Deep Learning
Lesson #01

Prof. Patrick Terrematte
patrickt@imd.edu.br

References

- Mostly based on the course of Deep Learning - Prof. Ivanovitch (2021.1)
  - https://github.com/ivanovitchm/deeplearning
- MIT 6.S191 Introduction to Deep Learning (2022)
  - https://github.com/dair-ai/ML-Course-Notes
  - http://introtodeeplearning.com/
- NYU-DLSP21 - Deep Learning - Prof. Yann LeCun & Alfredo Canziani
  - https://atcold.github.io/NYU-DLSP21/
- MLOps - Prof. Ivanovitch (2022.1)
  - https://github.com/ivanovitchm/mlops

References

- Adrian Rosebrock. Deep Learning for Computer Vision with Python [Link]
- Jason Brownlee. Deep Learning for Computer Vision: Image Classification, Object Detection, and Face Recognition in Python [Link]
- Jason Brownlee. Better Deep Learning [Link]
- Aurélien Géron. Hands on Machine Learning with Scikit-Learn, Keras and TensorFlow. [Link]
- François Chollet. Deep Learning with Python [Link]

Programa de Estudos Secundários do Instituto Metrópole Digital (PES/IMD)

O Programa de Estudos Secundários do Instituto Metrópole Digital (PES/IMD) é um programa de formação complementar que tem por objetivo fornecer uma oportunidade para estudantes e profissionais explorarem áreas de conhecimento relacionadas a sua formação. Baseado em experiências bem-sucedidas, como os "minors" americanos, o programa busca certificar pessoas em campos do saber da Tecnologia da Informação. Atualmente, o PES/IMD possui oito campos do saber:

- Bioinformática
- Ciência de Dados
- Informática Educacional
- Inovação e Empreendedorismo
- Inteligência Artificial
- Internet das Coisas
- Jogos Digitais
- Sistemas de Informações Gerenciais

Campos do Saber


Bioinformática

Ciência de Dados


Informática Educacional


Inovação e Empreendedorismo


Sistema de Informações Gerenciais


Inteligência Artificial


Internet das Coisas


Jogos Digitais

https://metropoledigital.ufrn.br/portal/ensino/pes

Carga horária mínima para obtenção do certificado: 360h

Estrutura curricular:

Código	Disciplina	Nível	CH	Tipo
IMD1112	Ética e Dados	Graduação	60	Obrigatória
IMD1113	Probabilidade e Inferência	Graduação	60	Obrigatória
IMD1101	Aprendizado de Máquina	Graduação	60	Obrigatória
IMD1114	Aprendizado Profundo	Graduação	60	Obrigatória
IMD1103	Aprendizado por Reforço	Graduação	60	Optativa
IMD1107	Processamento de Linguagem Natural	Graduação	60	Optativa
IMD1108	Visão Computacional	Graduação	60	Optativa
IMD1115	Processamento Digital de Imagem	Graduação	60	Optativa

https://metropoledigital.ufrn.br/portal/ensino/pes

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Campos do Saber


Bioinformática

Ciência de Dados


Informática Educacional


Inovação e Empreendedorismo

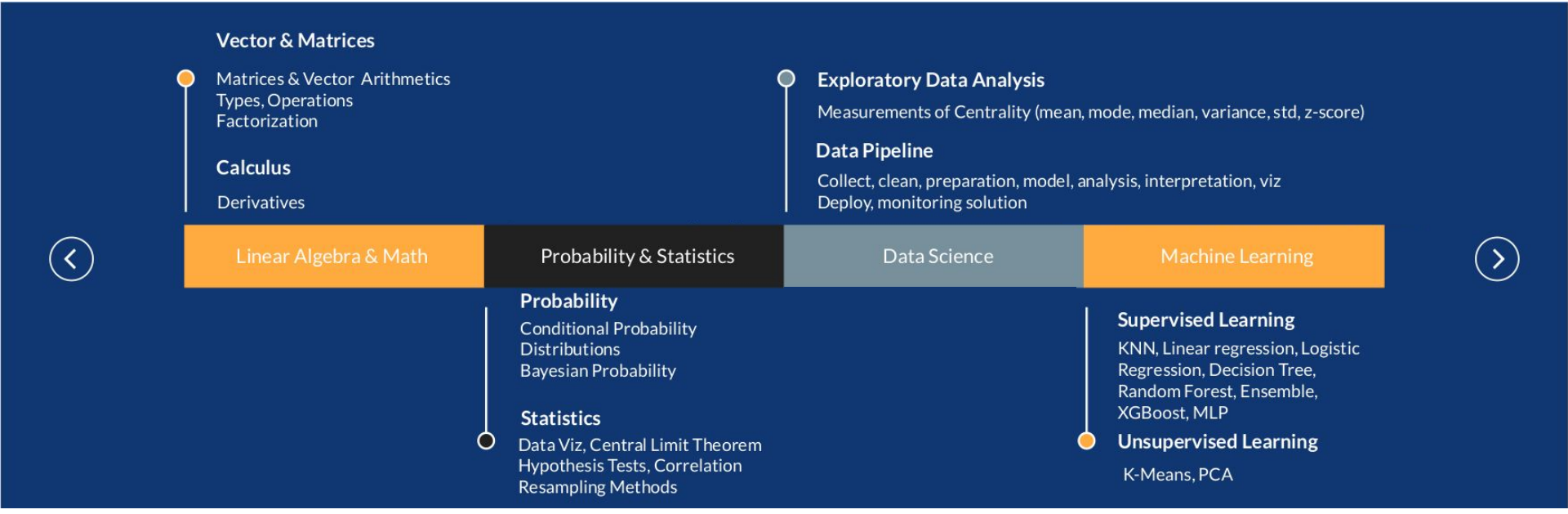

Sistema de Informações Gerenciais


Inteligência Artificial


Internet das Coisas


Jogos Digitais

Your Pathway



ARTIFICIAL INTELLIGENCE

ARTIFICIAL INTELLIGENCE

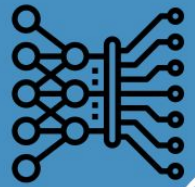
Any technique which enables computer to mimic human behavior

MACHINE LEARNING

AI techniques that give computers the ability to learn without being explicitly programed to do so

