



Sua Primeira Artificial Neural Network (ANN)

Apresentado por: Victor
Oliveira



Breve Introdução Pessoal.

- Formado em Ciência e Tecnologia Pela UFERSA;
- Certificação Huawei HCIA – AI;
- Mestrando em Ciência da Computação Pela UFERSA/UERN (PPgCC);
- Integrante do Grupo de Pesquisa Em Web Semantica e Aplicações CNPq;
- Pesquisador Convidado na University of Twente (NL) - Departamento de Web Semantics e Cybersecurity.



Huawei Certification

Victor Benoiston Jales de Oliveira

has successfully completed the Huawei certification requirements and is recognized as an

AI



Valid Through May 14, 2024

Validate this certificate's authenticity at
<http://support.huawei.com/learning/verifycertificate>
Certificate No. 01010200180843465984286

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CEO
Huawei Technologies Co., Ltd.

policy_aspects_key_concepts_retriever Public

an algorithm capable of classifying texts regarding the legal aspects within IDS initiative. With a further prospection of implementing in a LLM or NER model.

● Jupyter Notebook MIT License Updated 2 days ago

recommender_system Public

A K-nearest Neighbour based recommender system.

python machine-learning recommender-system knn-algorithm

● Python MIT License Updated on Nov 8, 2021

bbc_dataset_multiple_ml_approaches Public

A full lifecycle project regarding the bbc articles dataset, provided by kaggle. In this project, we implemented various algorithms, such as decision tree, knn, k-means, and various dnn.

● Jupyter Notebook MIT License Updated 2 days ago

python_web_crawler Public

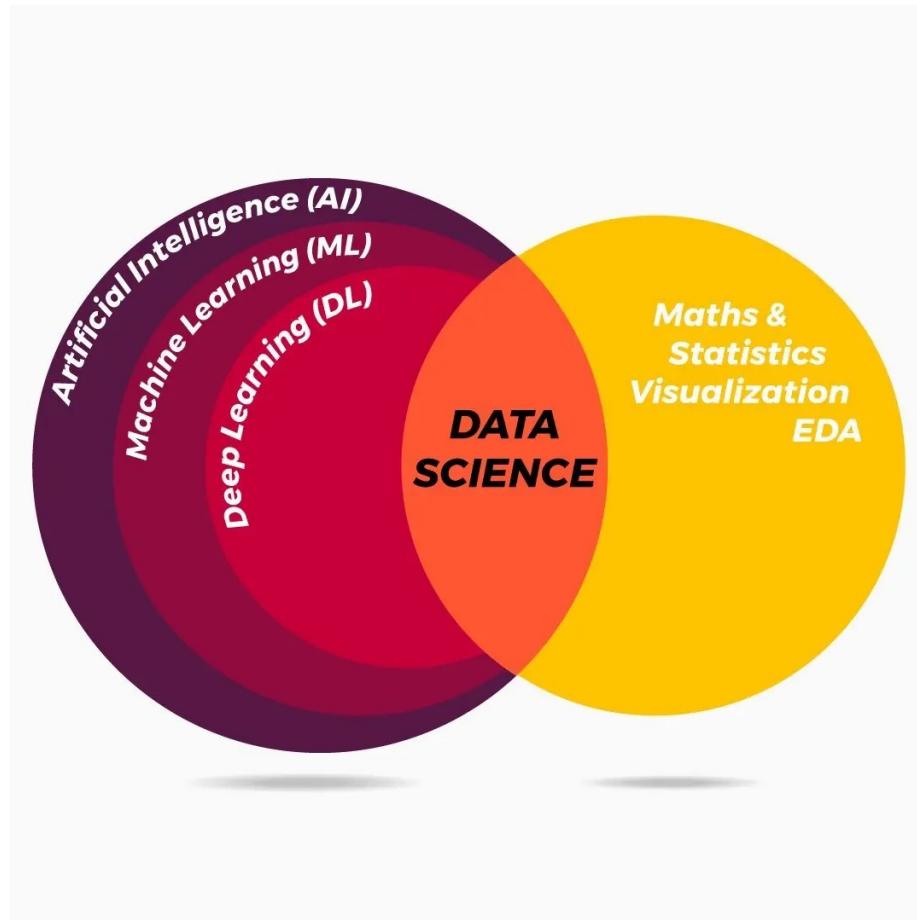
Python web crawler used to retrieve data from multiple state courts in Brazil only by the case number parameter.

● Python MIT License Updated on Jul 24

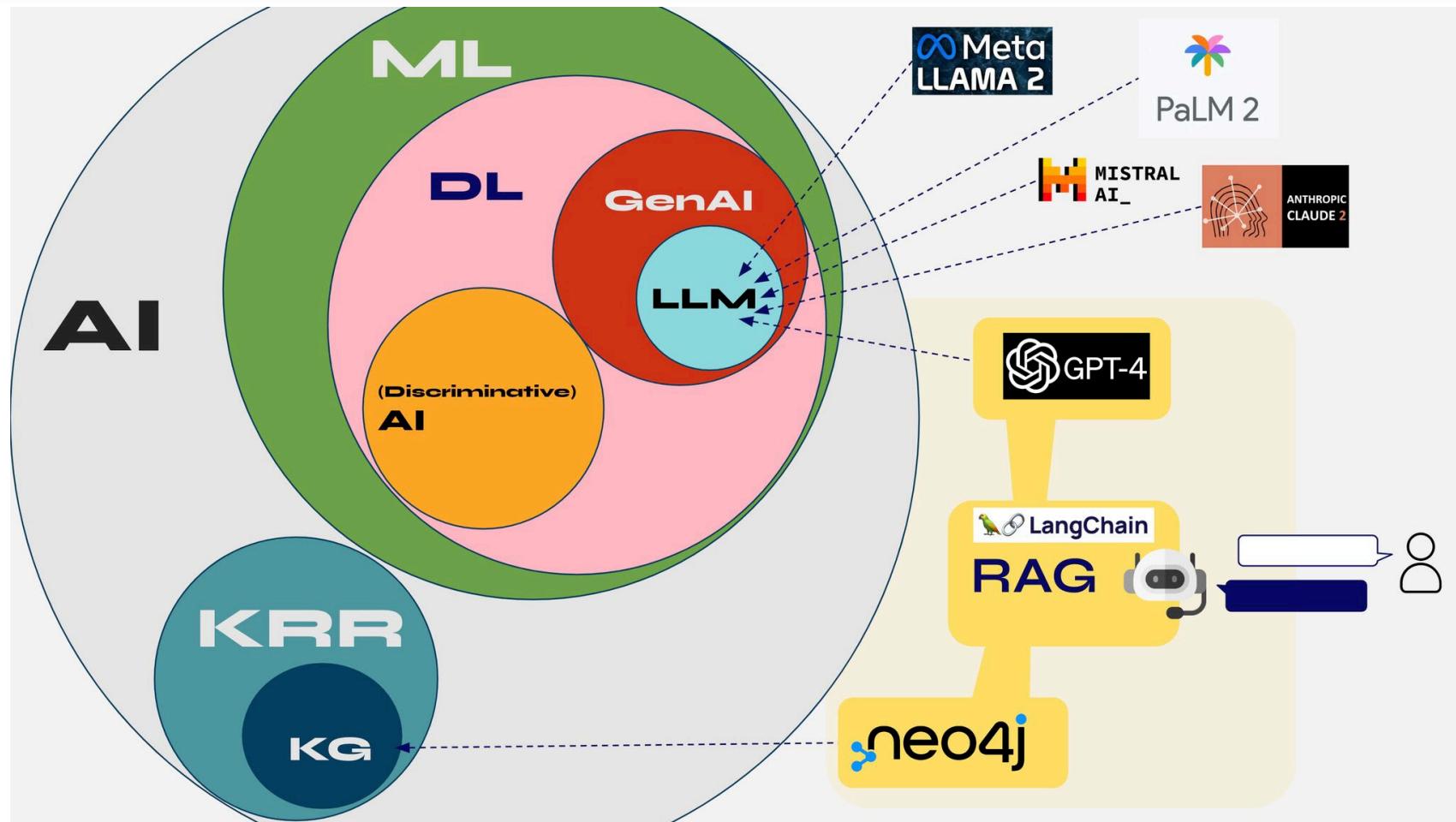


Conceitos Chave

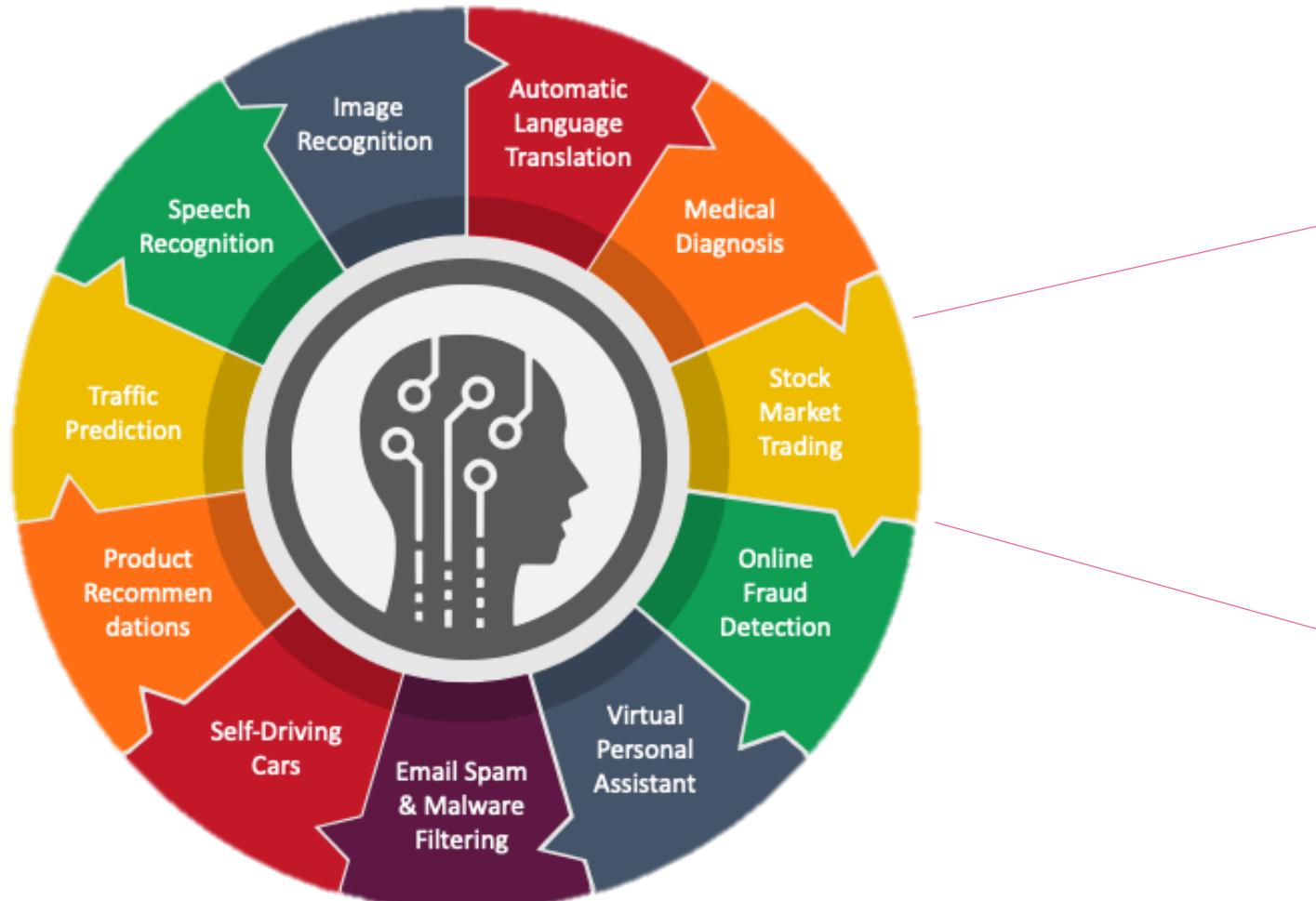
- Artificial Intelligence (AI)
- Machine Learning (ML)
- Deep Learning (DL)
- Data Science (DS)



