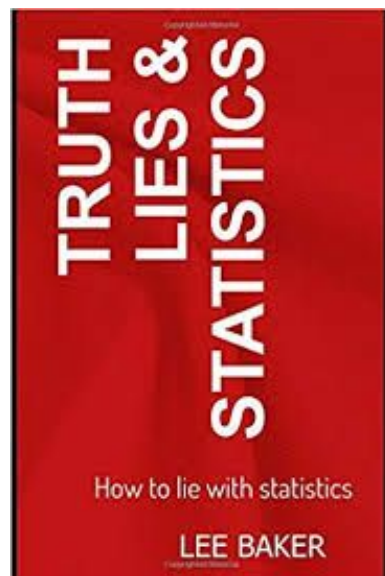


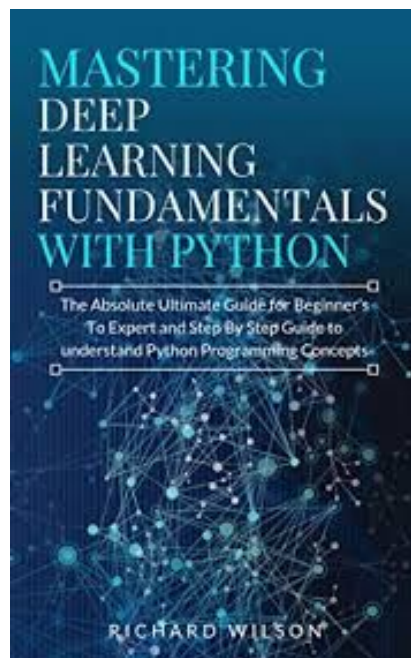
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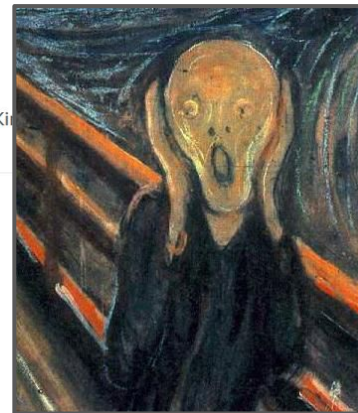
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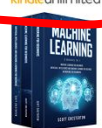
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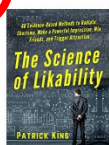


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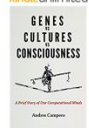
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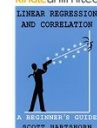
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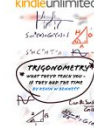
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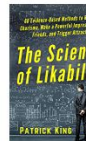
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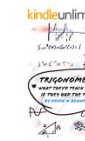
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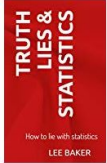
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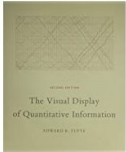
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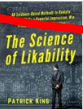


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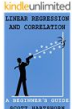
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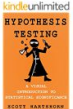
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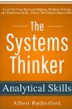
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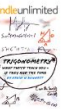
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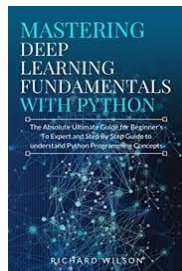
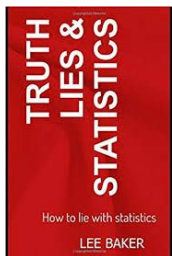
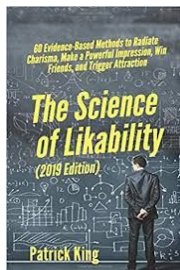
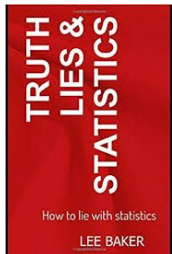
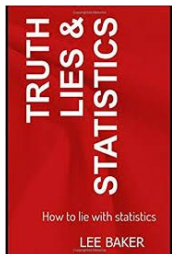
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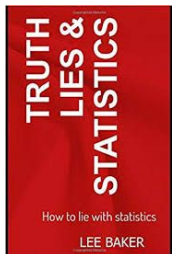


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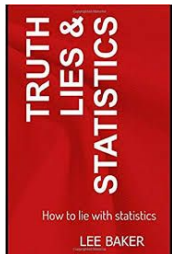
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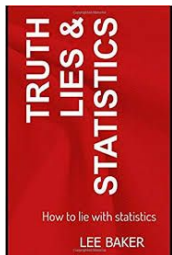
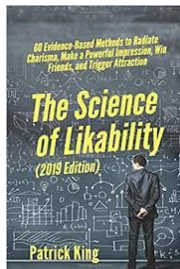
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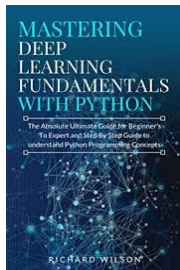
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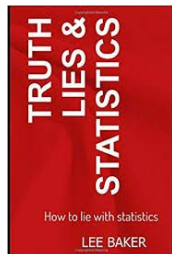


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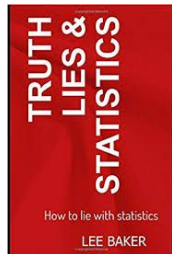




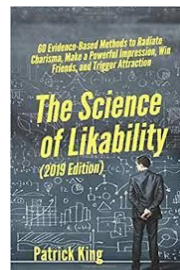
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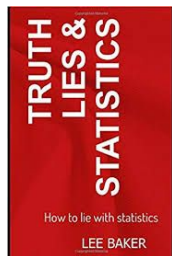
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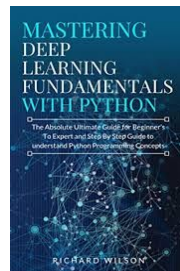
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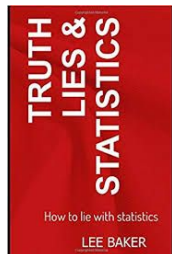