DEEP LEARNING

A subset of ML which make the computation of multi-layer neural network feasible



TinyML

GNN

DATA SCIENCE

1950 - 1980

1980 - 2010

2010 - **2021**

ML Workflow

Separação dos Dados
Treinamento, teste e validação

Treinamento
Limpe os dados, selecione características e treine o modelo

Validação
Avalie o modelo com dados de validação

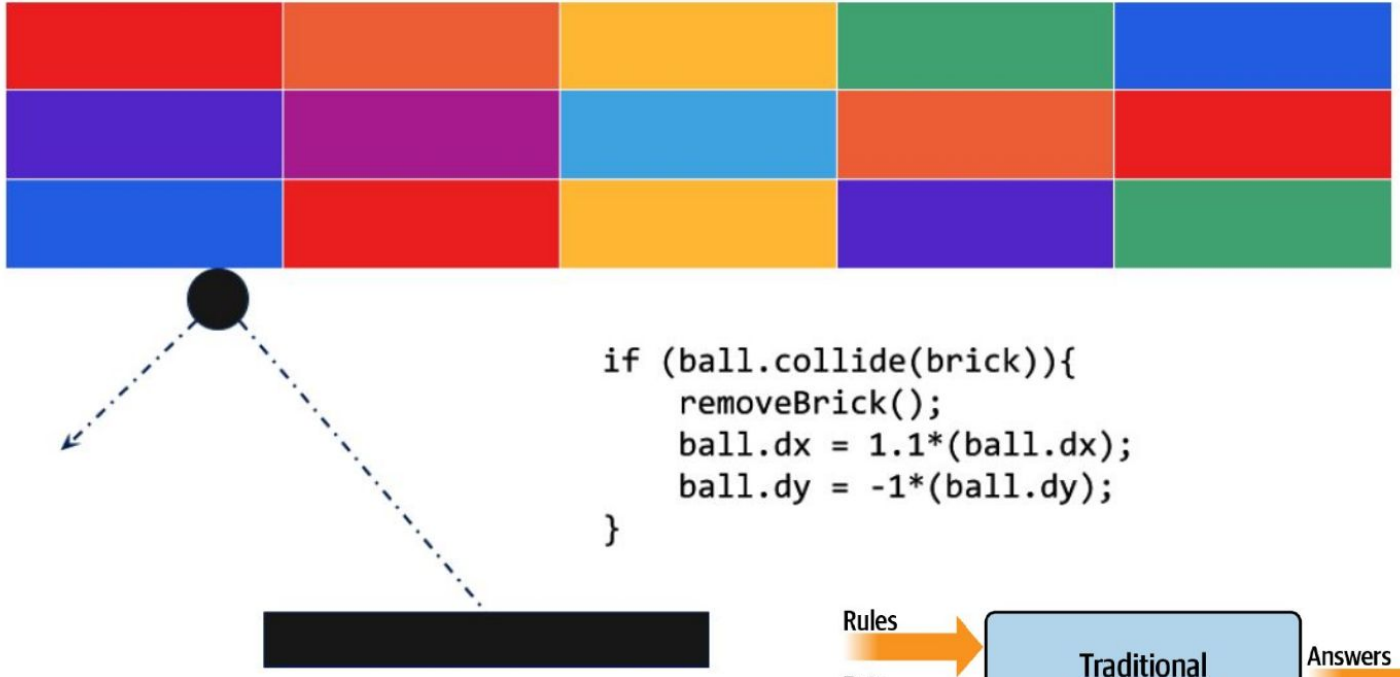
Sintonização
Melhore a performance do modelo com mais dados, características ou hiperparâmetros

Implantação
Implante o modelo em um ambiente real de produção

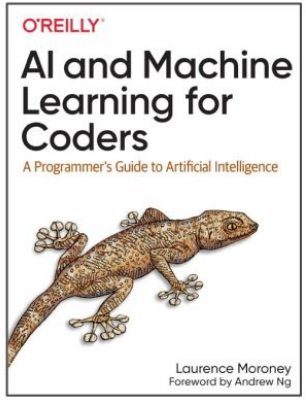
Teste do Modelo
Verifique a performance do modelo com dados de teste

Fonte: Huawei/HCIA

What is Machine Learning?



```
if (ball.collide(brick)){
    removeBrick();
    ball.dx = 1.1*(ball.dx);
    ball.dy = -1*(ball.dy);
}
```



Limitations of traditional programming

<activity detection>

```
if(speed<4){
    status=WALKING;
}
```

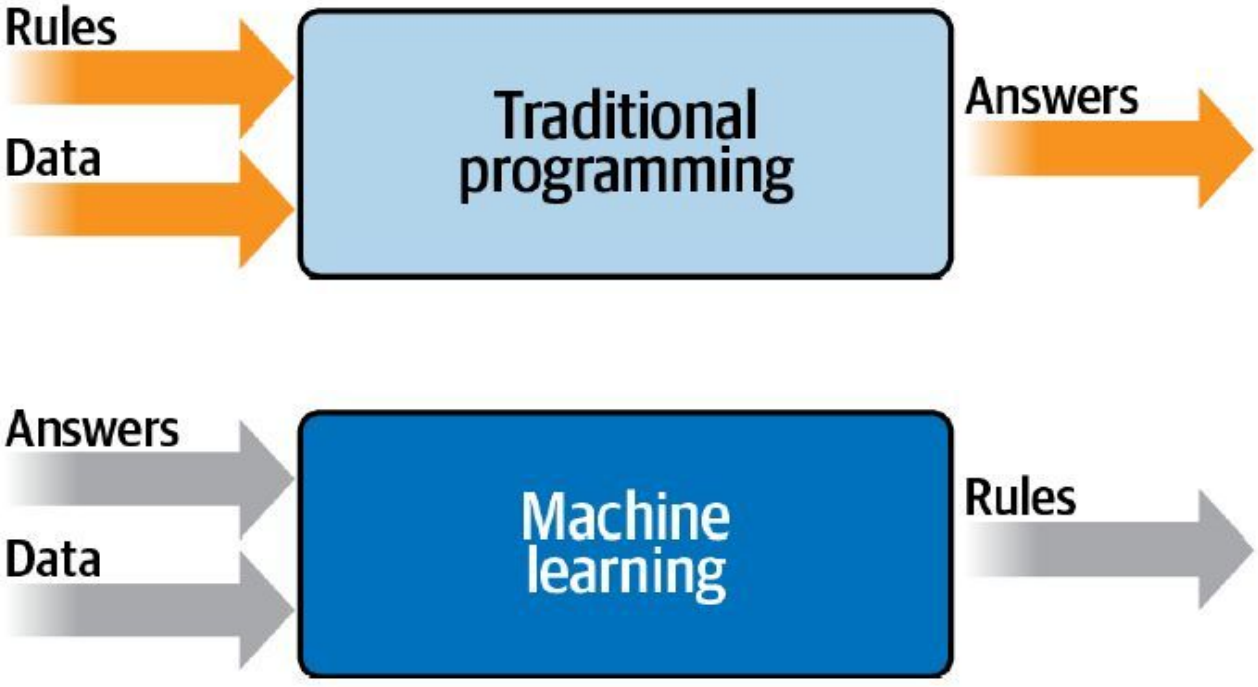
```
if(speed<4){
    status=WALKING;
} else {
    status=RUNNING;
}
```

```
if(speed<4){
    status=WALKING;
} else if(speed<12){
    status=RUNNING;
} else {
    status=BIKING;
}
```

```
// ???
```

