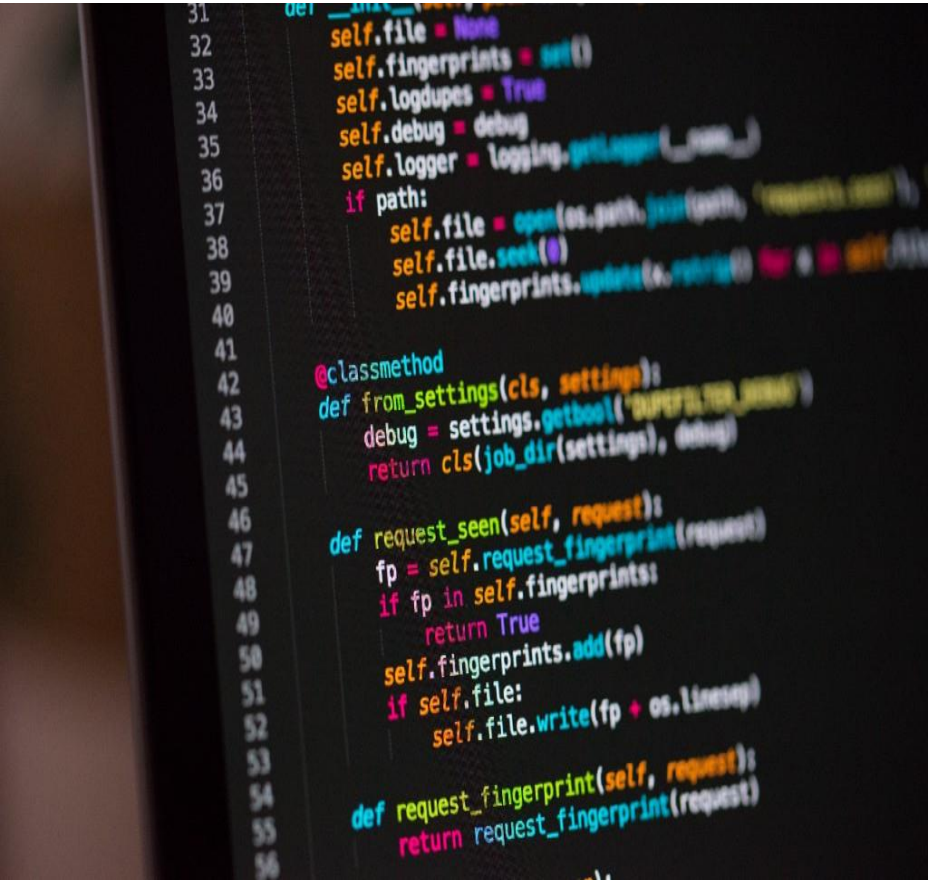
Algoritmo

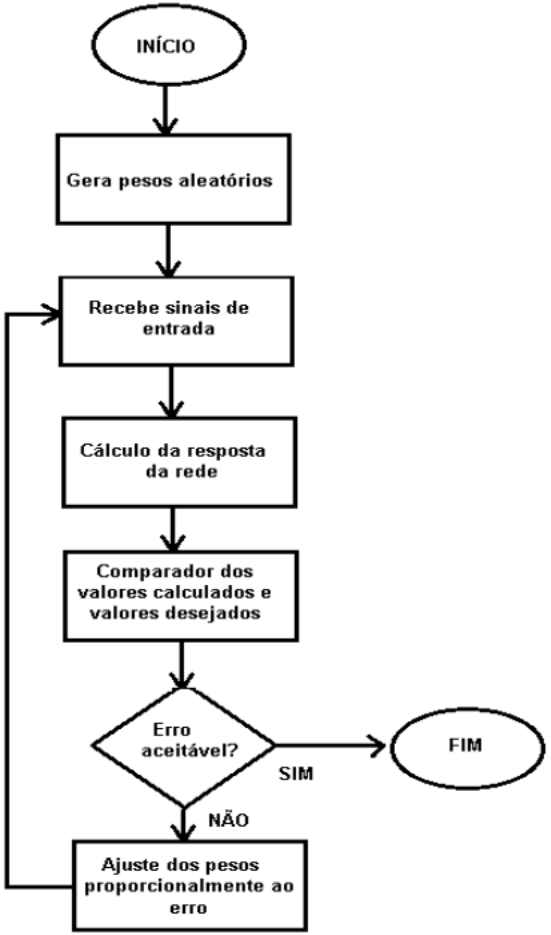
Modelo de treinamento

Relação dos pesos



Algoritmo




INÍCIO
Gera pesos aleatórios
Recebe sinais de entrada
Cálculo da resposta da rede
Comparador dos valores calculados e valores desejados
Erro aceitável?
SIM
FIM
NÃO
Ajuste dos pesos proporcionalmente ao erro