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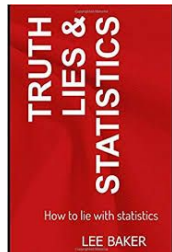




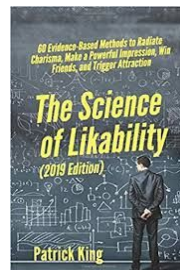
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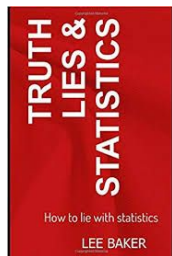
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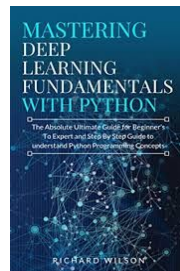
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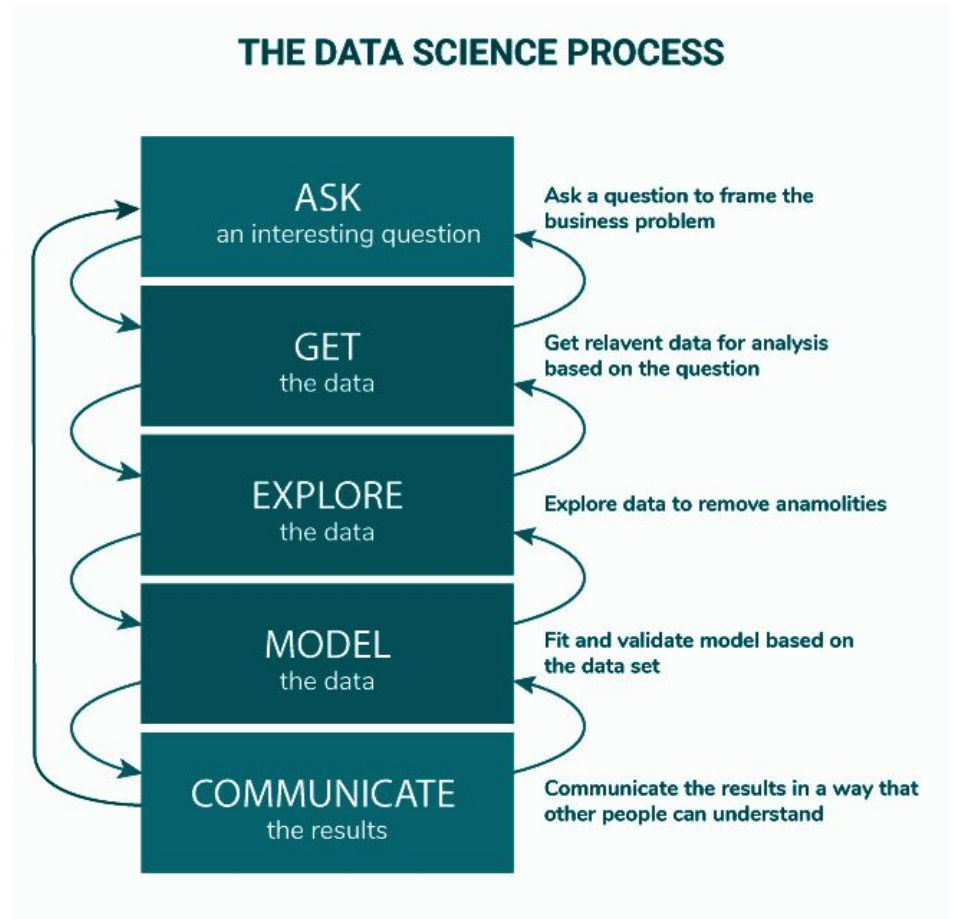


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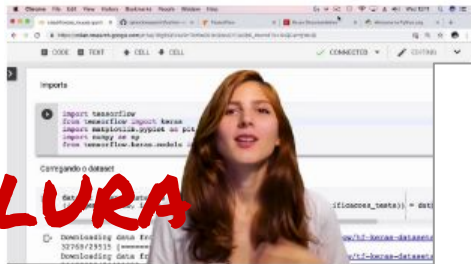


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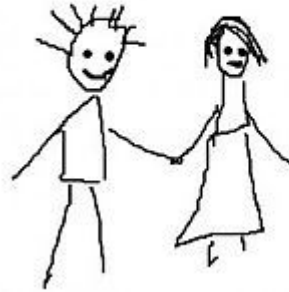
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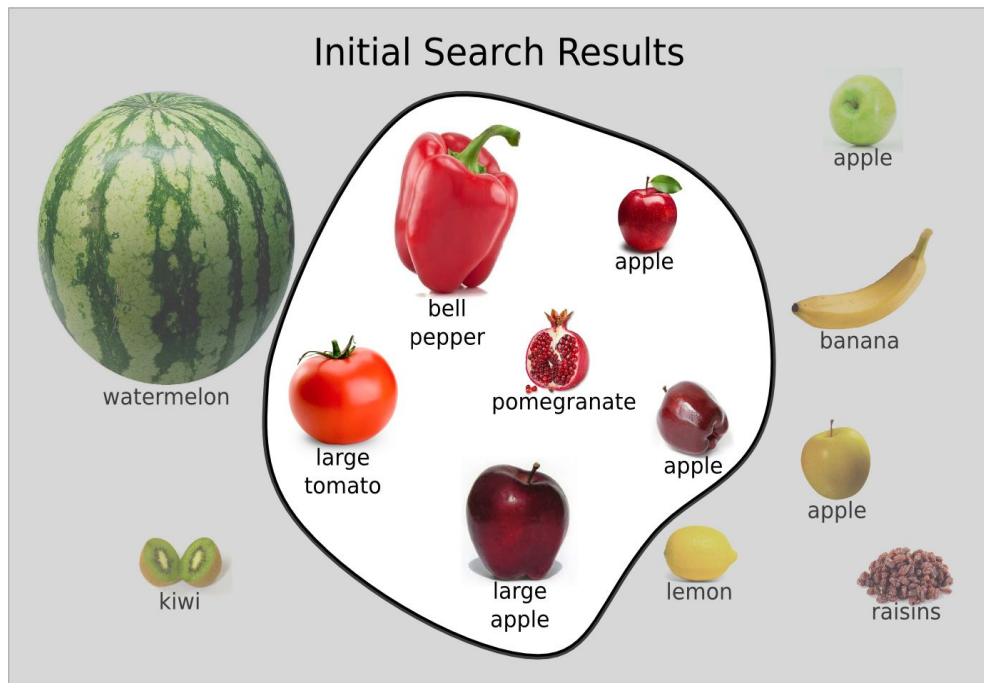


