

# NerdZão Portugal

## Machine Learning:

An introduction for Developers  
(part. 1 & 2)

AUGUST / SEPTEMBER

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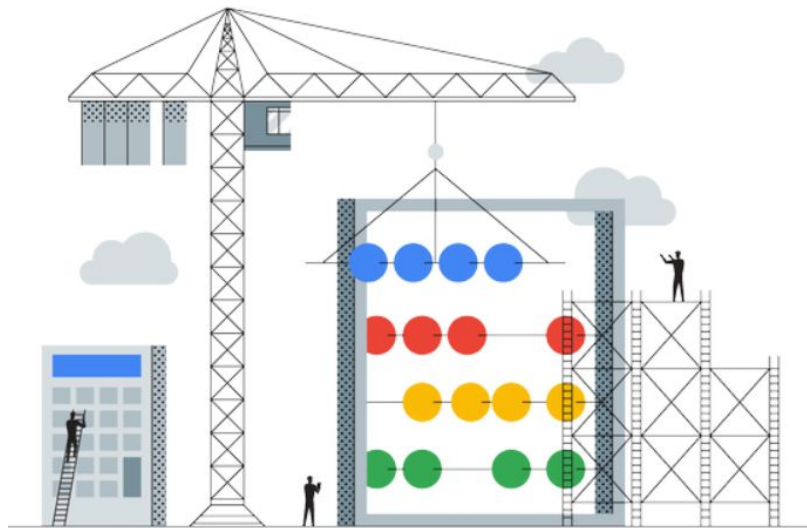


# | Agenda

1. What is Machine Learning?
  - History
  - Why only in recent years?
  - Objectives
2. Main types of machine learning algorithms & Technologies
3. Demonstration 1
4. Metrics
5. Consuming Models
6. Black-box
7. Demonstration 2
8. Starting the study

Machine Learning : An introduction for Developers

# History



[A history of Machine Learning](#)

## **| Why only in recent years?**

- If Machine Learning is so old, why is it only in recent years that technologies that use statistical models are emerging?

## Why only in recent years?

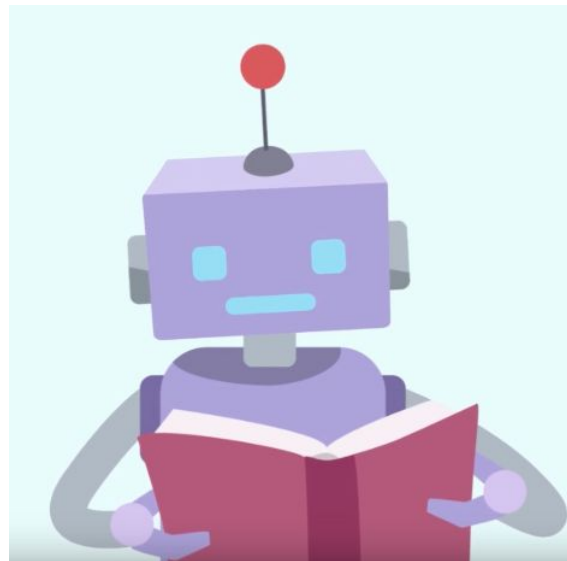
- If Machine Learning is so old, why is it only in recent years that technologies that use statistical models are emerging?

Mainly because of



# | What is Machine Learning?

- Machine Learning is a subfield of Artificial Intelligence, which was developed from the study of pattern recognition and computational learning.
- Machine learning as a "*field of study that **gives computers the ability to learn without being explicitly programmed***".  
[1] Arthur Samuel, 1959



[1] [Some Studies in Machine Learning Using the Game of Checkers - 1959](#)