@laurencemoroney

From programming to learning



From coding to ML

<gathering and label data>

```
01010010101001010101
10010101010010111101
01001010100101010001
01010010101001010101
```

Label = WALKING

```
10101001010010101011
01010100100100100001
00100111110101011111
10101001001111010111
```

Label = RUNNING

```
10010100111110101011
11010101110101011110
10101011110101010111
11111100011110101011
```

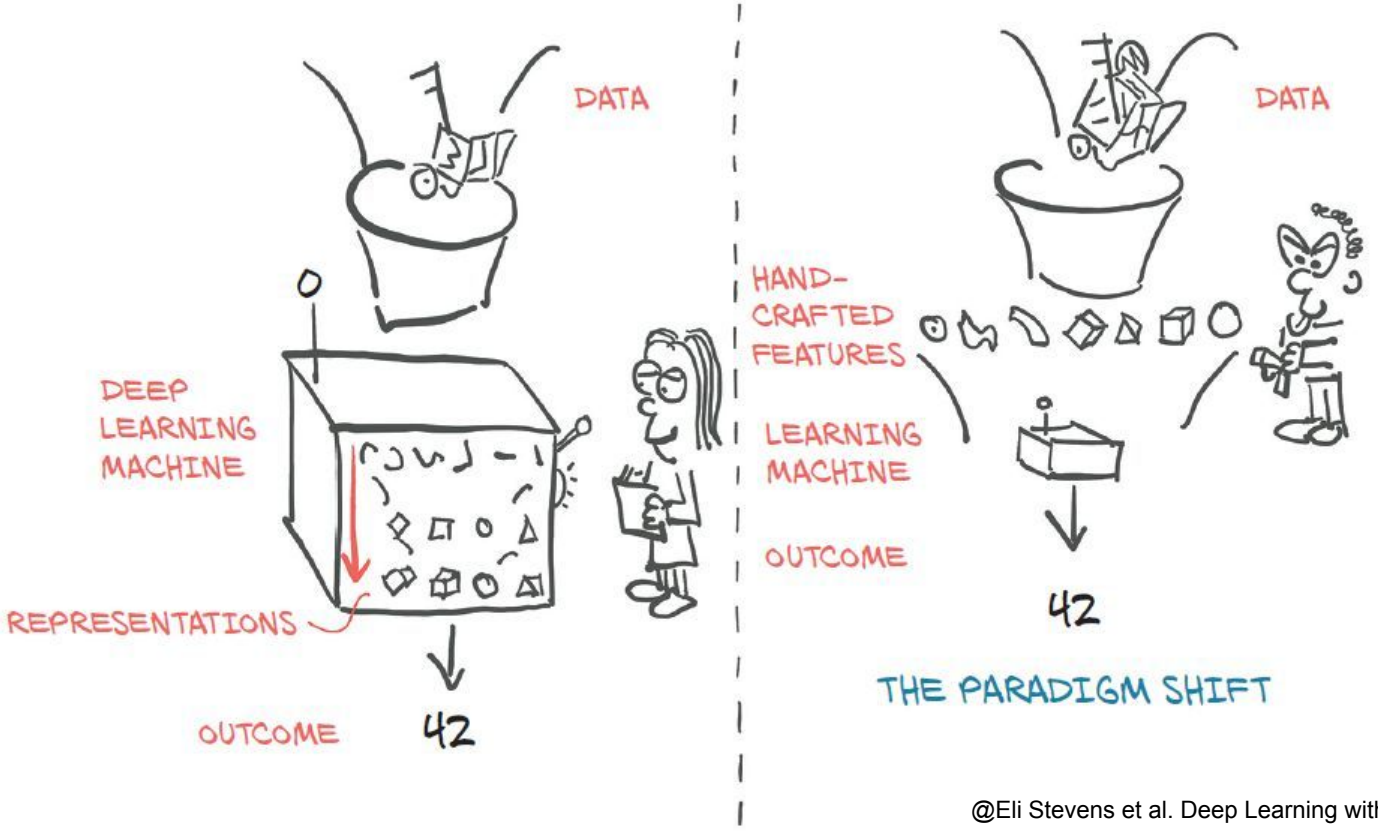
Label = BIKING

```
11111111110100111011
00111111010111110101
01011101010101011110
10101010101001111101
```

Label = GOLFING

@laurencemoroney

Why Deep Learning?



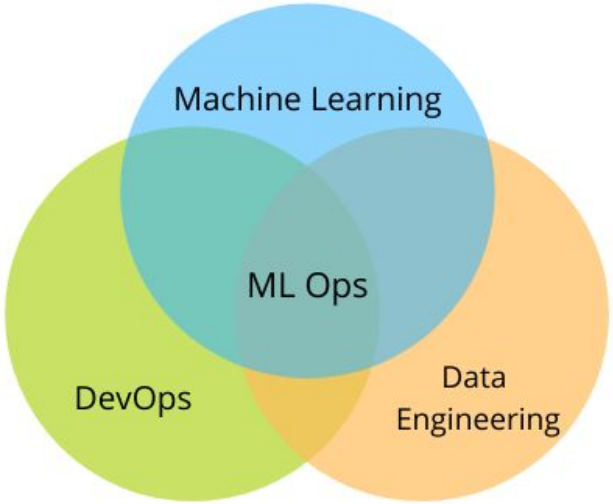
@Eli Stevens et al. Deep Learning with PyTorch, 2020.