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# TRADE-OFF PRECISÃO E REVOCACÃO



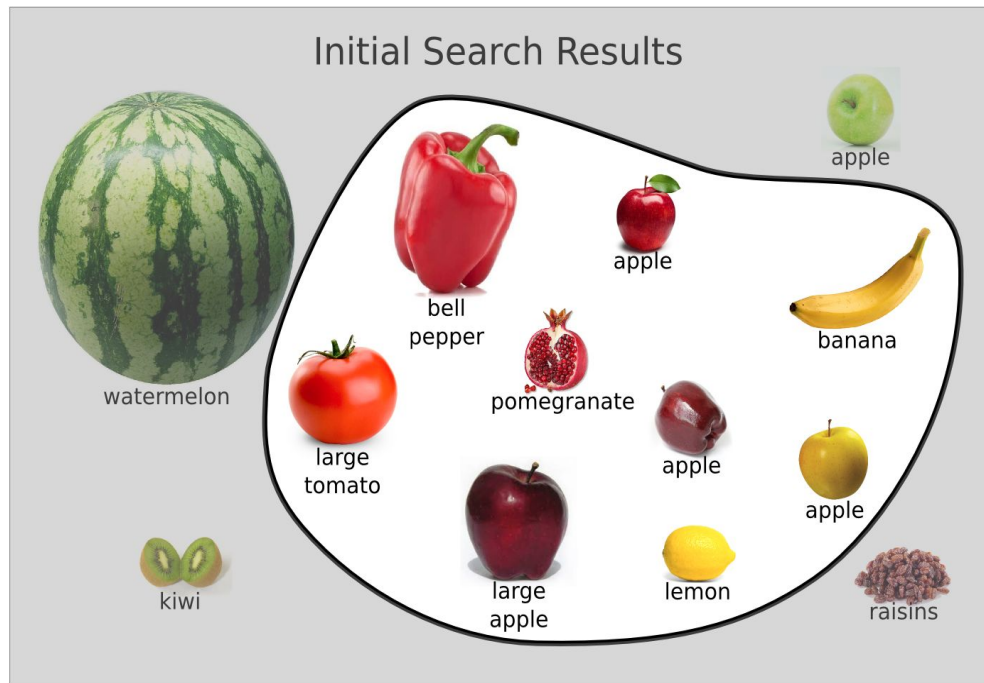
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precisão:  $3/6 = 50\%$