# **| Objectives**

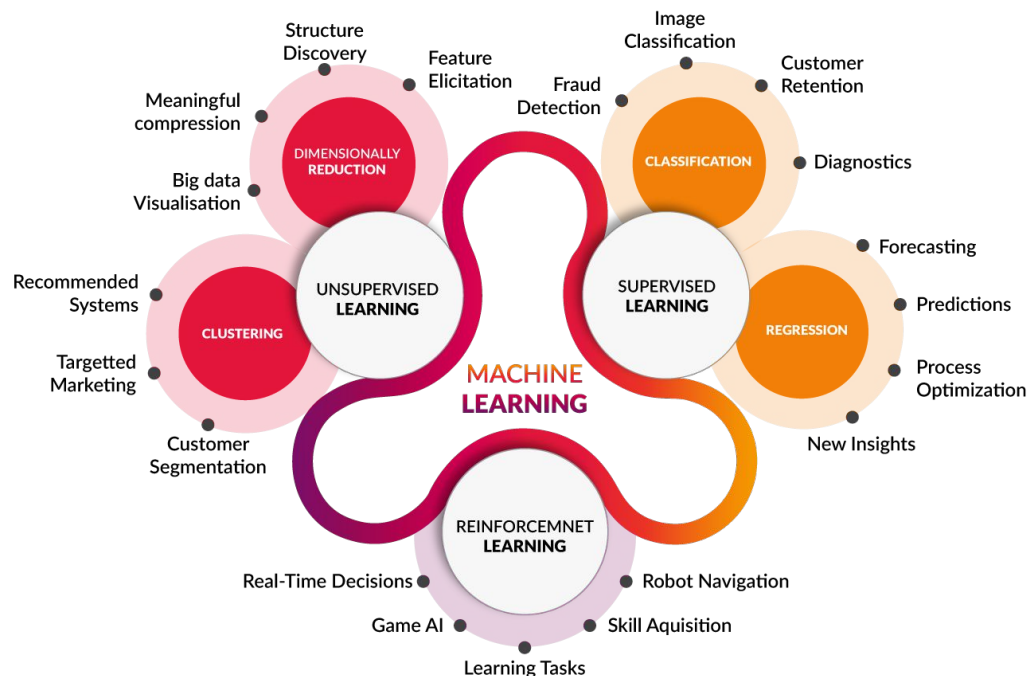
- The purpose of Machine Learning is to build computational models that can adapt and learn from experience. [2] Tom M. Mitchell, 1997
- In practical terms, machine learning algorithms aim to discover the relationship between the variables of a system (input / output) from data. [3] Cherkassky & Mulier, 2007

[2] [Machine Learning - 1997](#)

[3] Learning from Data: Concepts, Theory, and Methods 2nd Edition - 2007

# | Main types of machine learning algorithms

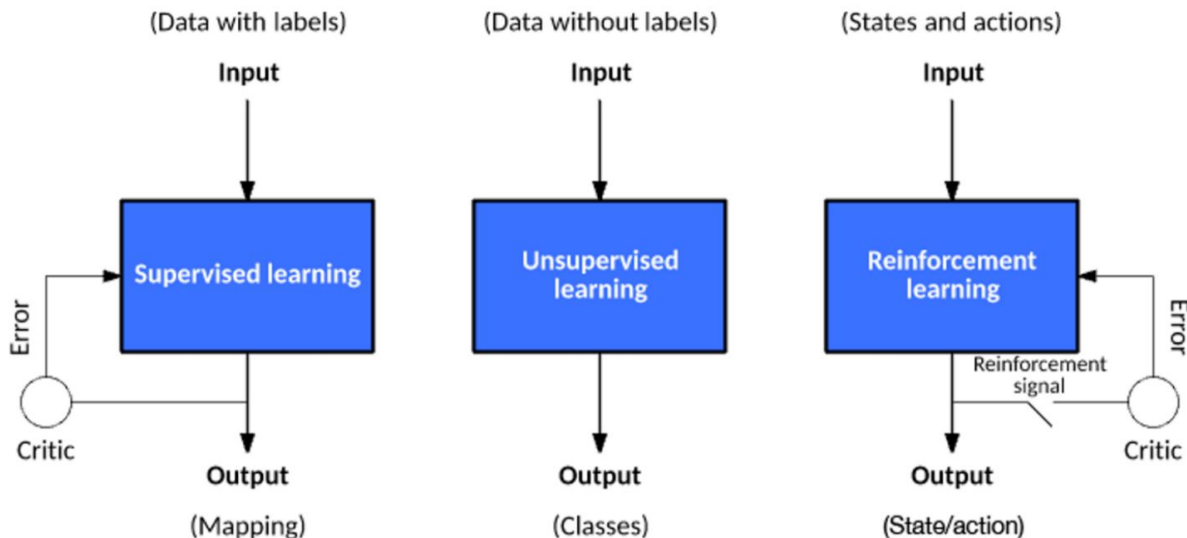
- There are three main types of machine learning algorithms.