Importando Modelos de RNA

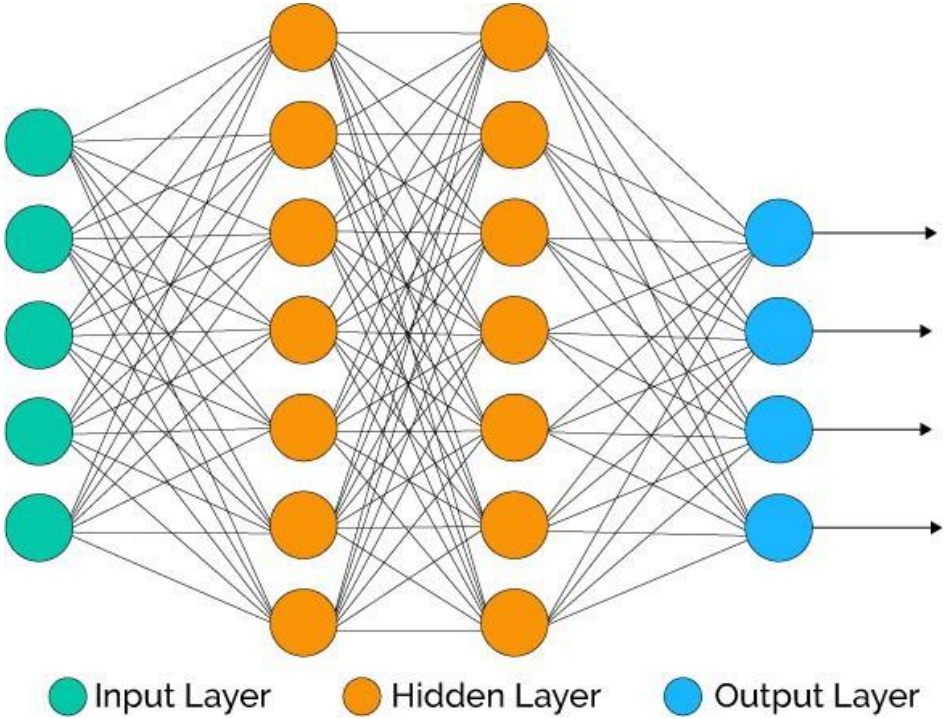
Classify ImageNet classes with ResNet50

```
from tensorflow.keras.applications.resnet50 import ResNet50
from tensorflow.keras.preprocessing import image
from tensorflow.keras.applications.resnet50 import preprocess_input, decode_predictions
import numpy as np

model = ResNet50(weights='imagenet')

img_path = 'elephant.jpg'
img = image.load_img(img_path, target_size=(224, 224))
x = image.img_to_array(img)
x = np.expand_dims(x, axis=0)
x = preprocess_input(x)
```

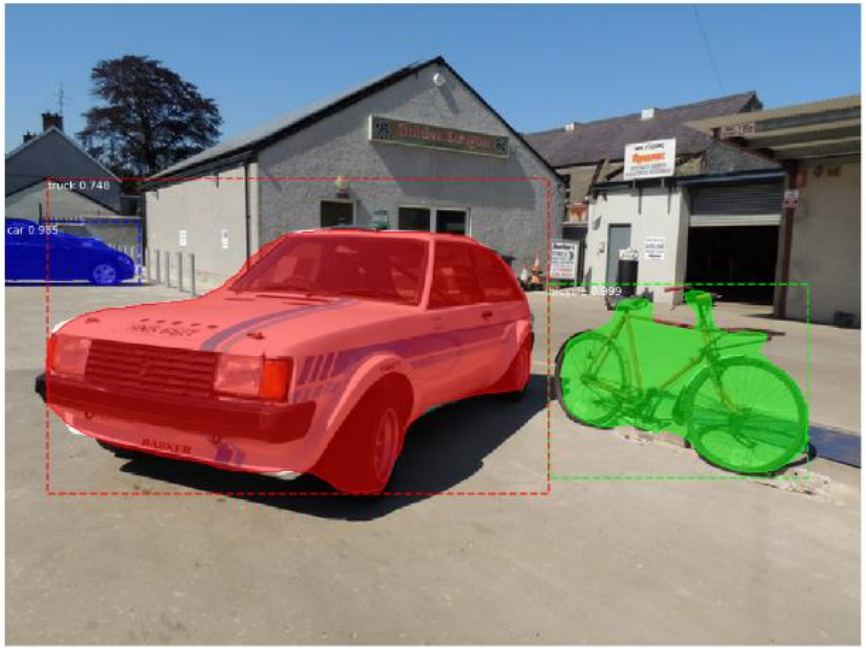
Exemplo de RNA no COLAB



https://colab.research.google.com/github/storopoli/ciencia-de-dados/blob/master/notebooks/Aula_18_a_Redes_Neurais_com_TensorFlow.ipynb#scrollTo=6zmMUxg8pfqE

Exemplo de RNA no COLAB

```
Processing 1 images
image                    shape: (480, 640, 3)         min:    0.00000  max:  255.00000  uint8
molded_images            shape: (1, 1024, 1024, 3)    min: -123.70000  max:  151.10000  float64
image_metas              shape: (1, 93)               min:    0.00000  max: 1024.00000  float64
anchors                  shape: (1, 261888, 4)        min:   -0.35390  max:    1.29134  float32
```



https://colab.research.google.com/github/tensorflow/tpu/blob/master/models/official/mask_rcnn/mask_rcnn_demo.ipynb#scrollTo=X8rPd4MyrDsn

Obrigado!

Prof. Dr. Diego Bruno