revocação:  $3/5 = 60\%$

acurácia:  $3+5/13 = 8/13 = 62\%$

# TRADE-OFF PRECISÃO E REVOCACÃO



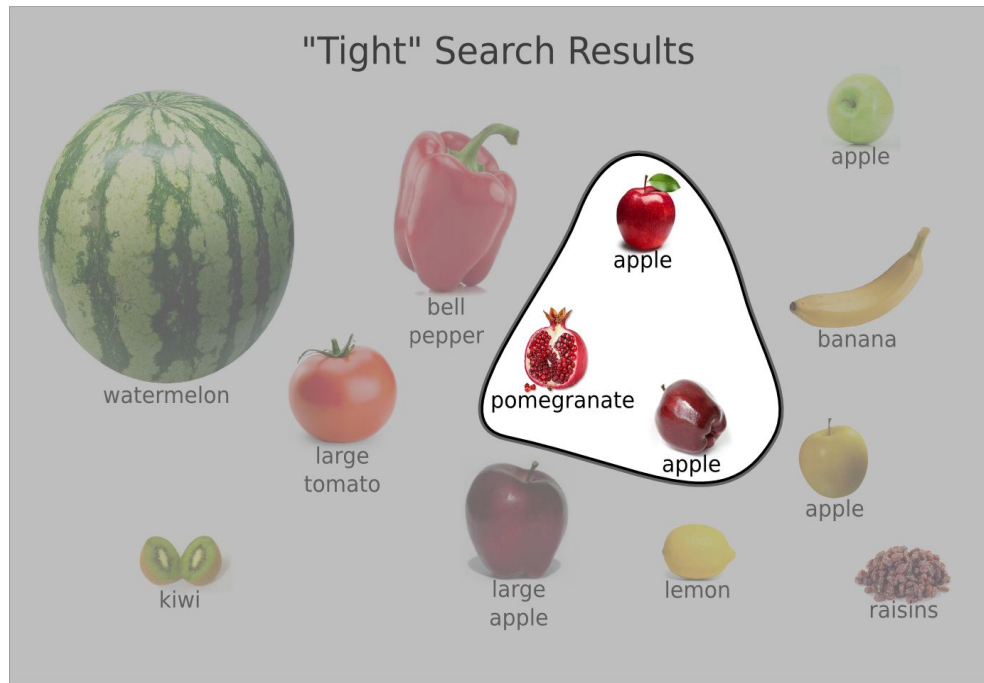
**2. FRUTA DE TAMANHO MÉDIO,  
VERMELHA OU AMARELA**

precisão:  $4/9 = 44\%$

revocação:  $4/5 = 80\%$

acurácia:  $3+4/13 = 7/13 = 54\%$

# TRADE-OFF PRECISÃO E REVOCACÃO



**3. FRUTA DE TAMANHO MÉDIO DE ATÉ 4 CM DE DIÂMETRO, VERMELHA**

precisão:  $2/3 = 67\%$

revocação:  $2/5 = 40\%$

acurácia:  $2+7/13 = 9/13 = 69\%$

# MÉTRICA F1

$$F1 = 2. \frac{Precision \times Recall}{Precision + Recall}$$

**1. FRUTA DE TAMANHO MÉDIO, VERMELHA**

precisão:  $3/6 = 0.5$   
revocação:  $3/5 = 0.6$

f1: 55%

**2. FRUTA DE TAMANHO MÉDIO, VERMELHA OU AMARELA**

precisão:  $4/9 = 0.4$   
revocação:  $4/5 = 0.8$

f1: 53%

**3. FRUTA DE TAMANHO MÉDIO DE ATÉ 4 CM DE DIÂMETRO, VERMELHA**

precisão:  $2/3 = 0.67$   
revocação:  $2/5 = 0.4$

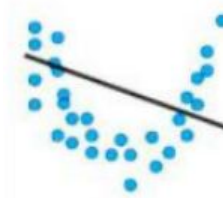
f1: 50%

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(OVERFIT)**

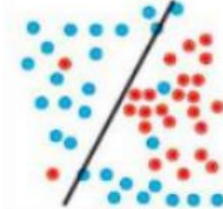
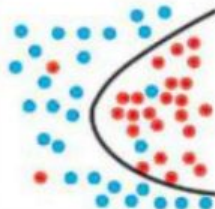
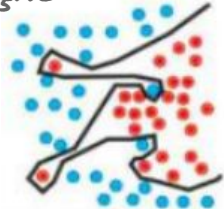
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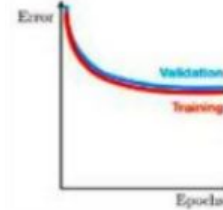
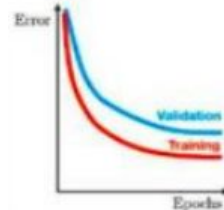
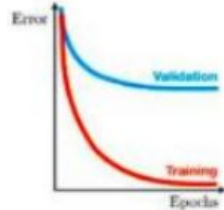
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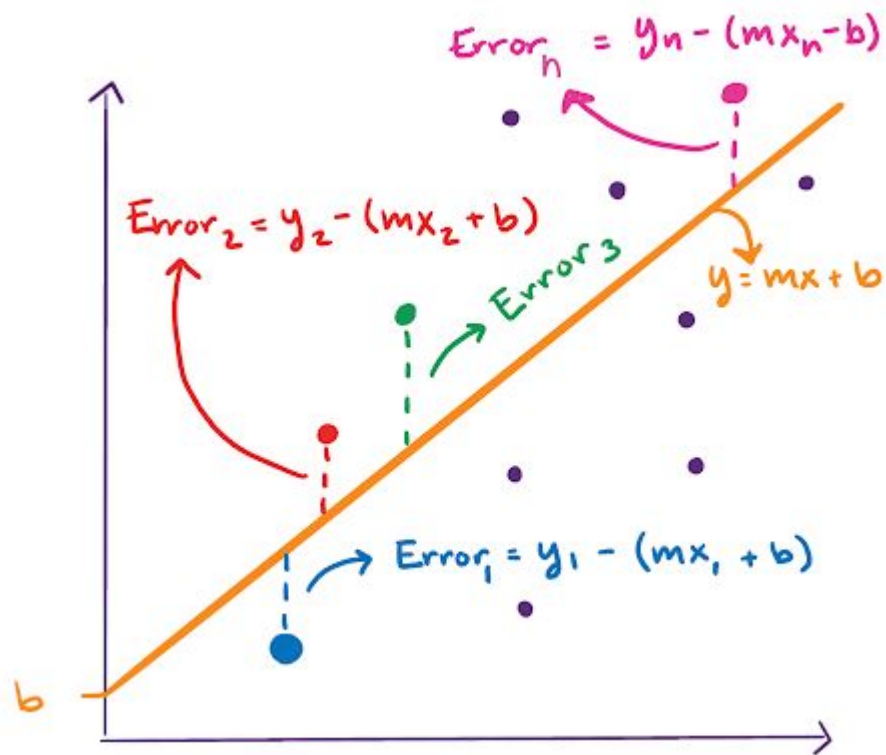
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# ERRO





## **SUB-AJUSTE (UNDERFIT)**

erro de treino alto  
erro de treino próximo ao erro de teste  
viés alto



TREINAR MAIS  
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## **CERTINHO**

erro de treino um pouco menor que erro de teste

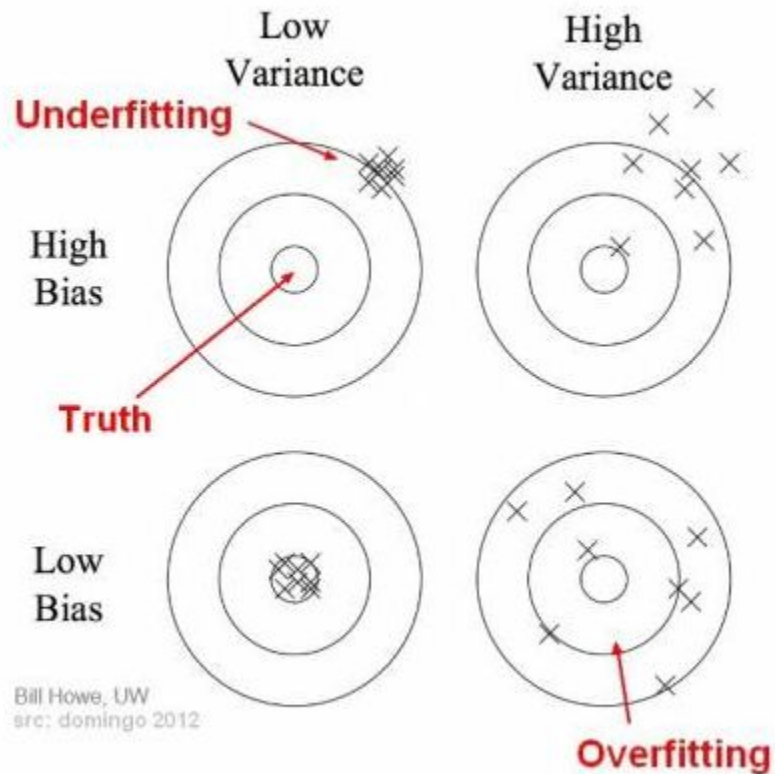
## **SOBRE-AJUSTE (OVERFIT)**

erro de treino baixo  
erro de treino muito menor que erro de teste  
variância alta