# | Main types of machine learning algorithms

- Basic idea of each type:



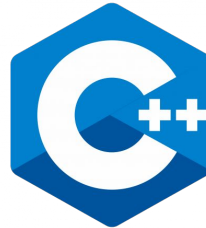
Algorithm Reinforcement learning: [Markov Decision Process](#)  
Super Mario Bros: Marl/O - [Machine Learning for Video Games](#)

# | Technologies

Languages used to work with Machine Learning algorithms:



Microsoft  
**SQL Server**



## **Demonstration 1**

- In this demo, I show the difference in practice between supervised and unsupervised Machine Learning. ([source code](#))



**Iris Versicolor**

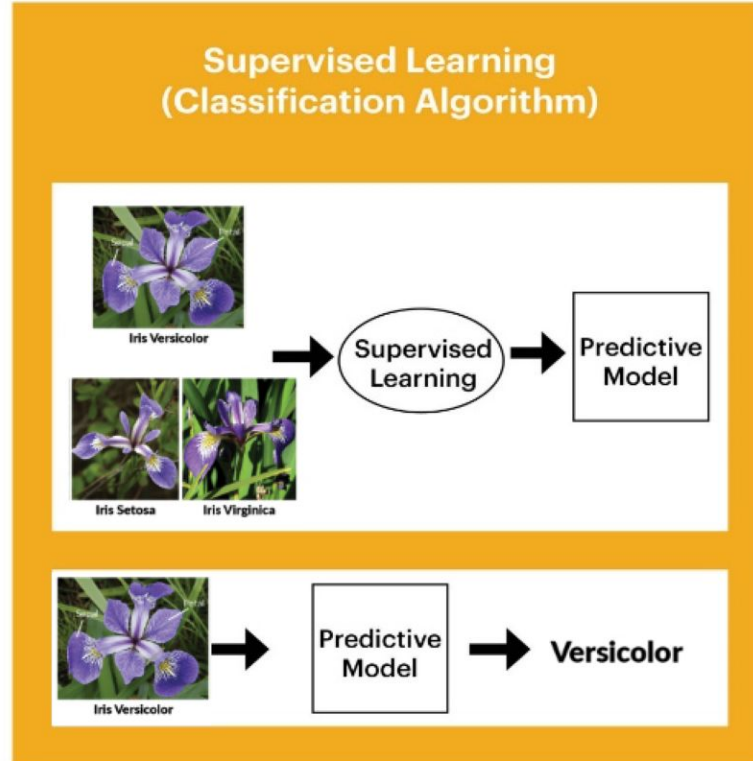


**Iris Setosa**



**Iris Virginica**

# Demonstration 1 : Flow Supervised Learning

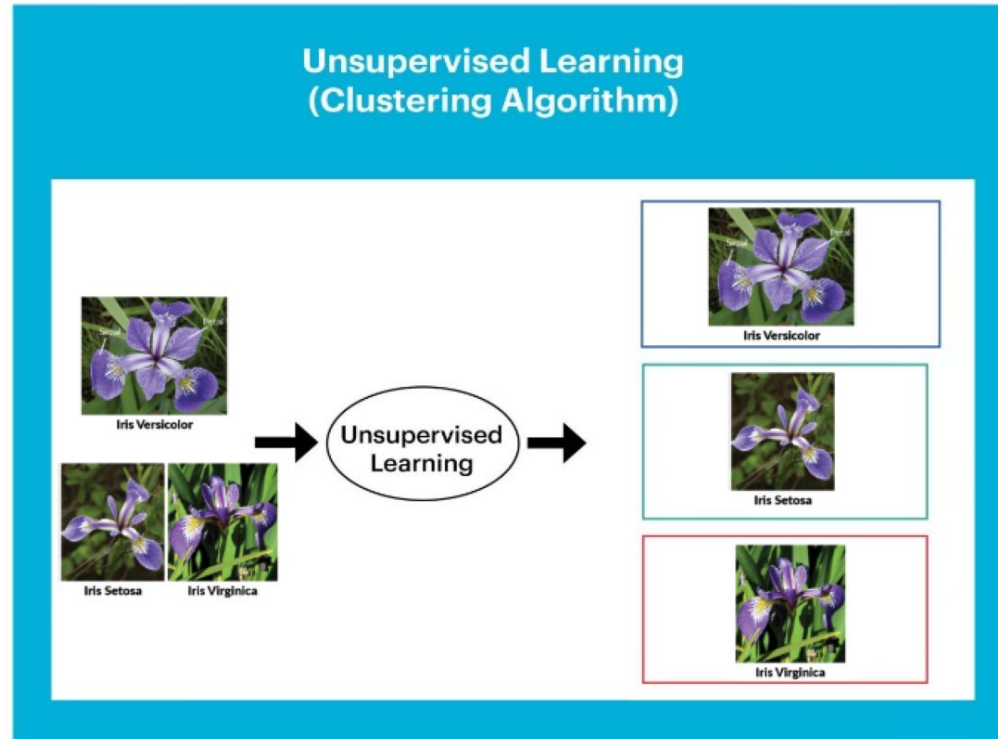


**Algorithms:**

[Support Vector Machine \(SVM\)](#)

[Artificial Neural Networks\(ANN\)](#)

# Demonstration 1 : Flow Unsupervised Learning



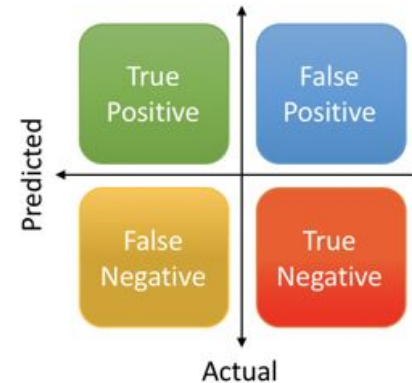
Algorithms:

[K-Means](#)

# Metrics

- Metrics is the main way to validate the results of a Machine Learning algorithm. And for each type of learning, there is a metric.