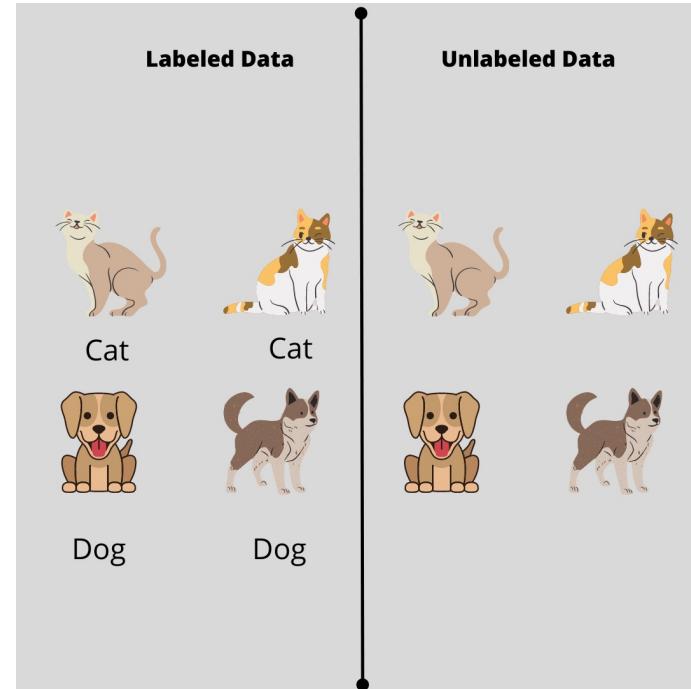
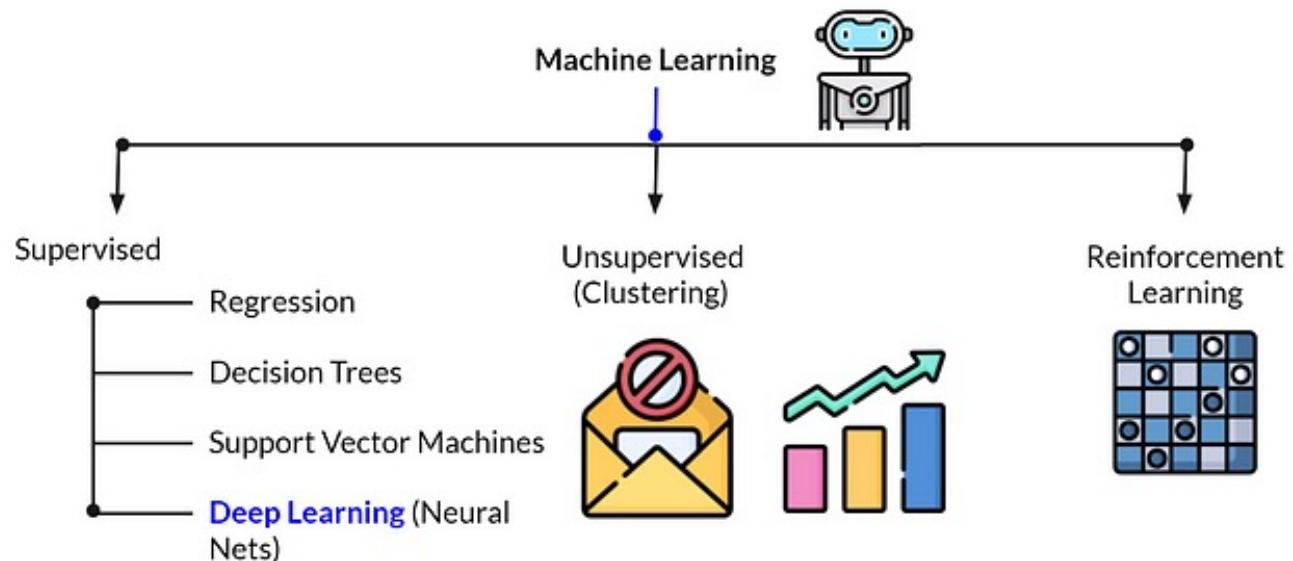
Olhar Atualizado



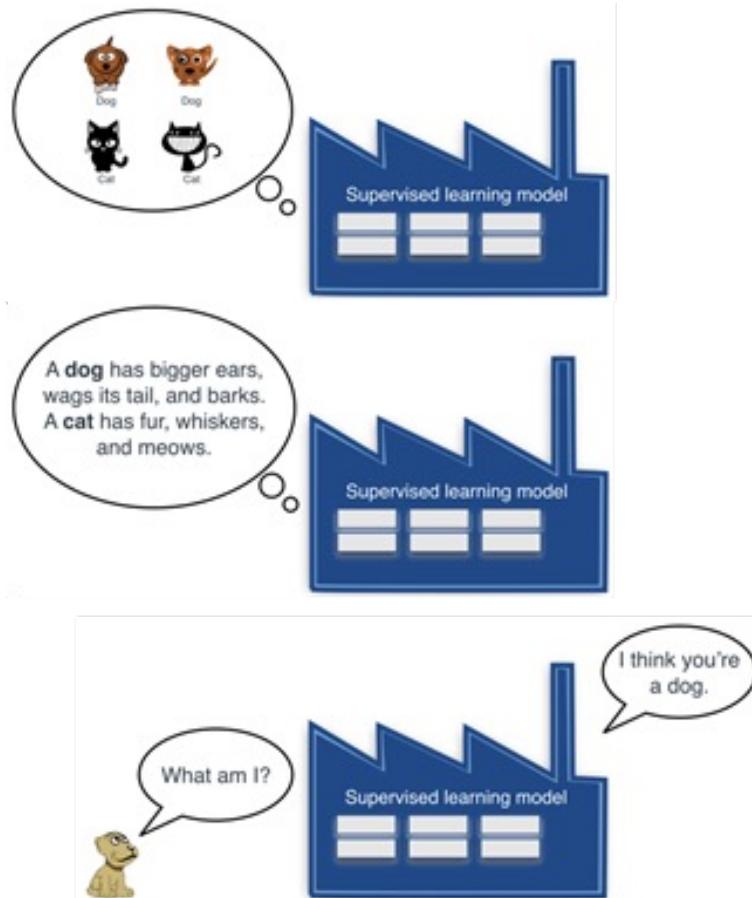
Aplicações de ML de DL.



Tipos de Aprendizado



Aprendizado Supervisionado



Remember

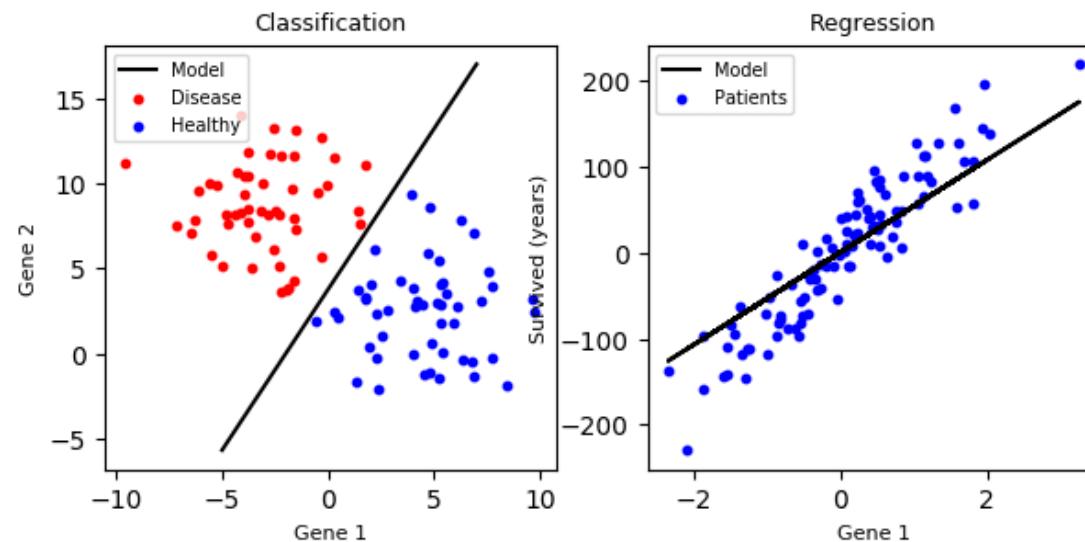
Formulate

Predict

Aprendizado Supervisionado

Classificação

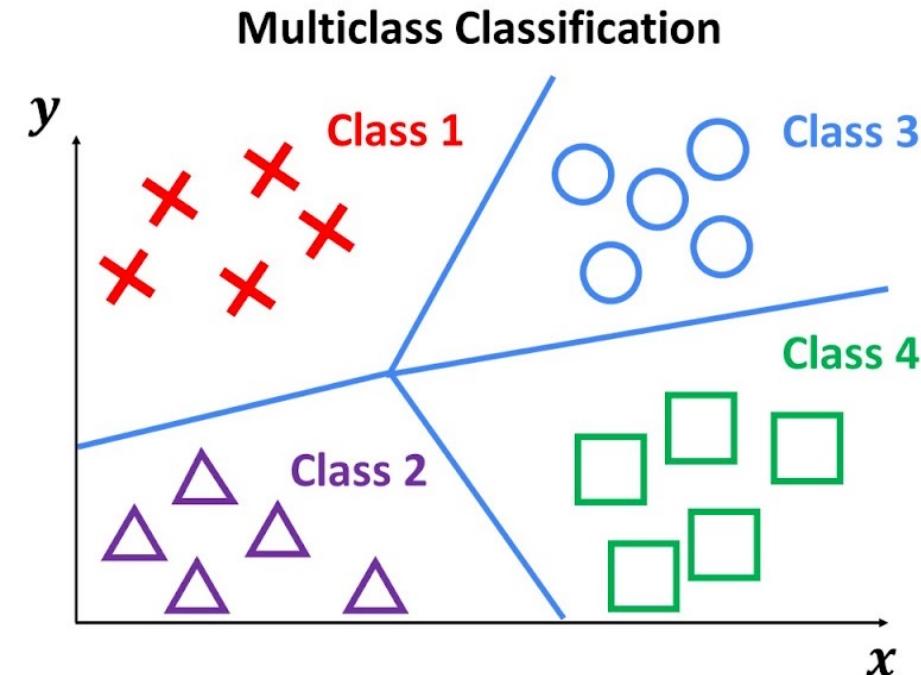
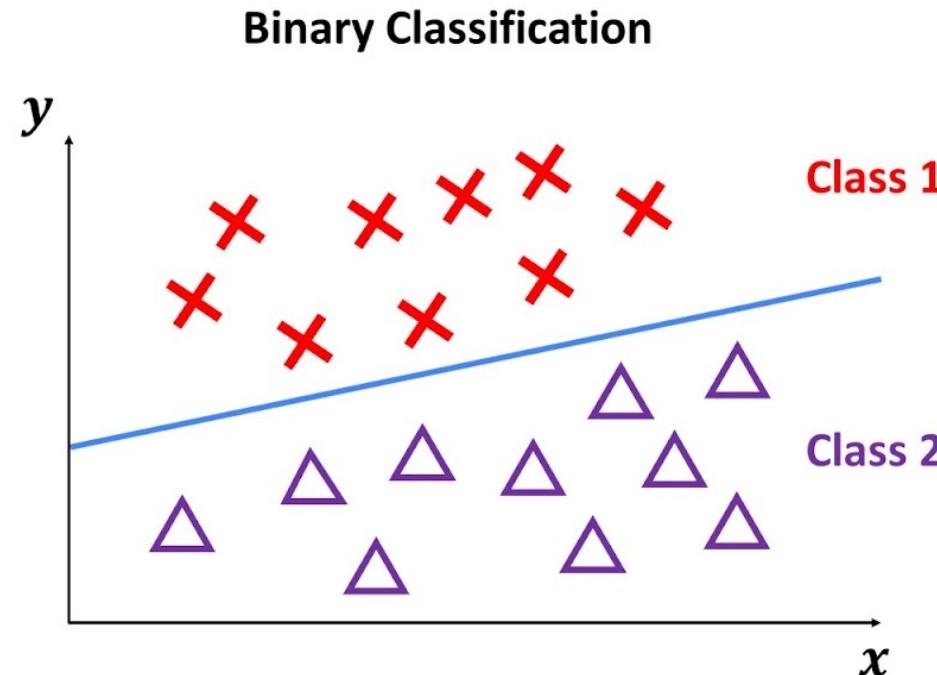
- K-Nearest Neighbors (k-NN);
- Support Vector Machine (SVM);
- Random Forest Decision;



Regressão

- Linear Regression;
- Logistic Regression;

Problema de Classificação



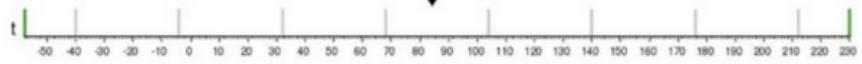
Problema de Regressão

Regression



What will be the temperature tomorrow?