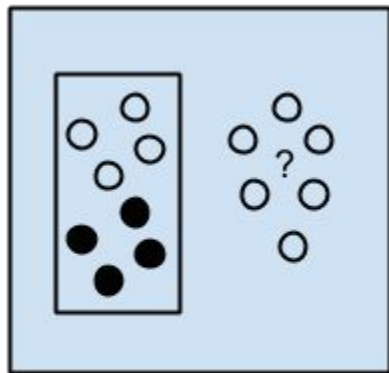


FAZER REGULARIZAÇÃO  
USAR MAIS DADOS

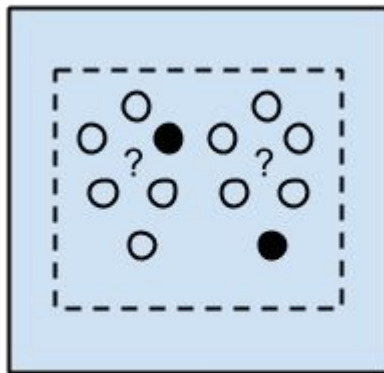
# TRADE-OFF VIÉS E VARIÂNCIA



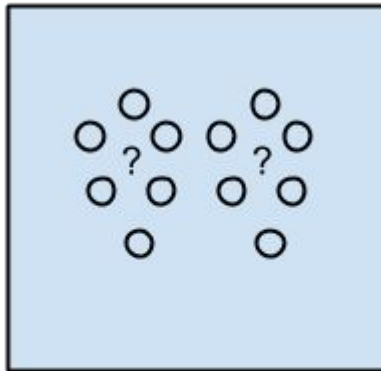
Bill Howe, UW  
src: domingo 2012



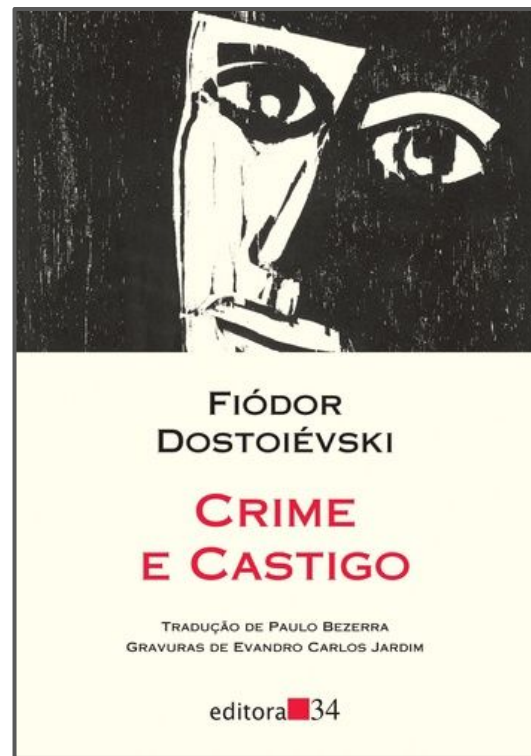
Supervised Learning  
Algorithms



Semi-supervised  
Learning Algorithms



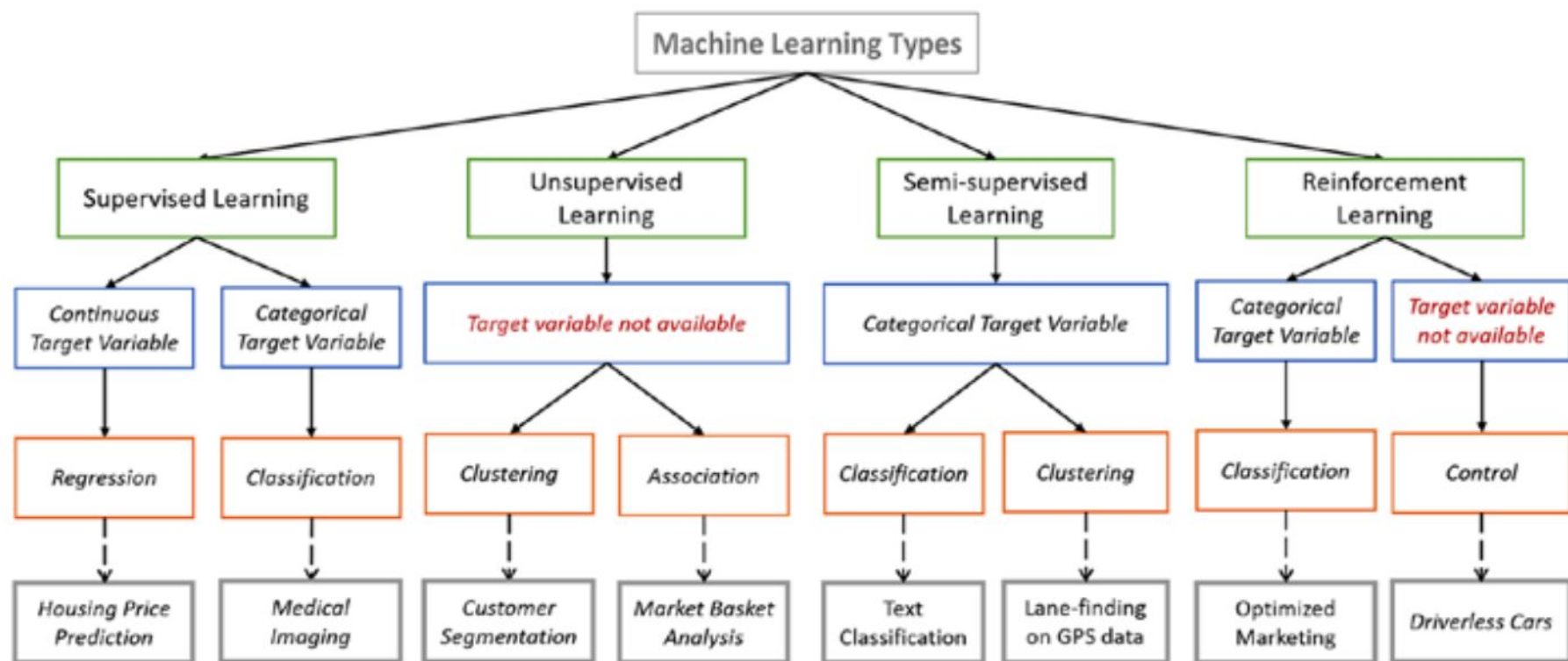
Unsupervised Learning  
Algorithms



Aprendizado por reforço

Tour vários algoritmos:

<https://machinelearningmastery.com/a-tour-of-machine-learning-algorithms/>



# LIVROS E KDD

[https://colab.research.google.com/drive/1\\_Y3M0zwbRnEwbSwkcWacRHy5fsuOC6s8?authuser=1](https://colab.research.google.com/drive/1_Y3M0zwbRnEwbSwkcWacRHy5fsuOC6s8?authuser=1)

# PROCESSAMENTO DE LINGUAGEM NATURAL

[https://colab.research.google.com/drive/1mJHPACX7H3EcsSfajDI58JNcEujKcQH7?authuser=1#scrollTo=kuCp3\\_2CaB1O](https://colab.research.google.com/drive/1mJHPACX7H3EcsSfajDI58JNcEujKcQH7?authuser=1#scrollTo=kuCp3_2CaB1O)

# MAIS APLICAÇÕES DE NLP

Cleanup, Tokenization

Stemming

Lemmatization

Part of Speech Tagging

Query Expansion

Parsing

Topic Segmentation and  
Recognition

Morphological Degmentation  
(Word/Sentences)

Information Retrieval and  
Extraction (IR)

Relationship Extraction

Named Entity Recognition  
(NER)

Sentiment Analysis/Sentence  
Boundary Disambiguation

World sense and  
Disambiguation

Text Similarity

Coreference Resolution

Discourse Analysis