$$\begin{aligned}\text{Precision} &= \frac{\text{True Positive}}{\text{True Positive} + \text{False Positive}} \\ \text{Recall} &= \frac{\text{True Positive}}{\text{True Positive} + \text{False Negative}} \\ \text{Accuracy} &= \frac{\text{True Positive} + \text{True Negative}}{\text{Total}}\end{aligned}$$

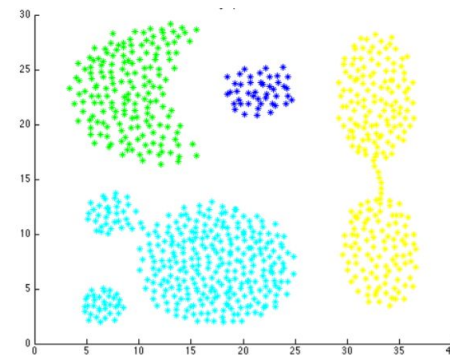
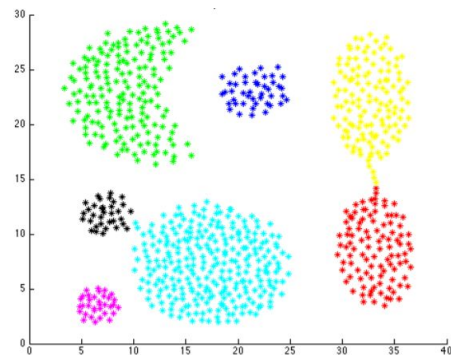


# Metrics

- Cluster assessment measures:

$$\text{Índice de Rand: } \frac{(A+D)}{(A+B+C+D)}$$

$$\text{Índice de Jaccard: } \frac{A}{(A+B+C)}$$



```
indice_rand =  
    0.8936  
  
indice_jaccard =  
    0.6706
```

# | Consuming Models

- There are two main ways to consume models created from machine learning algorithms:
  - a. Creating http endpoint:
    - programming language;
    - black-box.
  - b. Create a stream to produce / consume the input / output:
    - Apache Kafka; RabbitMQ; ActiveMQ; and etc.
  - c. Creating batch processes to process and store in storages.



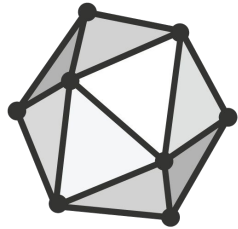
## | Black-box

- They are tools and libraries that facilitate the development of models or products of Machine Learning.
  - [Amazon Machine Learning](#);
  - [Watson Machine Learning](#);
  - [AI and machine learning products](#);
  - [Azure Machine Learning](#);
  - outros.