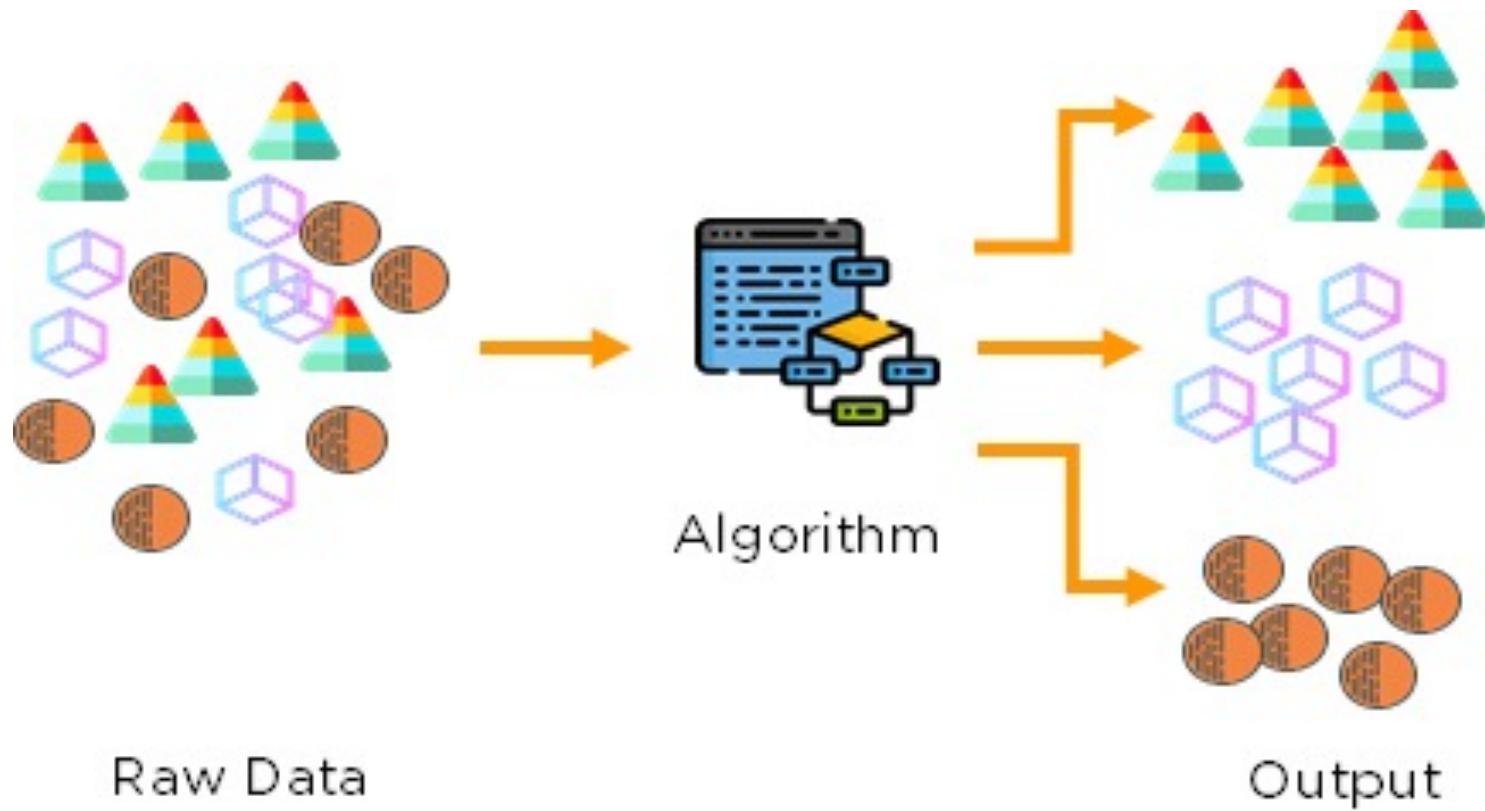
84°



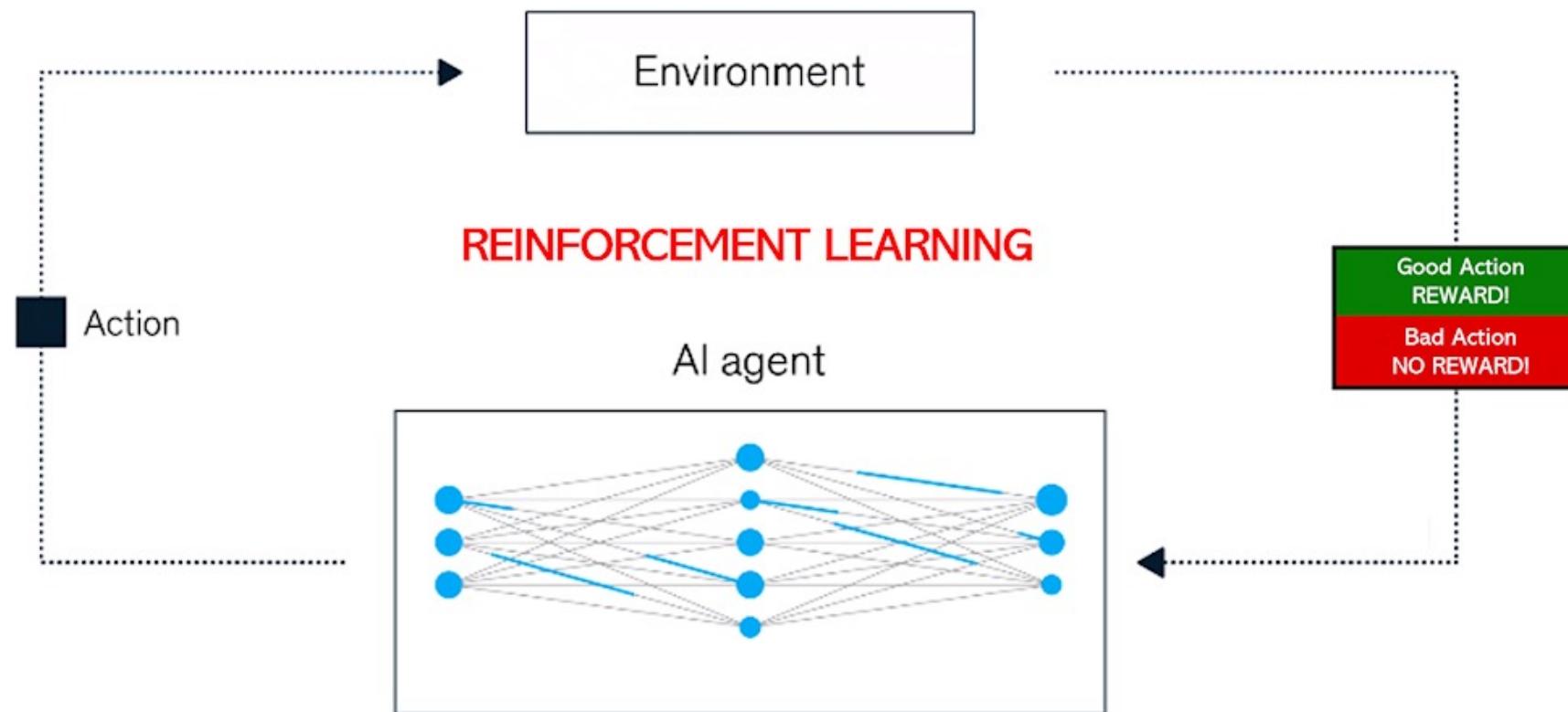
Fahrenheit

- Muito utilizado para previsões (clima, ações, mercado imobiliário, etc.)
- Existem as regressões linear, logística, polinomial, série de tempo e vetor de suporte

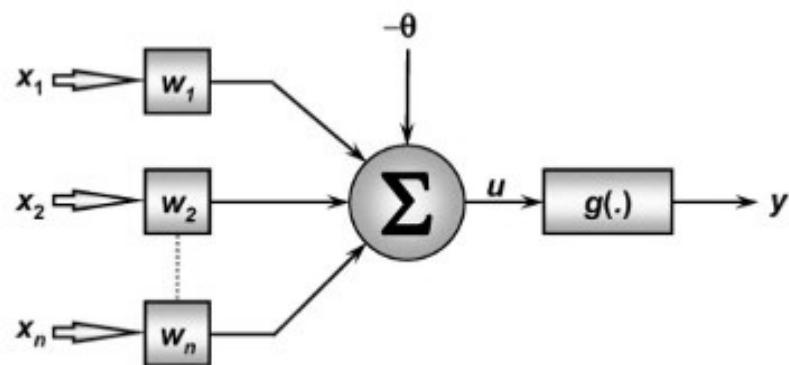
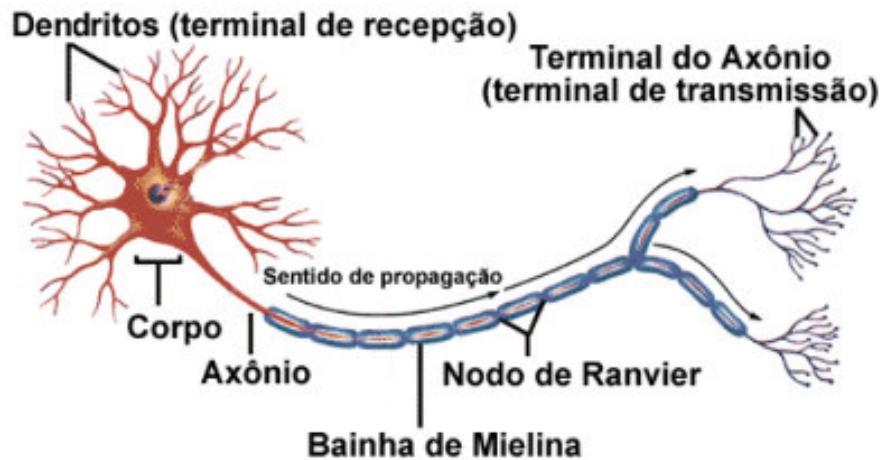
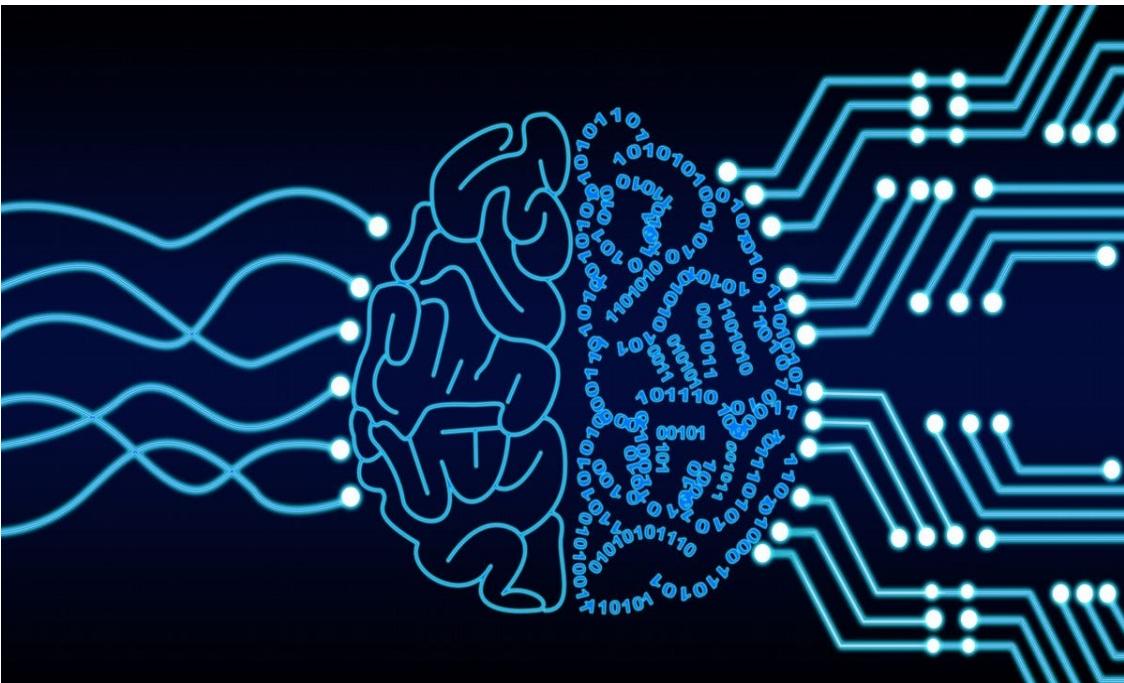
Aprendizado Não-Supervisionado