Machine Translation

Automatic Summarization/  
Paraphrasing

Natural Language Generation

Reasoning over  
Knowledge Based

Quation Answering System

Dialog System

Image Captioning & other  
Multimodel Tasks

# Bert

## Bidirectional Encoder Representations for Transformers

<https://yashuseth.blog/2019/06/12/bert-explained-faqs-understand-bert-working/>

Como funciona:

<https://www.analyticsvidhya.com/blog/2019/06/understanding-transformers-nlp-state-of-the-art-models/>

Slides sobre BERT:

<https://www.slideshare.net/minhpgn/bert-pretraining-of-deep-bidirectional-transformers-for-language-understanding-126429863>



# APRENDIZAGEM DE MÁQUINA PROFUNDA

<https://colab.research.google.com/drive/1EGVpsDUMKjSmrtZcHzWysDzdeEhGbHRK?authuser=1>

# A mostly complete chart of Neural Networks

©2016 Fjodor van Veen - asimovinstitute.org

-  Backfed Input Cell
-  Input Cell
-  Noisy Input Cell
-  Hidden Cell
-  Probablistic Hidden Cell
-  Spiking Hidden Cell
-  Output Cell
-  Match Input Output Cell
-  Recurrent Cell
-  Memory Cell
-  Different Memory Cell
-  Kernel
-  Convolution or Pool

Perceptron (P)



Feed Forward (FF)



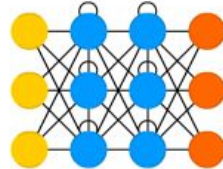
Radial Basis Network (RBF)



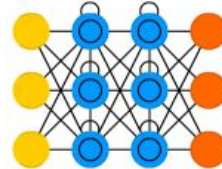
Deep Feed Forward (DFF)



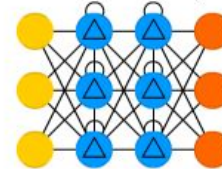
Recurrent Neural Network (RNN)



Long / Short Term Memory (LSTM)



Gated Recurrent Unit (GRU)



Auto Encoder (AE)



Variational AE (VAE)



Denoising AE (DAE)