Roles of MLops and an AI Team

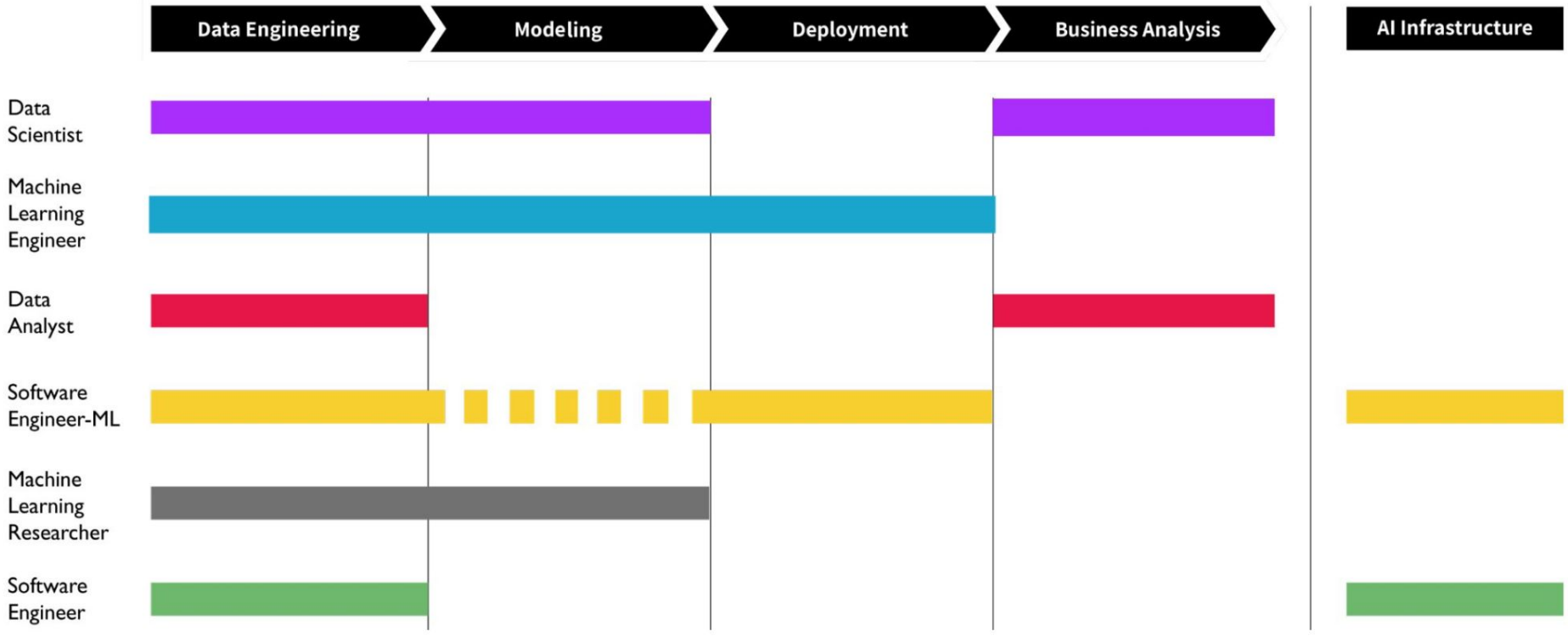
Machine Learning Operations (MLOps)

"Extensão da metodologia **DevOps** incluindo **Aprendizagem de Máquina e Ciência de Dados** como itens prioritários."

https://ml-ops.org/



MLOps


Data Engineering
Modeling
Deployment
Business Analysis
AI Infrastructure
Data Scientist
Machine Learning Engineer
Data Analyst
Software Engineer-ML
Machine Learning Researcher
Software Engineer

CS 329S: Machine Learning Systems Design

Stanford, Winter 2022

Schedule & syllabus

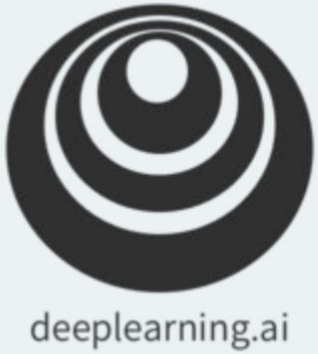
The lecture slides, notes, tutorials, and assignments will be posted online here as the course progresses.
Lecture times are **3:15 - 4:45pm PST**. All deadlines are at **11:59pm PST**.

This schedule is subject to change according to the pace of the class.

See Past course for the last year's lectures.

Date	Description	Materials	Events
Mon Jan 3	Understanding machine learning production	Lecture note Lecture slides Lessons learned from 150 ML models at Booking.com	Lecture
Wed Jan 5	ML and Data Systems Fundamentals	Lecture note Lecture slides Case study: Predict Value of Homes On Airbnb Breakout exercise: Designing Twitter's Trending Hashtags	Lecture
Mon Jan 10	Training Data	Lecture note Lecture slides	Lecture
Wed Jan 12	Feature engineering	Lecture note Lecture slides	Lecture

https://stanford-cs329s.github.io/syllabus.html



Design an ML production system end-to-end
Establish a model baseline, address concept drift
How to develop, deploy and continuously improve a productionized ML application

Practical Data Science (PDS) Specialization

- 3 courses
- Advanced
- Antje Barth, Sireesha Muppala, Shelbee Eigenbrode, Chris Fregly
- Amazon Web Services (AWS)

Machine Learning Engineering for Production (MLOps) Specialization

- 4 courses
- Advanced
- Andrew Ng, Robert Crowe, Laurence Moroney, Cristian Bartolomé Arámburu

Defining the Skills

Mathematics
People with mathematics skills demonstrate the ability to solve problems using linear algebra (for instance, matrix vector operations, eigenvalues, eigenvectors, and combinatorics), calculus (derivatives, integrals, and so on) and mathematical functions (simple functions, min/max/argmin/argmax, and so on).

Algorithmic coding
People with algorithmic coding skills demonstrate the ability to understand algorithms written with code, implement classic algorithms like sorting and search, and use classic data structures like trees, dictionaries and arrays.

Software engineering
People with software engineering skills demonstrate the ability to use a variety of computer science and software methods such as object-oriented programming, internet protocols, HTTP requests, agile/scrum methodologies, databases, version control (such as Git), containers, and unit testing.