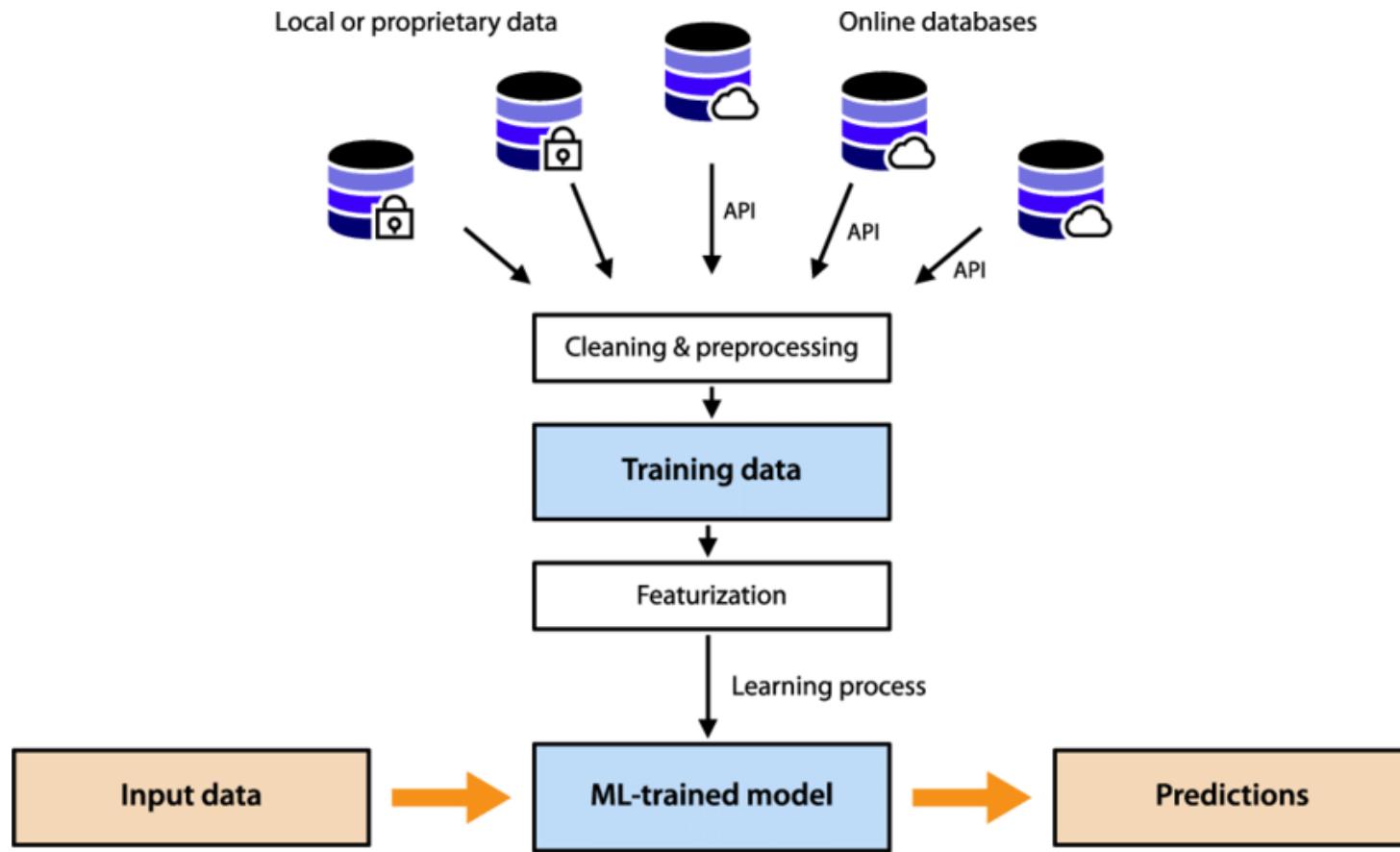
Aprendizado Por Reforço



Pausa Epistemológica



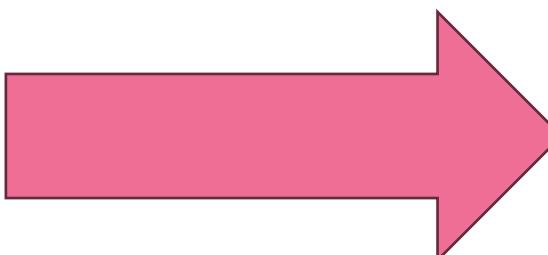
Simplificação de um algoritmo de ML



Categorias de Dados

- Imagens;
- Texto;
- Vídeos (Imagens);
- Áudio;
- Frequência;
- Vibração;

Convertido



Bytes, String, Int, etc....

Exemplos de Imagens Ruidosa



Imagen Original

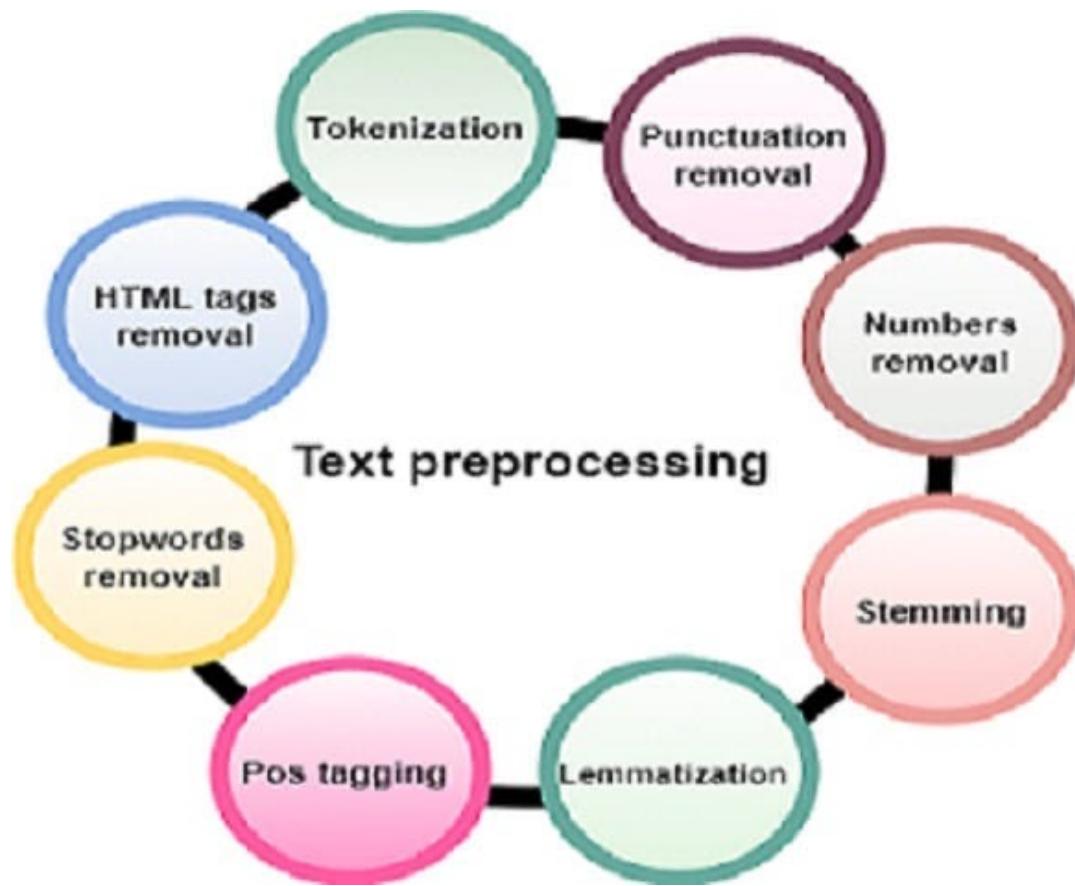


Ruído Sal e Pimenta /
Salt and pepper noise



Ruído Gaussiano /
Gaussian Noise

Exemplo prático para classificação de texto



Exemplos de Tabela Ruidosa

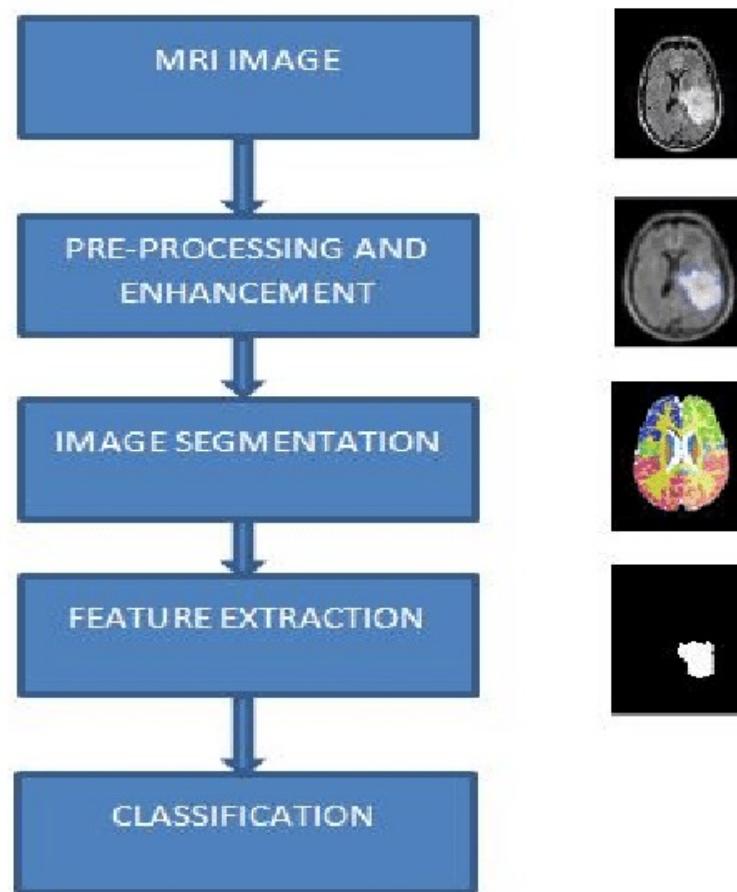
	A	B	C	D	E
1	Name	Email	Num Tickets	Discount Code	Delivery
2	Josie Zhao	jo@mail.com	2	BIRTHDAY	email
3	Sam Ochibe	s@sweb.com	1		pickup
4	Bart Simple	bart@simpson.org	5	STUDENT	yes
5	Ernie O'Malley	ernie.mail.com	0	none	email
6	Alvina Velasquez	alvie@schooledu	3	student	email
7	Zander	zandaman	10		email
8	Shweta Chowpatti	snc@this.org	three		pickup