## | Consuming Models

- More recently, ONNX (Open Neural Network Exchange) technology has emerged. ([source code](#))

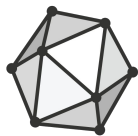


ONNX

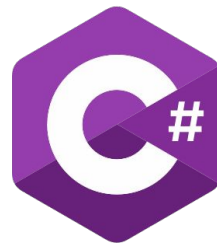
- **ONNX is an open format built to represent machine learning models.**

## **Demonstration 2 - The ONNX technology in action**

- In this demo, a statistical model will be created in Python using the [MNIST](#) data set and this model will be used in C# to make a prediction of a drawn number.

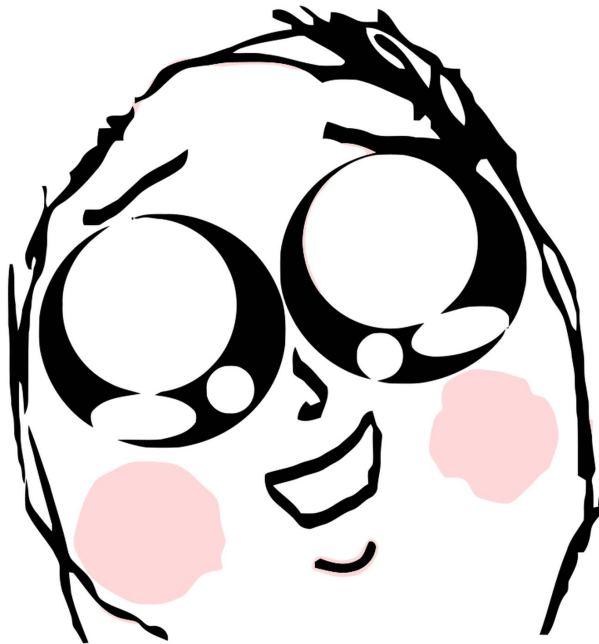


ONNX



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**I loved it... I want to learn more!**



## | Starting the study - Video lessons

- [MIT - 6.034 Artificial Intelligence, Fall 2010](#) (30 lessons)
- [University of Oxford - Deep Learning](#) (16 lessons)
- [Stanford CS229: Machine Learning - 2018](#) (20 lessons)
- [Redes Neurais - USP - Introdução às Redes Neurais](#) (10 lessons)
- [Reconhecimento de Padrões - USP](#) (52 lessons)
  
- [\[SEI 2019\] Automated Machine Learning by WeDo](#) - Univ. Minho
- [Aplicações de Inteligência Artificial nas áreas fiscal, auditoria e saúde](#) - 2020
  
- [Introduction to the Developer's Intro to Data Science Video Series](#) (28 videos)
- [ML.NET - Machine Learning Introduction](#) (8 videos)
- [\[Online\] Nerdzão #214 - Linguagem R](#)

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## | Starting the study - Websites



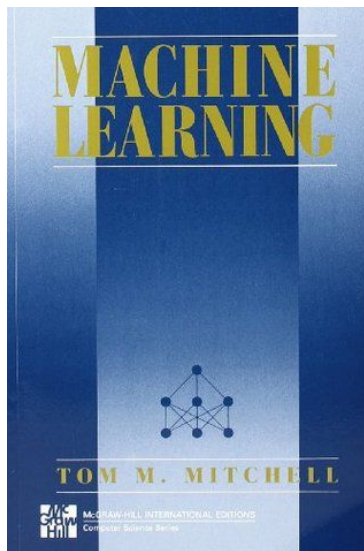
- [DAVE TANG'S BLOG](#)
- [Machine Learning for Everyone](#) (blog)

# | Starting the study - Courses

- **Coursera:**
  - [Machine Learning](#), by Andrew Ng;
  - [Data Science](#).
- **EDX:**
  - [Data, Analytics and Learning](#).
- **Udemy:**
  - [Data Science A-Z™: Real-Life Data Science Exercises Included](#);
  - [Machine Learning A-Z \(Python & R in Data Science Course\)](#);
  - [Complete Google Cloud Data Engineer & Architect Course \(GCP\)](#).
- **Udacity:**
  - [Intro to Machine Learning](#);
  - [Machine Learning](#).