Machine learning
People with machine learning skills demonstrate the ability to use classic machine learning models (for example, PCA, K-means, K-NNs, SVM, Logistic Regression, Linear Regression, and Decision Tree learning), methods to train them (such as initialization, optimization, regularization, and hyperparameter tuning), and techniques to strategize machine learning projects.

Deep learning
People with deep learning skills demonstrate the ability to use classic deep learning models (such as fully connected networks, convolutional neural networks, recurrent neural networks, and layers), methods to train them (such as initialization, regularization, optimization, and transfer learning), and techniques to strategize deep learning projects.

Data science
People with data science skills demonstrate the ability to use probabilities (including distributions, conditional probabilities, independence, Bayes theorem, etc.), statistics (including hypothesis testing, bias/variance tradeoffs, mean, variance, and mode) and data analysis (including preprocessing, visualization and metrics such as accuracy, R-squared, residuals, precision, and recall).

State of the Art

arXiv.org

arXiv is a free distribution service and an open-access archive for 1,833,415 scholarly articles in the fields of physics, mathematics, computer science, quantitative biology, quantitative finance, statistics, electrical engineering and systems science, and economics. Materials on this site are not peer-reviewed by arXiv.

Subject search and browse:

Physics Search Form Interface Catchup

News

Read about recent news and updates on arXiv's blog. (View the former "what's new" pages here). Read robots beware before attempting any automated download.

COVID-19 Quick Links

See COVID-19 SARS-CoV-2 preprints from

- arXiv
- medRxiv and bioRxiv

Important: e-prints posted on arXiv are not peer-reviewed by arXiv; they should not be relied upon without context to guide clinical practice or health-related behavior and should not be reported in news media as established information without consulting multiple experts in the field.

Physics

- Astrophysics (**astro-ph** new, recent, search)
  includes: Astrophysics of Galaxies; Cosmology and Nongalactic Astrophysics; Earth and Planetary Astrophysics; High Energy Astrophysical Phenomena; Instrumentation and Methods for Astrophysics; Solar and Stellar Astrophysics
- Condensed Matter (**cond-mat** new, recent, search)
  includes: Disordered Systems and Neural Networks; Materials Science; Mesoscale and Nanoscale Physics; Other Condensed Matter; Quantum Gases; Soft Condensed Matter; Statistical Mechanics; Strongly Correlated Electrons; Superconductivity
- General Relativity and Quantum Cosmology (**gr-qc** new, recent, search)
- High Energy Physics - Experiment (**hep-ex** new, recent, search)
- High Energy Physics - Lattice (**hep-lat** new, recent, search)
- High Energy Physics - Phenomenology (**hep-ph** new, recent, search)
- High Energy Physics - Theory (**hep-th** new, recent, search)
- Mathematical Physics (**math-ph** new, recent, search)
- Nonlinear Sciences (**nlin** new, recent, search)
  includes: Adaptation and Self-Organizing Systems; Cellular Automata and Lattice Gases; Chaotic Dynamics; Exactly Solvable and Integrable Systems; Pattern Formation and Solitons

Papers With Code

https://paperswithcode.com/

Computer Vision

Semantic Segmentation

80 benchmarks

1462 papers with code

Image Classification

184 benchmarks

1275 papers with code

Object Detection

299 benchmarks

1076 papers with code

Image Generation

134 benchmarks

509 papers with code

Denoising

95 benchmarks

467 papers with code

See all 965 tasks

Medical

Medical Image Segmentation

171 benchmarks

131 papers with code

Drug Discovery

14 benchmarks

105 papers with code

Lesion Segmentation

5 benchmarks

75 papers with code

Brain Tumor Segmentation

7 benchmarks

44 papers with code

COVID-19 Diagnosis

40 papers with code

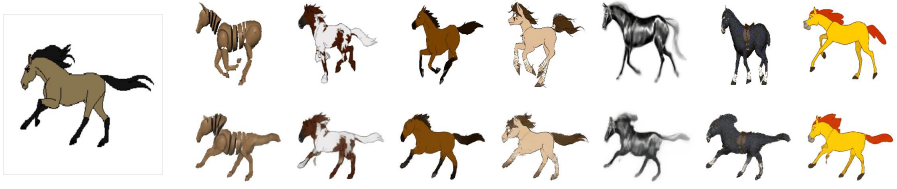
See all 199 tasks

http://www.youtube.com/watch?v=0d6OHldD7Ek


WELCOME TO
DEEPFACECOLAB
https://github.com/chervonij/DFL-Colab

Introduced by Siarohin et al. in Animating Arbitrary Objects via Deep Motion Transfer