Exemplo de CSV ruidoso

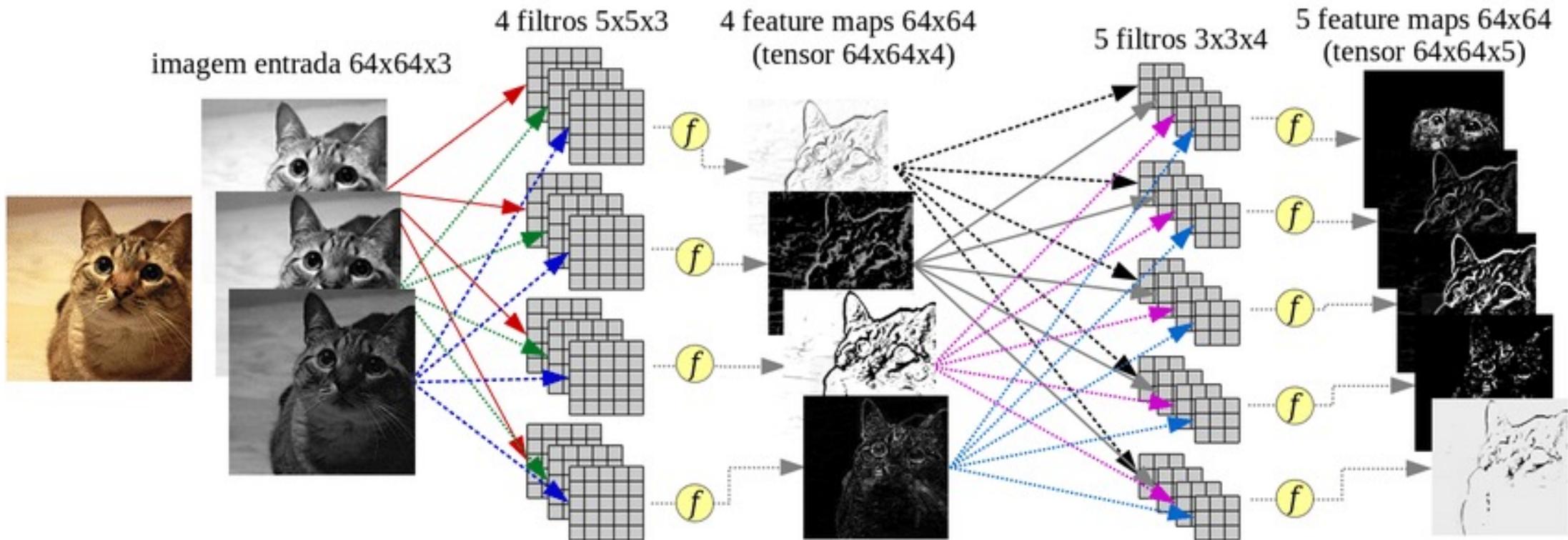
text	category
Hello,1	World,2
3	OpenAI,invalid
GPT-3.5,4 ,5	ChatGPT,
MissingCategory,	
Goodbye,6	

text	class
Hey I would like to have ur number,	politics
B4 I forget, thx!,	economics
Lemme get you a car,	buying,
I'm buying :D,	1423,
The car is Imgt4u! ?,	hey!, <3
<h1/>Hey,	Dude.,

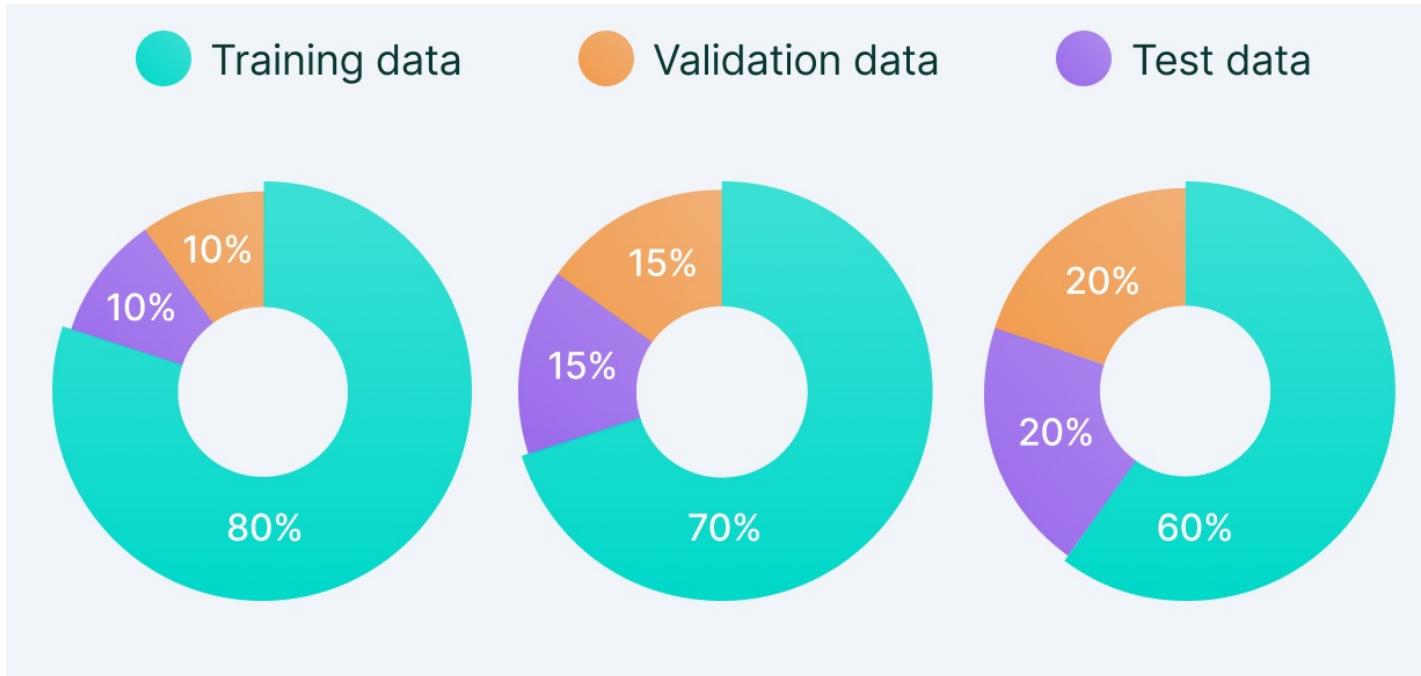
Exemplo prático para classificação de Imagem



Um Pouco Mais Sobre Classificação de Imagens

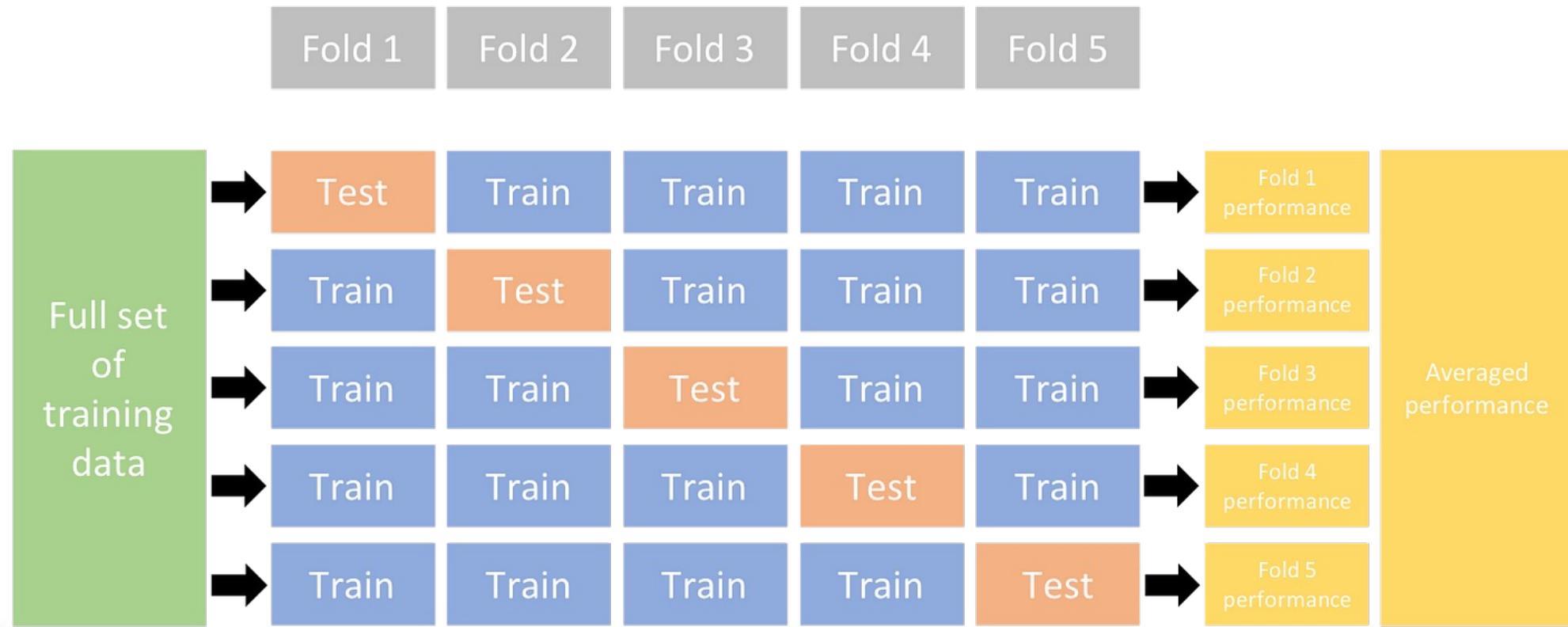


Divisão do Dataset



- **Training data:** Dados utilizados para treinamento dos modelos;
- **Test data:** Dados utilizados para teste do modelo;
- **Validation data:** Dados utilizados para validação (aplicação de métricas)

K-fold Cross Validation



Métricas

$$\text{MSE} = \frac{1}{n} \sum_{i=1}^n (Y_i - \hat{Y}_i)^2$$

Mean Square Error
(Loss Function)



Low accuracy
Low precision



High accuracy
Low precision



Low accuracy
High precision

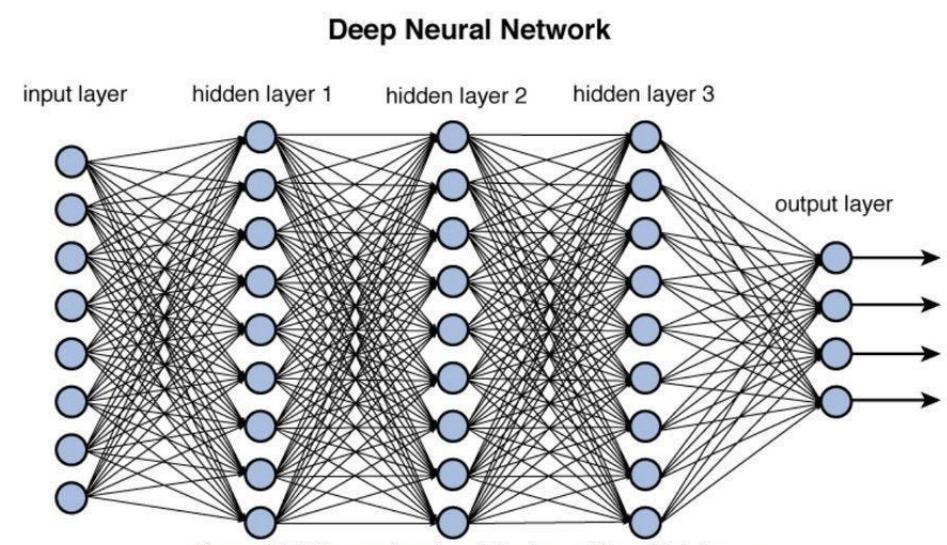
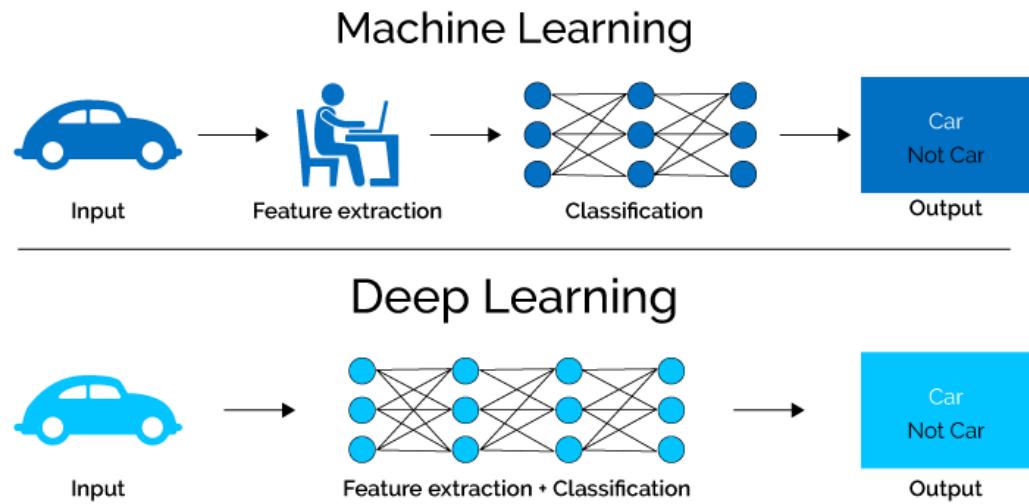