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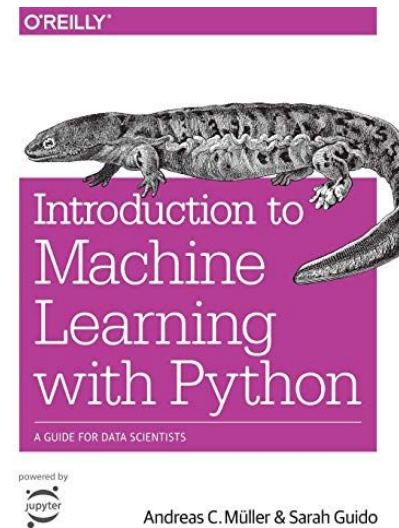
## Starting the study - Books



Machine Learning, Tom Mitchell, McGraw Hill, 1997.



Introdução à Mineração de Dados: Com aplicações em R, 2016.

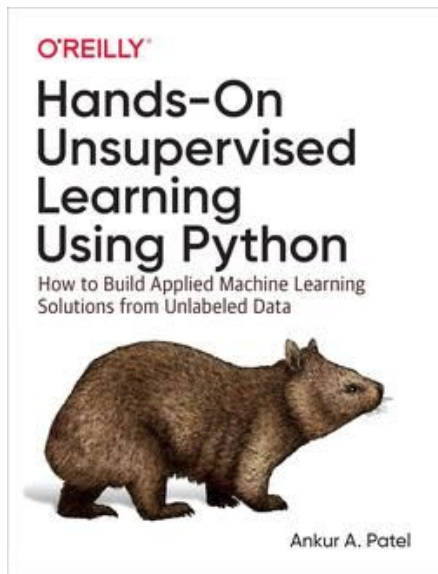


Introduction to Machine Learning with Python: A Guide for Data Scientists, 2016

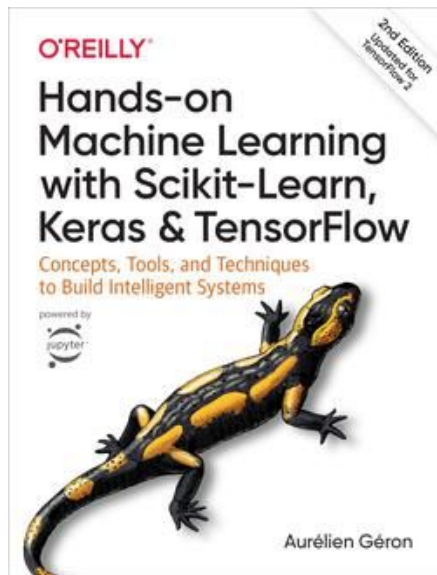


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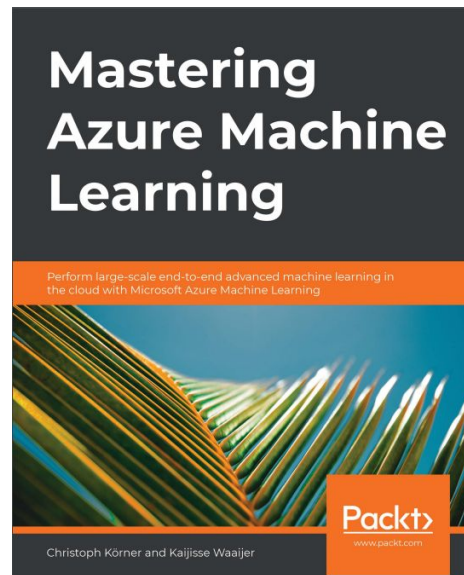
## | Starting the study - Books



Hands-On Unsupervised Learning Using Python, 2019.  
[Code Examples](#) on GitHub.



Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, 2019.  
[Code Examples](#) on GitHub.



Mastering Azure Machine Learning, 2020. Book free, [link](#).

**Thank you**

# | Contacts



- **GitHub:** [MackMendes](https://github.com/MackMendes)
- **Twitter:** [@CharlesMendesMa](https://twitter.com/CharlesMendesMa)
- **Blog:** <http://charlesmms.azurewebsites.net/>