https://github.com/AliaksandrSiarohin/first-order-model



https://paperswithcode.com/dataset/mgif

Natural Language Processing

Machine Translation

56 benchmarks

977 papers with code

Language Modelling

19 benchmarks

962 papers with code

Question Answering

66 benchmarks

863 papers with code

Sentiment Analysis

50 benchmarks

584 papers with code

Text Generation

49 benchmarks

416 papers with code

See all 363 tasks

Graphs

Link Prediction

52 benchmarks

304 papers with code

Node Classification

61 benchmarks

249 papers with code

Graph Embedding

1 benchmark

168 papers with code

Graph Classification

46 benchmarks

139 papers with code

Community Detection

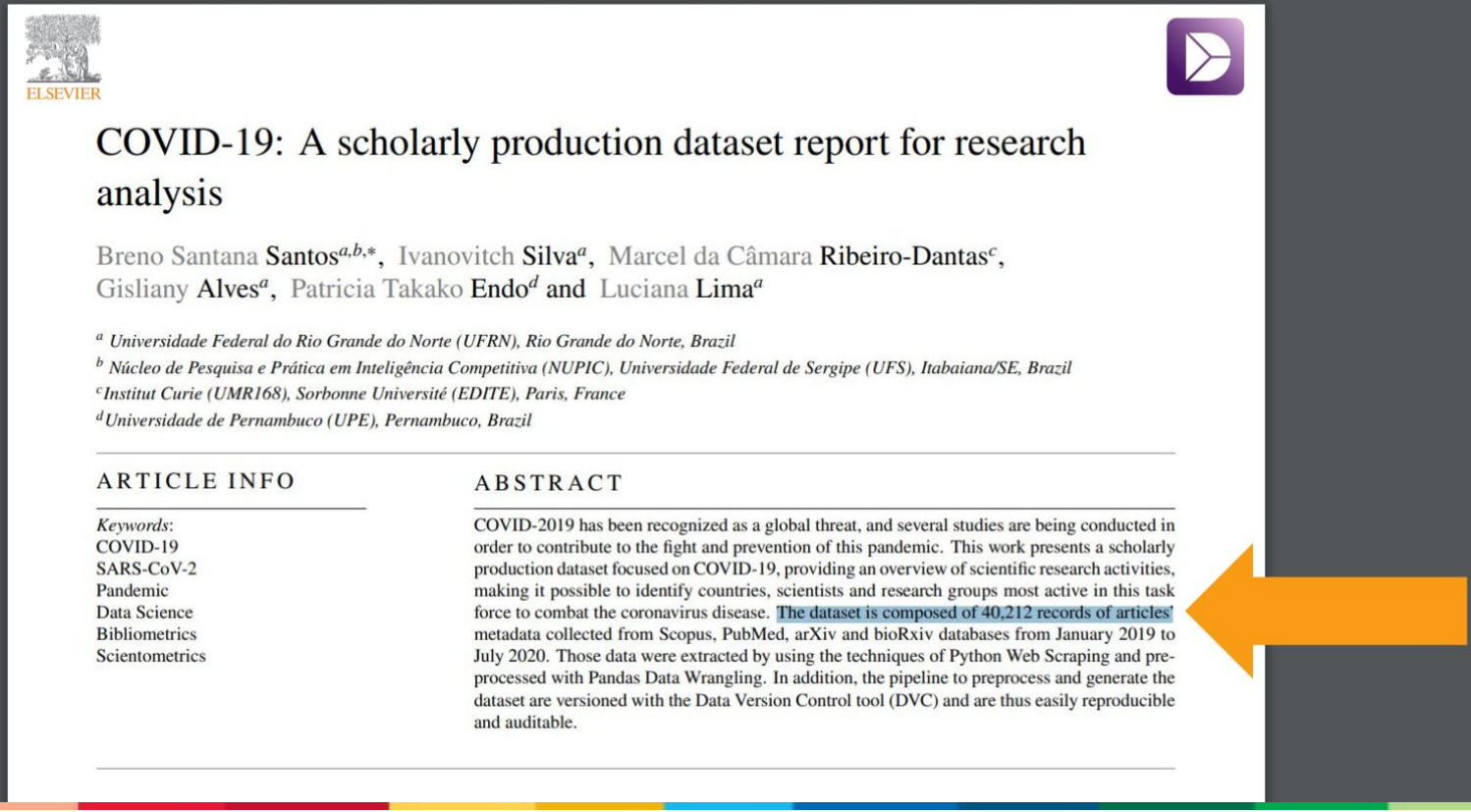
12 benchmarks

107 papers with code

See all 63 tasks

isola.ai

+100k papers



ELSEVIER

COVID-19: A scholarly production dataset report for research analysis

Breno Santana Santos[a,b,*], Ivanovitch Silva[a], Marcel da Câmara Ribeiro-Dantas[c], Gisliany Alves[a], Patricia Takako Endo[d] and Luciana Lima[a]

[a] Universidade Federal do Rio Grande do Norte (UFRN), Rio Grande do Norte, Brazil
[b] Núcleo de Pesquisa e Prática em Inteligência Competitiva (NUPIC), Universidade Federal de Sergipe (UFS), Itabaiana/SE, Brazil
[c] Institut Curie (UMR168), Sorbonne Université (EDITE), Paris, France
[d] Universidade de Pernambuco (UPE), Pernambuco, Brazil

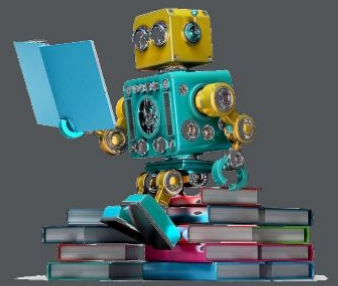
ARTICLE INFO

Keywords:
COVID-19
SARS-CoV-2
Pandemic
Data Science
Bibliometrics
Scientometrics

ABSTRACT

COVID-2019 has been recognized as a global threat, and several studies are being conducted in order to contribute to the fight and prevention of this pandemic. This work presents a scholarly production dataset focused on COVID-19, providing an overview of scientific research activities, making it possible to identify countries, scientists and research groups most active in this task force to combat the coronavirus disease. The dataset is composed of 40,212 records of articles' metadata collected from Scopus, PubMed, arXiv and bioRxiv databases from January 2019 to July 2020. Those data were extracted by using the techniques of Python Web Scraping and pre-processed with Pandas Data Wrangling. In addition, the pipeline to preprocess and generate the dataset are versioned with the Data Version Control tool (DVC) and are thus easily reproducible and auditable.

https://github.com/jrmiranda/ML-Gallery



NLP + Generative Transformer Model + Google Colab + GPU K80 + OpenAI GPT-2

```
pip install gpt-2-simple
```

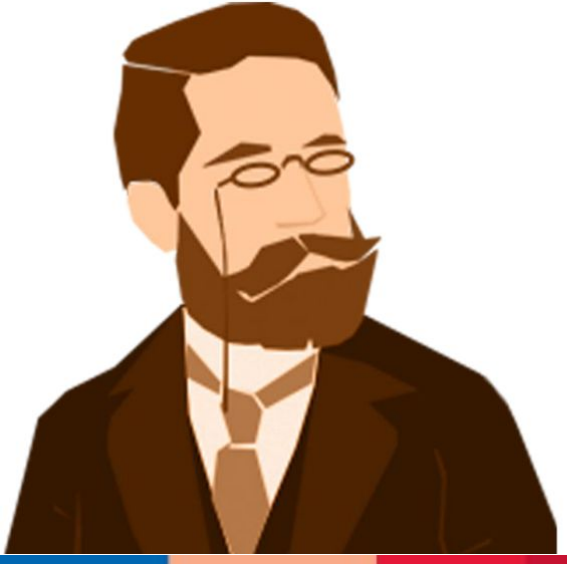
@jrmiranda

http://bit.do/vai_gpt_2

Brazil is one of the most densely populated countries in the world. The outbreak has affected more than 600,000 people and put the country on the front line of the global pandemic. As the outbreak continues to spread, the health and socioeconomic reforms of the president and his government have been criticised for being overly harsh. This analysis attempts to understand the reasons behind the policies and why they are being so harshly criticised, and how the institutional changes and the administration have been ineffective in dampening the disease. In particular, the reasons for the policies are discussed. It is argued that the policies are overly harsh not only because of the lack of economic growth but also because of the lack of social and health security, making it difficult to pay the healthcare bill. The authors conclude that the policies are counterproductive and the policies need to be reformed. This study provides a framework for analysing the policies of the government and the subsequent failure in their implementation.