High accuracy
High precision

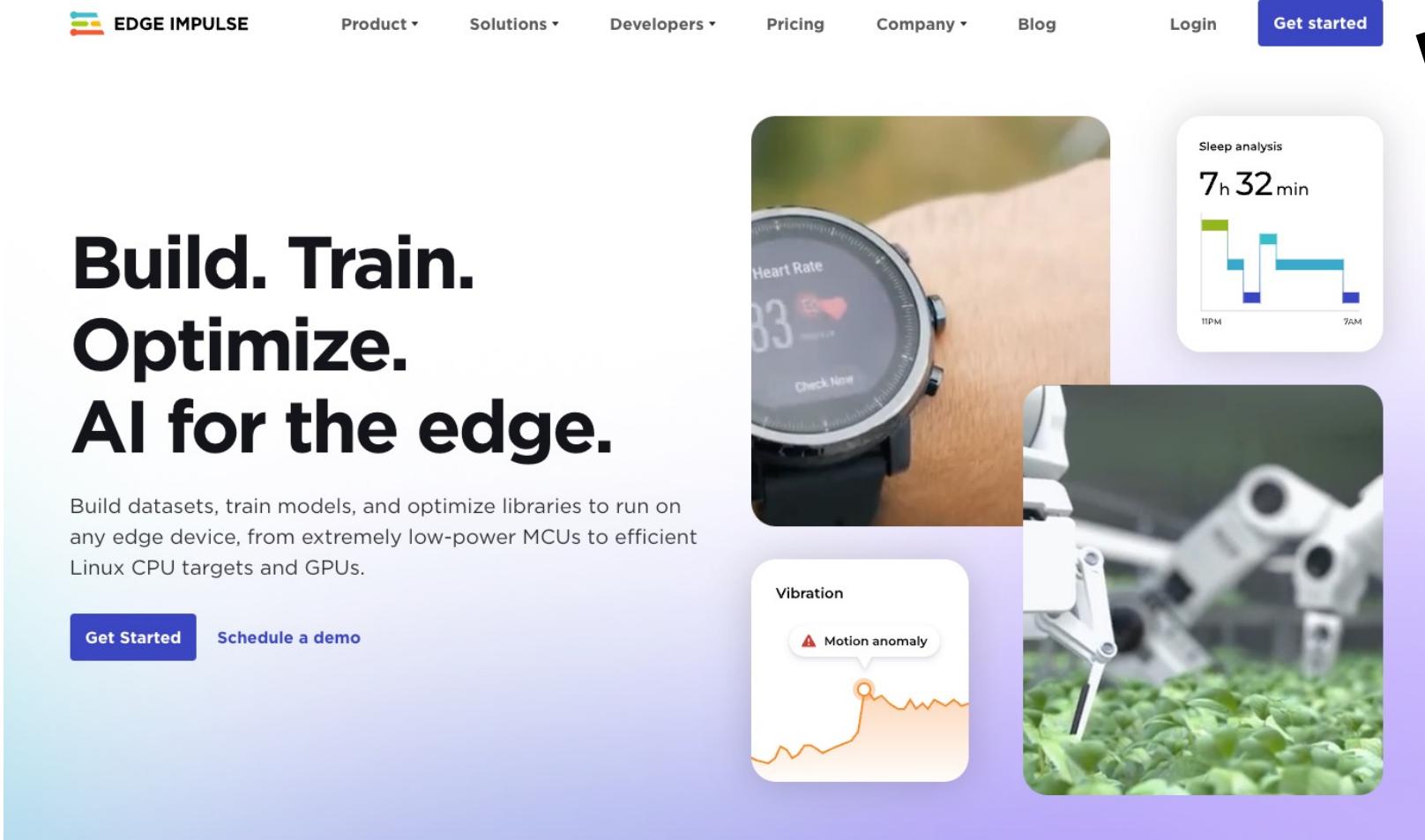
Métricas

		True Class	
		Positive	Negative
Predicted Class	Positive	TP	FP
	Negative	FN	TN
		Matriz de Confusão	

Deep Learning



Conhecendo o Edge Impulse



The screenshot shows the homepage of the Edge Impulse website. At the top, there is a navigation bar with links for Product, Solutions, Developers, Pricing, Company, Blog, Login, and a prominent blue "Get started" button. A large black arrow points from the right side towards this "Get started" button. Below the navigation, the main headline reads "Build. Train. Optimize. AI for the edge." in a large, bold, black font. To the right of the headline are three images: a smartwatch displaying a heart rate of 83, a graph titled "Sleep analysis" showing 7h 32 min of sleep, and a robotic arm interacting with green plants. At the bottom left, there are two calls-to-action: a blue "Get Started" button and a link to "Schedule a demo".

EDGE IMPULSE

Product ▾ Solutions ▾ Developers ▾ Pricing Company ▾ Blog Login Get started

Build. Train. Optimize. AI for the edge.

Build datasets, train models, and optimize libraries to run on any edge device, from extremely low-power MCUs to efficient Linux CPU targets and GPUs.

Get Started Schedule a demo

Heart Rate
83 Check Now

Sleep analysis
7h 32 min
11PM 7AM

Vibration
Motion anomaly

Robot arm interacting with plants

Criando o projeto

The screenshot shows a user interface for managing projects. On the left, there is a profile card for 'Victor Oliveira' featuring a teal circular icon with 'VO' and the name 'Victor Oliveira' below it. At the top right, there are two tabs: 'Projects' (which is selected) and 'Custom ML blocks'. Below the tabs, the word 'Projects' is displayed again, followed by a list of four projects. Each project entry consists of a teal circular icon with 'vo', the owner's name 'Victor Oliveira /', and the project name. To the right of each project name is a vertical ellipsis menu. A large black arrow points downwards towards the 'Create new project' button. The button is blue with white text and is located at the top right of the project list area.

Project Name	Owner
Victor Oliveira / Test	Victor Oliveira
Victor Oliveira / standard_cnn_classifier_car_truck	Victor Oliveira
Victor Oliveira / augmented_cnn_classifier_car_truck	Victor Oliveira
Victor Oliveira / moviment_detection	Victor Oliveira

Overview do Projeto

The screenshot shows the Edge Impulse project overview page for a project named "Victor Oliveira / capcomp".

Project info: Victor Oliveira / capcomp

Getting started: Start building your dataset or validate your model's on-device performance.

- Add existing data
- Collect new data
- Upload your model

Start with a tutorial: Not sure where to start? Follow a tutorial to build your first model in just minutes!

- Motion: Gesture recognition
- Images: Object detection
- Audio: Audio classification

Sharing: Your project is private. [Make this project public](#)

Collaborators (1/1): Victor Oliveira (OWNER)

Summary: DEVICES CONNECTED 0

Navigation: Project info, Keys, Export, Jobs

Left sidebar:

- Dashboard
- Devices
- Data acquisition
- Impulse design
 - Create impulse
- EON Tuner
- Retrain model
- Live classification
- Model testing
- Versioning
- Deployment

GETTING STARTED:

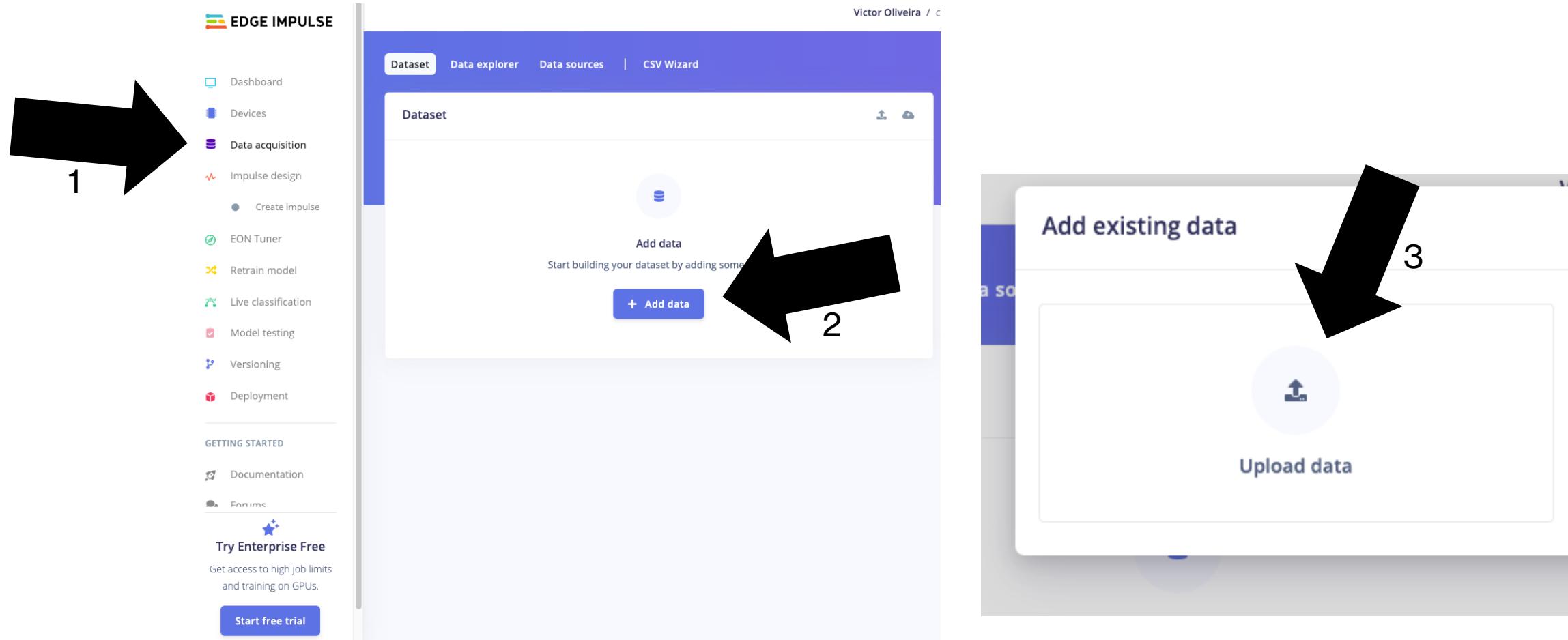
- Documentation
- Forums

Try Enterprise Free: Get access to high job limits and training on GPUs. [Start free trial](#)