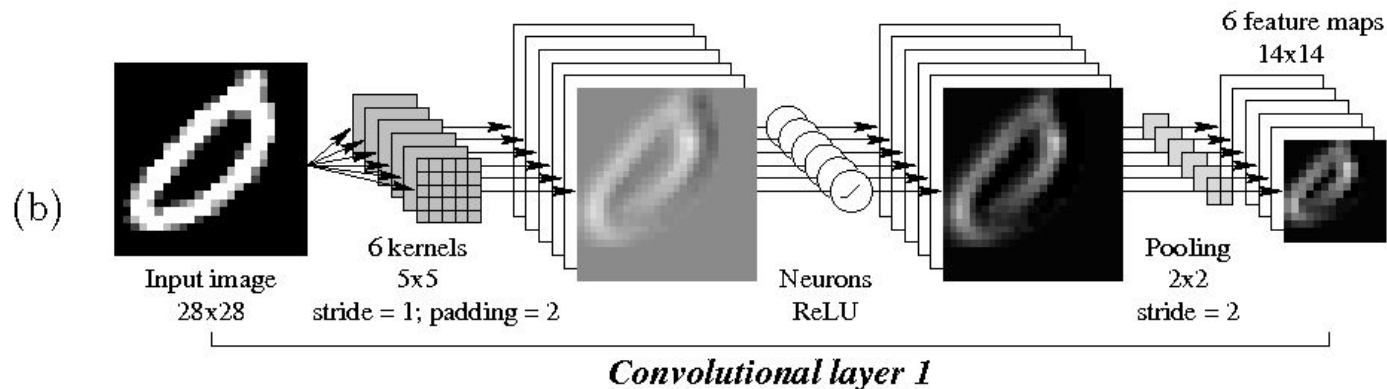
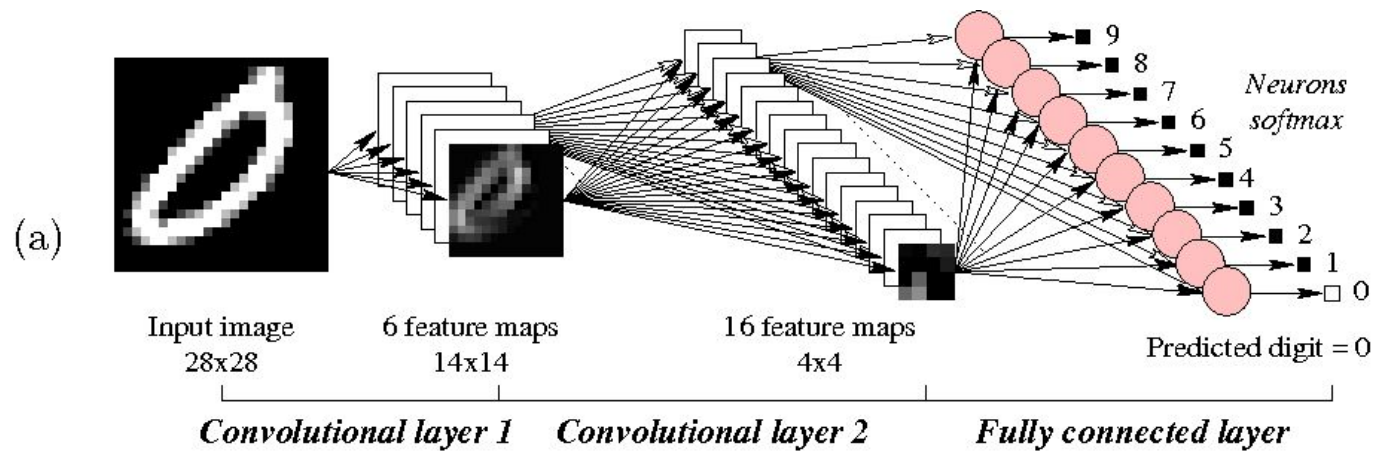


Sparse AE (SAE)



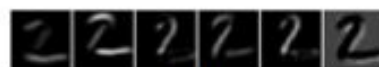
Intro MIT:

<https://www.youtube.com/watch?v=O5xeyoRL95U>

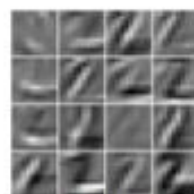




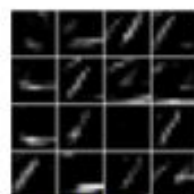
conv1



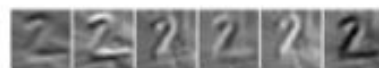
relu1



conv2



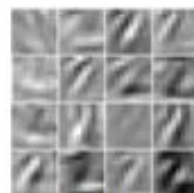
relu2



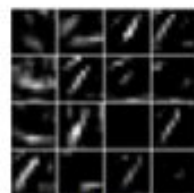
conv1



relu1



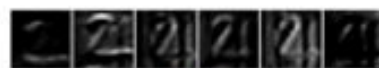
conv2



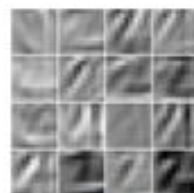
relu2



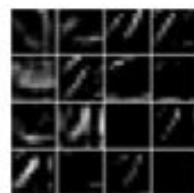
conv1



relu1



conv2



relu2



**SHIP**  
**CAR(99.7%)**



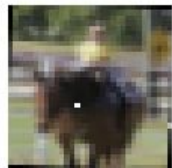
**HORSE**  
**FROG(99.9%)**



**DEER**  
**AIRPLANE(85.3%)**



**DEER**  
**DOG(86.4%)**



**HORSE**  
**DOG(70.7%)**



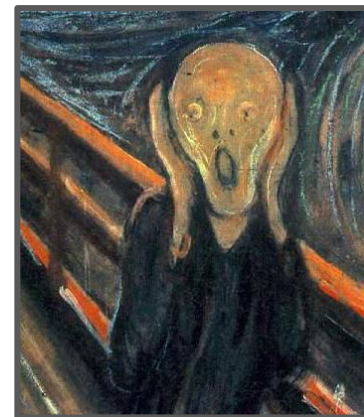
**DOG**  
**CAT(75.5%)**



**BIRD**  
**FROG(86.5%)**



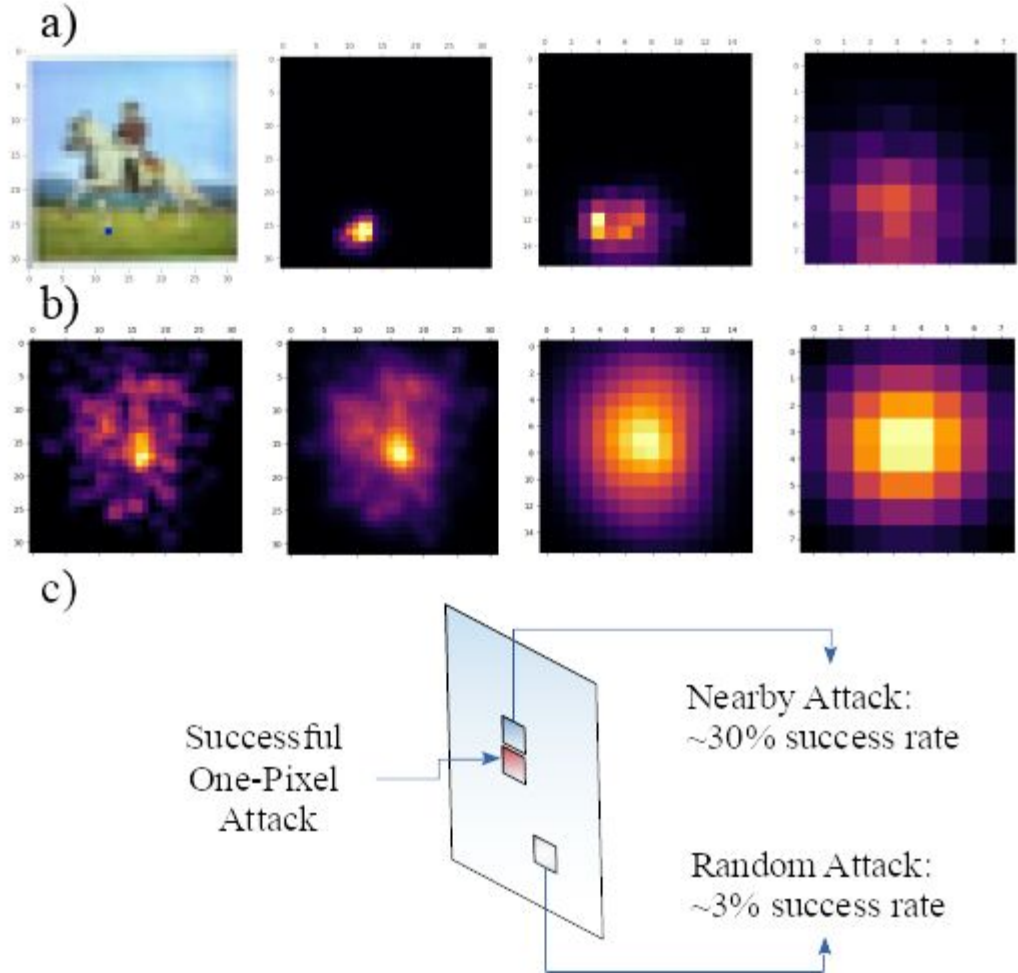
**BIRD**  
**FROG(88.8%)**



One pixel attack paper:  
<https://arxiv.org/abs/1710.08864>

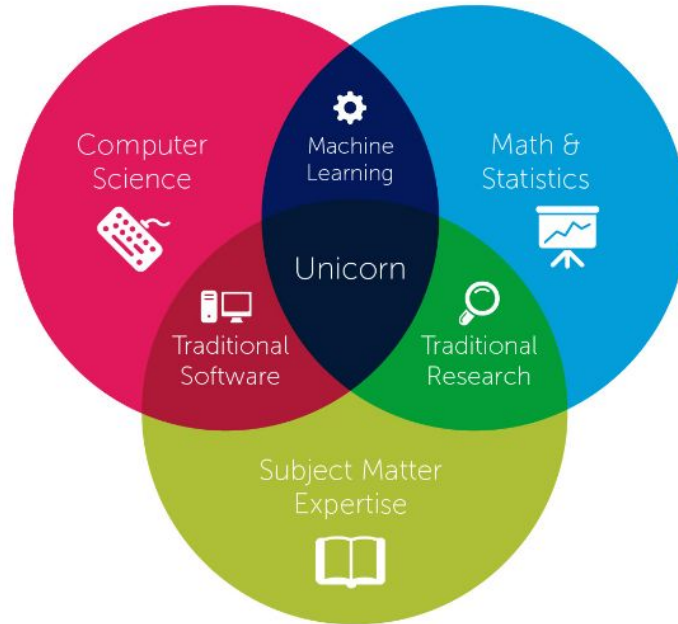
Successful one-pixel attacks were shown to grow its influence throughout the layers, culminating in a strong and spread influence in the last layers.

paper: Understanding the One-pixel Attack: Propagation Maps and Locality Analysis



CIENTISTA DE DADOS É  
UNICÓRNIO?

# SERÁ QUE ALGUÉM GOSTA?





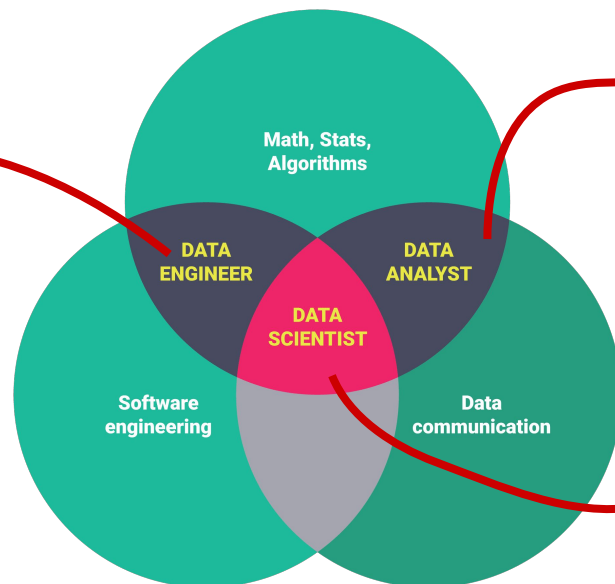
# DIVISÃO DO MERCADO

SPARK

HADOOP

AWS LAMBDA

ELASTICSEARCH



POWER BI

TABLEAU