Created by GPT-2

Who would be the author of that text?



100%
Unique

0%
Plagiarism

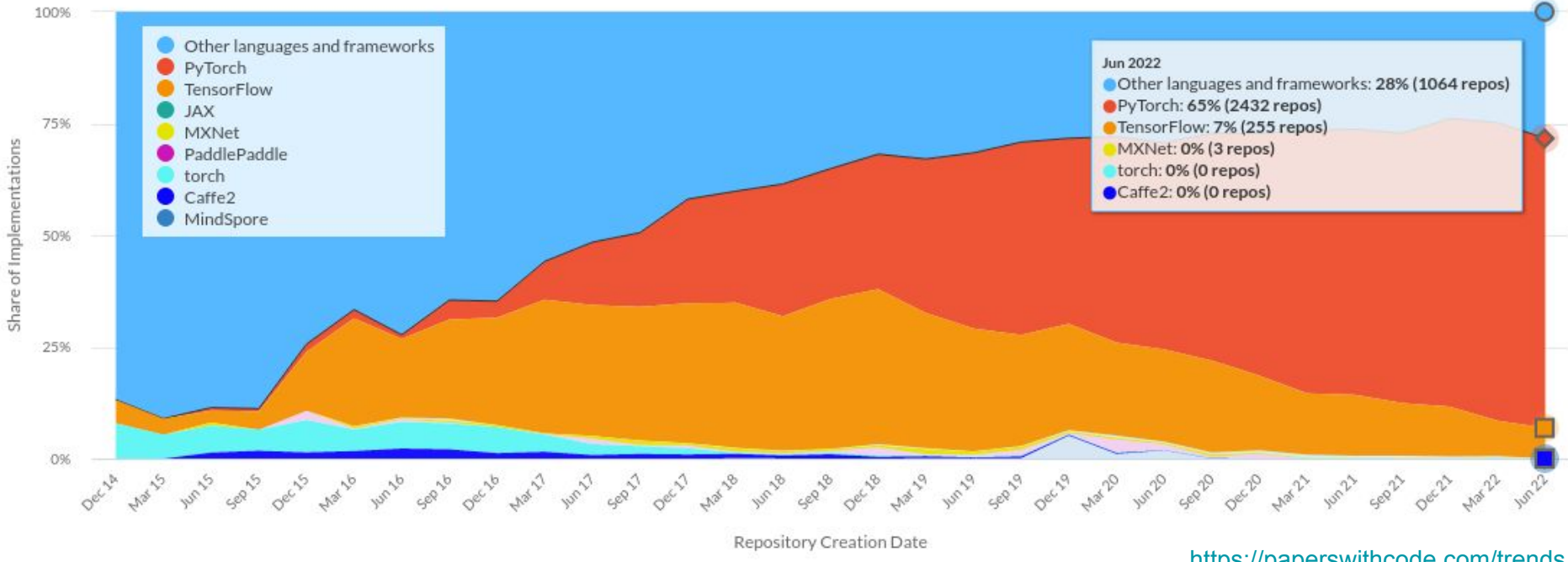
What if?


Instituto Nacional da Propriedade Industrial
Buscar no Site
INPI INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL
Alguma dúvida?
MARCAS
PATENTES
DESENHOS INDUSTRIAIS
INDICAÇÕES GEOGRÁFICAS
PROGRAMAS DE COMPUTADOR
TOPOGRAFIAS DE CIRCUITOS INTEGRADOS
CONTRATOS DE TECNOLOGIA E DE FRANQUIA
ACADEM DO INP
Chatbot
Alguma dúvida?
Chatbot do INPI
DISPONÍVEL 24/7
DE MAIS
VALOR
À SUA
CRIAÇÃO!

Trends

Frameworks

Paper Implementations grouped by framework



https://paperswithcode.com/trends

Weights & Biases

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Developer tools for machine learning

Experiment tracking, hyperparameter optimization, model and dataset versioning

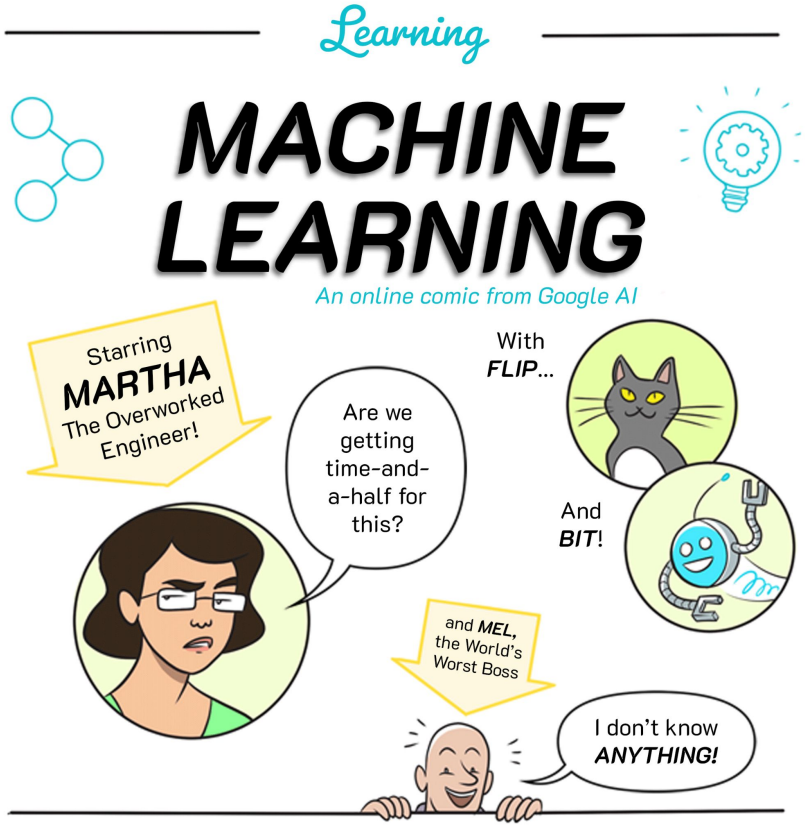
Create a free account Request a demo

Track, compare, and visualize ML experiments with 5 lines of code.