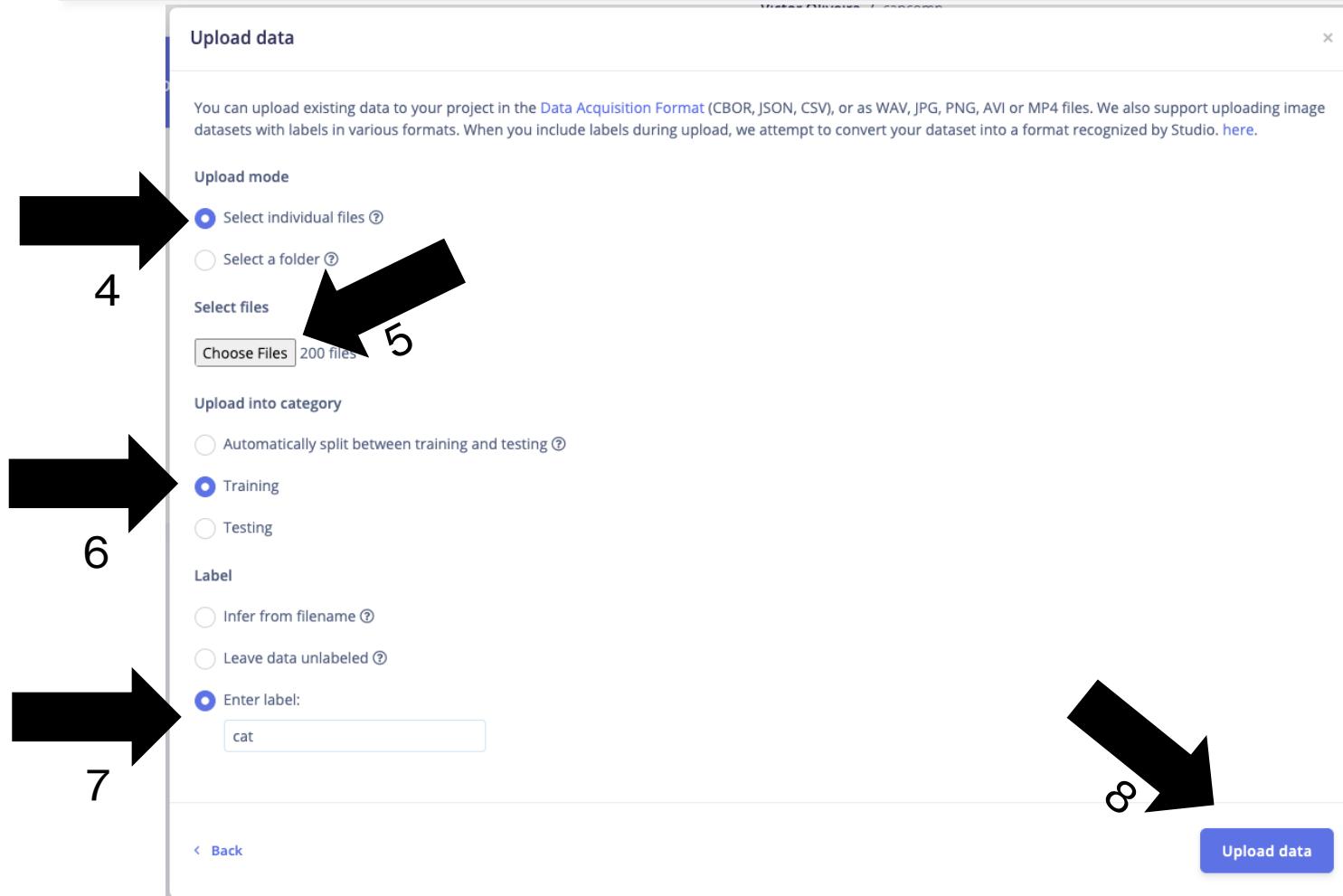
Link para o dataset

<https://encurtador.com.br/jEHPZ>

1º Passo: Carregar os Dados



1º Passo: Carregar os Dados



Atenção!

- 1) Carregue as 200 imagens para treinamento, e coloque a label 'cat';
- 2) Carregue as 50 imagens para teste, e coloque a label 'cat';
- 3) Carregue as 200 imagens para treinamento, e coloque a label 'dog';
- 4) Carregue as 50 imagens para teste, e coloque a label 'dog'.

1º Passo: Carregar os Dados

The screenshot shows a user interface for managing datasets. At the top, there are tabs for 'Dataset', 'Data explorer', 'Data sources', and 'CSV Wizard'. Below this, a summary section displays 'DATA COLLECTED' (500 items) and 'TRAIN / TEST SPLIT' (80% / 20%). The main area is titled 'Dataset' and contains a table with the following columns: SAMPLE NAME, LABEL, ADDED, and LENGTH. The table lists 400 training samples, all labeled 'dog' and added today at 19:48:15, with lengths indicated by three dots.

SAMPLE NAME	LABEL	ADDED	LENGTH
0197	dog	Today, 19:48:15	...
0190	dog	Today, 19:48:15	...
0199	dog	Today, 19:48:15	...
0198	dog	Today, 19:48:15	...
0196	dog	Today, 19:48:15	...
0195	dog	Today, 19:48:15	...
0194	dog	Today, 19:48:15	...
0191	dog	Today, 19:48:15	...
0192	dog	Today, 19:48:15	...
0193	dog	Today, 19:48:15	...

Sua Interface deve parecer com a imagem ao lado.

2o Passo: Design do Impulse

1

EDGE IMPULSE

- Dashboard
- Devices
- Data acquisition
- Impulse design
 - Create impulse

- EON Tuner
- Retrain model
- Live classification

- Model testing
- Versioning
- Deployment

GETTING STARTED

- Documentation
- Forums

Victor Oliveira / ca

An impulse takes raw data, uses signal processing to extract features, and then uses a learning block to classify new data.

Image data

Input axes

image

Image width: 32

Image height: 32

Resize mode: Fit shortest axis

For optimal accuracy with transfer learning blocks, use a 96x96 or 160x160 image size.

2

3

Add a processing block

Did you know? You can bring your own DSP code.

DESCRIPTION	AUTHOR	RECOMMENDED
Image Preprocess and normalize image data, and optionally reduce the color depth.	Edge Impulse ★	<button>Add</button>
Raw Data Use data without pre-processing. Useful if you want to use deep learning to learn features.	Edge Impulse	<button>Add</button>

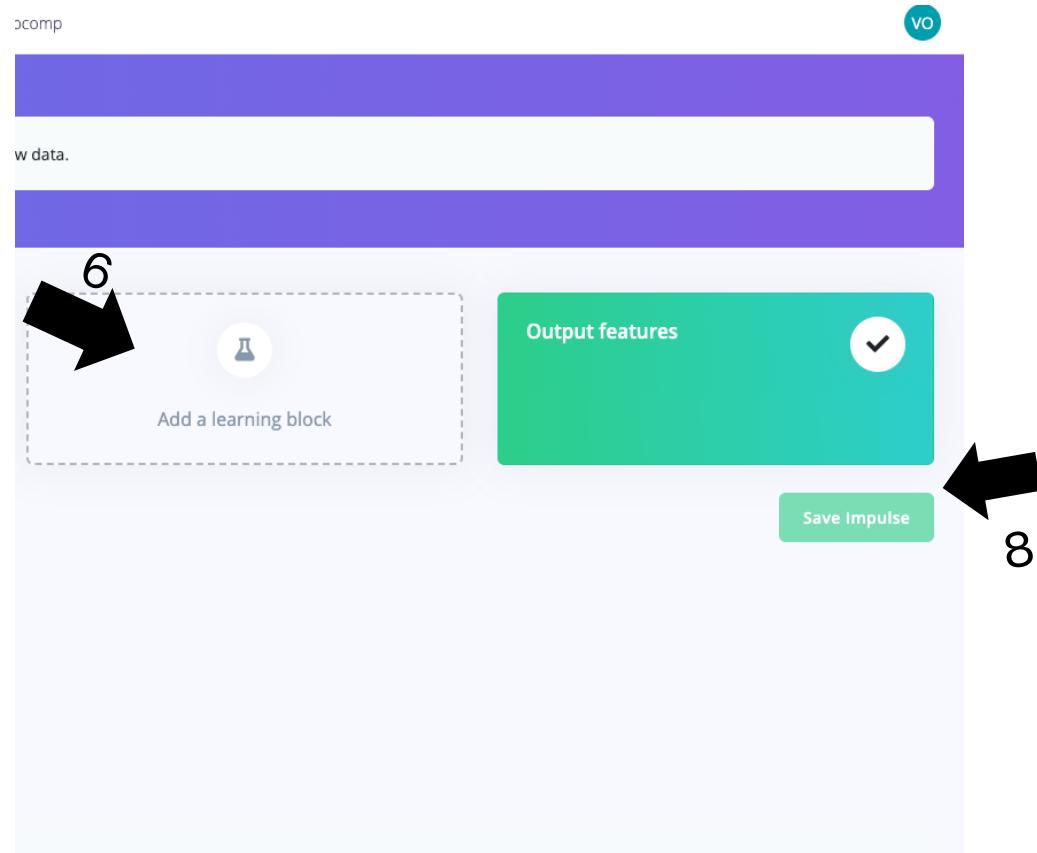
4

5

Add custom block

Cancel

2o Passo: Design do Impulse



Add a learning block

Did you know? You can bring your own model in PyTorch, Keras or scikit-learn.

DESCRIPTION	AUTHOR	RECOMMENDED
Transfer Learning (Images) Fine tune a pre-trained image classification model on your data. Good performance even with relatively small image datasets.	Edge Impulse	Add
EfficientNet B0 Transfer learning model based on efficientnetb0_notop.h5 weights. This is a much larger model than MobileNet for Linux devices and accelerators.	Community blocks	Add
Classification Learns patterns from data, and can apply these to new data. Great for categorizing movement or recognizing audio.	Edge Impulse	Add
Regression Learns patterns from data, and can apply these to new data. Great for predicting numeric continuous values.	Edge Impulse	Add
Classification - BrainChip Akida™ Learns patterns from data, and can apply these to new data. Great for categorizing movement or recognizing audio. ONLY FOR: BrainChip AKD1000 MINI PCIe board	BrainChip	Add
Transfer Learning (Images) - BrainChip Akida™ Fine tune a pre-trained image classification model on your data. Good performance even with relatively small image datasets. ONLY FOR: BrainChip AKD1000 MINI PCIe board	BrainChip	Add

Some learning blocks have been hidden based on the data in your project. [Show all blocks anyway](#)

A large black arrow labeled '7' points to the 'Add' button for the first recommended block.

2o Passo: Design do Impulse

The screenshot shows the Edge Impulse web interface. On the left, a sidebar lists various options: Dashboard, Devices, Data acquisition, Impulse design (which is highlighted with a red arrow labeled '9'), Create impulse, Image, Transfer learning, EON Tuner, Retrain model, Live classification, Model testing, Versioning, Deployment, and Try Enterprise Free. The main area has a purple header with the text '#1 Click to set a description for this version'. Below the header are two tabs: 'Parameters' (selected) and 'Generate features'. The 'Raw data' section contains a placeholder image and a 'Raw features' section with some hex code. The 'Parameters' section includes an 'Image' subsection where 'Color depth' is set to 'RGB'. At the bottom right of this section is a 'Save parameters' button. A large black arrow labeled '10' points to this button. To the right, another panel titled '#1 Click to set a description for this version' shows a 'Training set' with 400 items and 2 classes (cat, dog). A 'Generate features' button is at the bottom right of this panel. A large black arrow labeled '11' points to this button.