Try a live notebook

https://wandb.ai

References



https://cloud.google.com/products/ai/ml-comic-1

References

- Adrian Rosebrock. Deep Learning for Computer Vision with Python [Link]
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- Jason Brownlee. Better Deep Learning [Link]
- Aurélien Géron. Hands on Machine Learning with Scikit-Learn, Keras and TensorFlow. [Link]
- François Chollet. Deep Learning with Python [Link]

Course outline - Uni1

#	Week	Day (24N56)		*misc*	Outline
1	1	22/08/2022	2a	**início U1:**	Introduction: Course Outline & Presentation
2	1	24/08/2022	4a		Functions, Context Managers and Decorators / Object-Oriented, Functional Programming
3	2	29/08/2022	2a		Fundamentals of Deep Learning
4	2	31/08/2022	4a		Fundamentals of Deep Learning
5	3	05/09/2022	2a		Better Generalization vs Better Learning
-	-	07/09/2022	4a	**FERIADO**	-
6	4	12/09/2022	2a		Better Generalization
7	5	14/09/2022	4a		Better Learning
8	6	19/09/2022	2a		Better Generalization vs Better Learning
9	6	21/09/2022	4a		Better Generalization vs Better Learning
10	7	26/09/2022	2a		Fundamentals of Convolutional Neural Networks (CNN)
11	7	28/09/2022	4a		Fundamentals of Convolutional Neural Networks (CNN)
-		30/09/2022	6a	**fim U1** **TRANCAMENTO**	AVAL UNI1 70% Notebooks (Weeks 1-7) 30% Exams

Course outline - Uni2

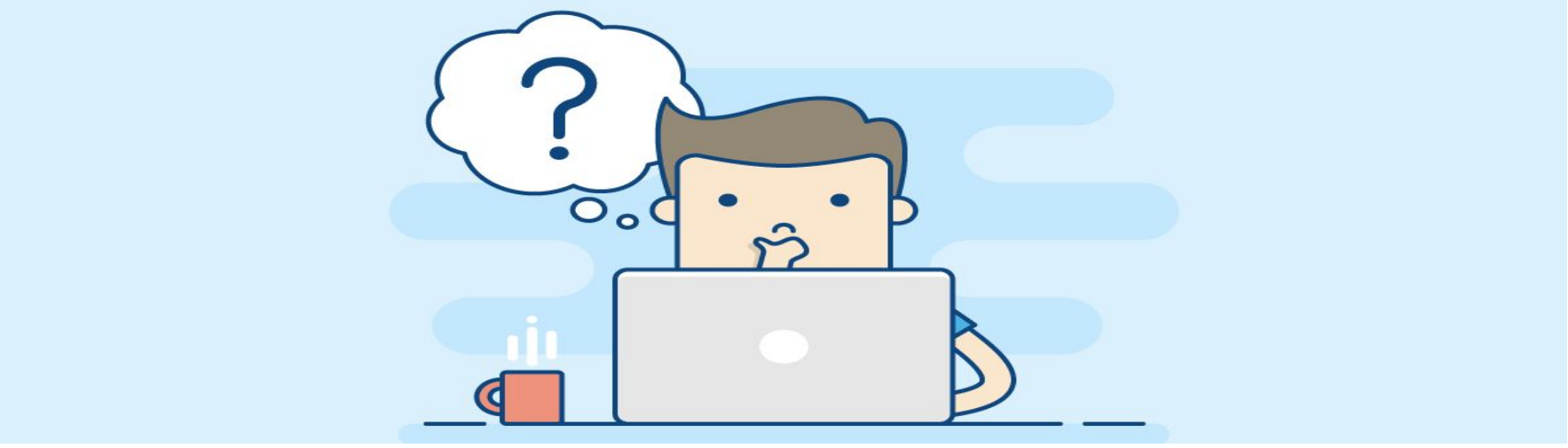
-		03/10/2022	2a	**FERIADO**	
12	8	05/10/2022	4a	início U2:	Convolutional Neural Networks (CNN) Architecture I - LeNet-5 and AlexNet
13	8	10/10/2022	2a		Convolutional Neural Networks (CNN) Architecture I - LeNet-5 and AlexNet
-		12/10/2022	4a	**FERIADO**	-
14	9	17/10/2022	2a		Convolutional Neural Networks (CNN) Architecture II - VGG and GoogLeNet
15	9	19/10/2022	4a		Convolutional Neural Networks (CNN) Architecture II - VGG and GoogLeNet
16	10	24/10/2022	2a		Convolutional Neural Networks (CNN) Architecture III - ResNet
17	10	26/10/2022	4a		Convolutional Neural Networks (CNN) Architecture III - ResNet
-		-	*sáb*		-
-		30/10/2022	*dom*	eleição	-
18	11	31/10/2022	2a		Convolutional Neural Networks (CNN) Architecture III - Transfer Learning
19		02/11/2022	4a	**FERIADO**	-
-		**05/11/2022**	*sáb*	**fim U2**	AVAL UNI2 50% Notebooks 8-11 / 50% Exam

Course outline - Uni3

20	12	07/11/2022	2a	**início U3:**	Other Applications
21	12	09/11/2022	4a		Other Applications
22	13	14/11/2022	2a		Other Applications
23	13	16/11/2022	4a		Other Applications
-		21/11/2022	2a	**FERIADO**	-
24	13	23/11/2022	4a		Other Applications
25	14	28/11/2022	2a		Other Applications
26	14	30/11/2022	4a		Other Applications
27	15	05/12/2022	2a		Final Project
28	15	07/12/2022	4a		Final Project
29	16	12/12/2022	2a		Final Project
30	16	14/12/2022	4a		Final Project
31	17	19/12/2022	2a		
32	17	21/12/2022	4a		AVAL UNI3 70% Final Project / 30% Exam on projects
-		23/12/2022	-	**fim do semestre**	

Github and Notebooks

https://github.com/terrematte/deeplearning



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