#1 Click to set a description for this version

Parameters Generate features

Raw data

Raw features

Parameters

Image

Color depth RGB

Save parameters

#1 Click to set a description for this version

Parameters Generate features

Training set

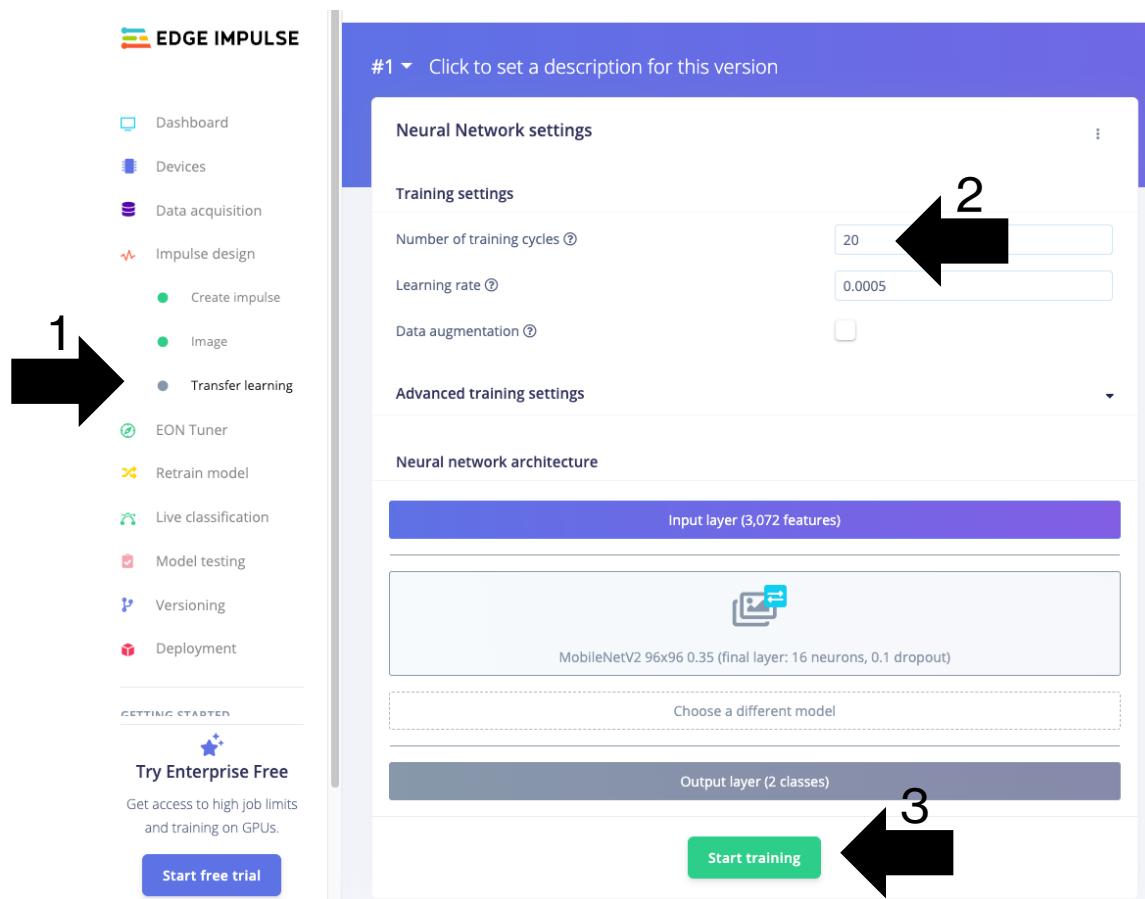
Data in training set 400 items

Classes 2 (cat, dog)

Generate features

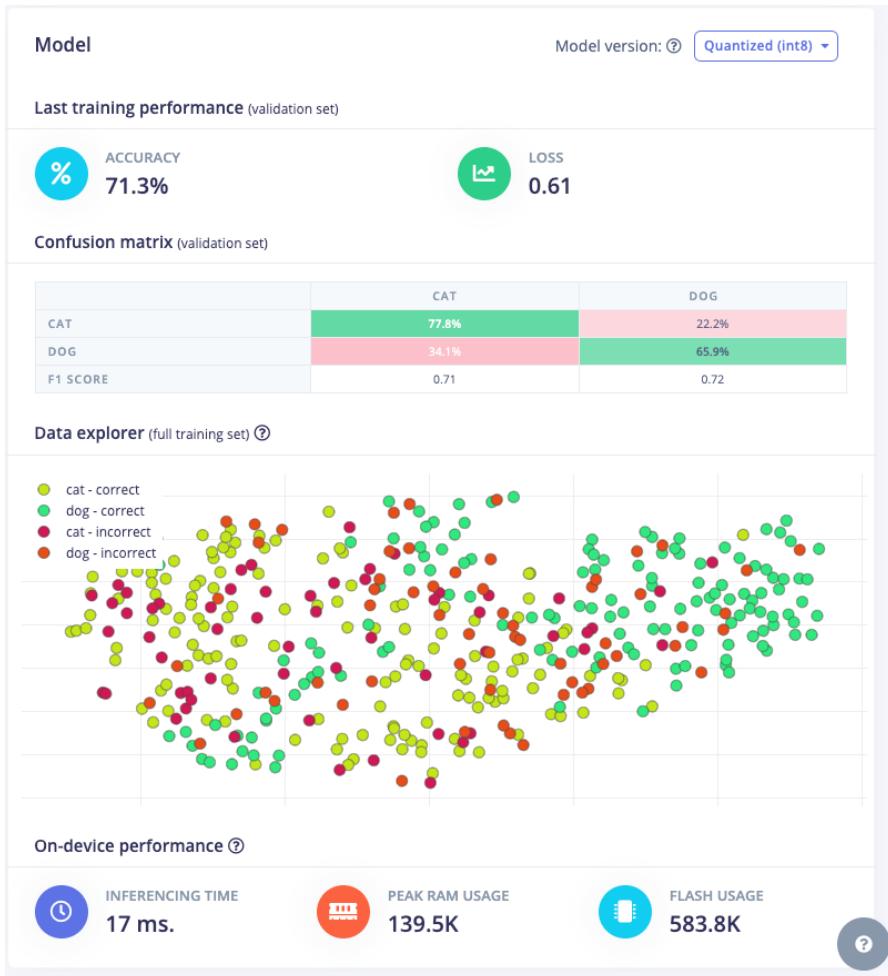
© 2023 EdgeImpulse Inc. All rights reserved

3o Passo: Realizando o Treinamento



→ (2) O parametro 'number of training cycles' é chamado de epochs (épocas).

Modelo Final



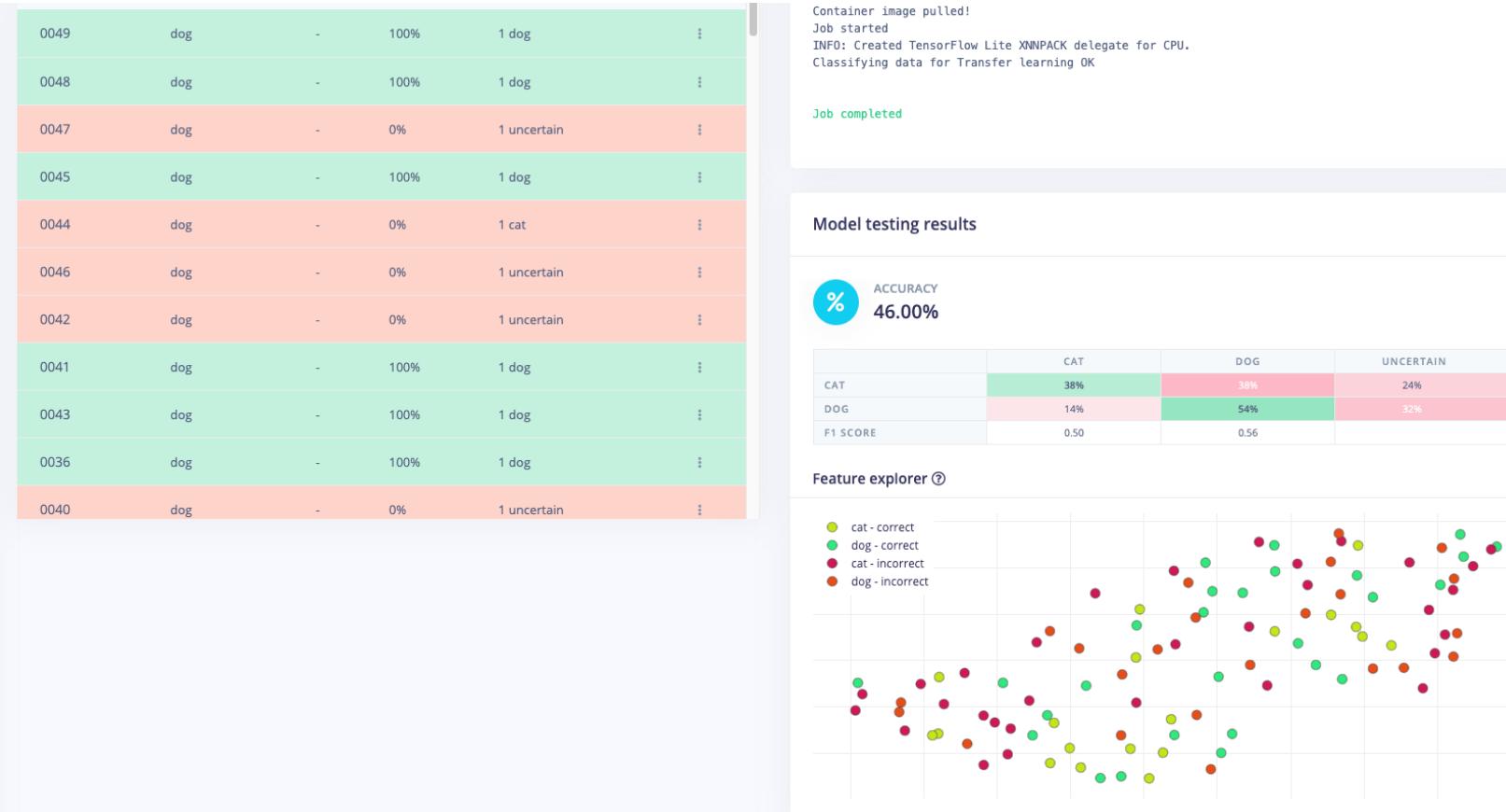
Seu modelo deve parecer com a imagem ao lado.

Testando o Modelo

The screenshot shows the Edge Impulse web interface. On the left, there's a sidebar with various navigation options: Dashboard, Devices, Data acquisition, Impulse design, Create impulse, Image, Transfer learning, EON Tuner, Retrain model, Live classification, Model testing (which is highlighted), Versioning, and Deployment. A large black arrow labeled '1' points from the 'Model testing' option in the sidebar to the main content area. The main content area has a blue header bar with the text: "This lists all test data. You can manage this data through [Data acquisition](#)". Below this is a table titled "Test data". The table has columns: SAMPLE NAME, EXPECTED OUTCOME, LENGTH, ACCURACY, and RESULT. There are nine rows, each containing the sample name 0049 through 0041, the expected outcome "dog", and a dash for length and accuracy. A green button labeled "Classify all" with a checkmark icon is located at the top right of the table. A second black arrow labeled '2' points to this button.

SAMPLE NAME	EXPECTED OUTCOME	LENGTH	ACCURACY	RESULT
0049	dog	-	-	
0048	dog	-	-	
0047	dog	-	-	
0045	dog	-	-	
0044	dog	-	-	
0046	dog	-	-	
0042	dog	-	-	
0041	dog	-	-	

Testando o Modelo



Seu modelo deve parecer com a imagem ao lado.

Deploy!

The screenshot shows the Edge Impulse web interface. On the left is a sidebar with various navigation items: Dashboard, Devices, Data acquisition, Impulse design, Create impulse, Image, Transfer learning, EON Tuner, Retrain model, Live classification, Model testing, Versioning, Deployment (which is selected), and Getting started. A large black arrow points to the 'Deployment' item. The main area has two sections: 'Configure your deployment' on the left and 'Run this model' on the right. The 'Configure your deployment' section includes a search bar, a 'DEFAULT DEPLOYMENT C++ library' section with a description, and a 'MODEL OPTIMIZATIONS' section with an 'Enable EON™ Compiler' toggle. The 'Run this model' section features a large black arrow pointing towards a QR code, with a 'Launch in browser' button below it.

Victor Oliveira / capcomp

EDGE IMPULSE

Dashboard

Devices

Data acquisition

Impulse design

Create impulse

Image

Transfer learning

EON Tuner

Retrain model

Live classification

Model testing

Versioning

Deployment

Getting started

Configure your deployment

You can deploy your impulse to any device. This makes the model run without an internet connection, minimizes latency, and runs with minimal power consumption. [Read more](#).

Search deployment options

DEFAULT DEPLOYMENT
C++ library

A portable C++ library with no external dependencies, which can be compiled with any modern C++ compiler.

MODEL OPTIMIZATIONS

Model optimizations can increase on-device performance but may reduce accuracy.

Enable EON™ Compiler Same accuracy, up to 50% less memory. [Learn more](#)

Quantized (int8)

	IMAGE	TRANSFER LEARNING	TOTAL
Selected ✓	1 ms.	17 ms.	18 ms.
LATENCY	1 ms.	17 ms.	18 ms.
RAM	4.0K	139.5K	139.5K
FLASH	-	583.8K	-
ACCURACY			-

Run this model

Scan QR code or launch in browser to test your prototype

Launch in browser

Escaneie o QR code com a câmera do seu celular.