



# IMD1122

# Special Topics in AI

# Deep Learning

## Outline Presentation

Lesson #01

The background image shows an aerial view of a modern university campus. The campus features several large, colorful buildings with modern architectural designs, including one with a prominent red facade and another with blue and yellow panels. There is a large, open grassy area with some trees and a few small structures. In the foreground, there is a road with some traffic and a parking lot. In the distance, there are more buildings and hills under a clear blue sky.

Ivanovitch silva



ivan@imd.ufrn.br



<https://github.com/ivanovitchm>



@ivanovitchm

slido

# What do you expect from this course?

- ① Start presenting to display the poll results on this slide.

How many subjects/courses are you enrolled  
in 2021.1 (1, 2, 3, so on...)?

- ⓘ Start presenting to display the poll results on this slide.

slido

# What is your level of proficiency in Python?

- ⓘ Start presenting to display the poll results on this slide.

# Campos do Saber



Bioinformática



Ciência de Dados



Informática  
Educacional



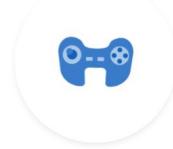
Inovação e  
Empreendedorismo



Inteligência Artificial



Internet das Coisas



Jogos Digitais



Sistemas de  
Informações  
Gerenciais

## O que é o 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.

<https://pes.imd.ufrn.br/pes/index>

# Your Pathway

## Vector & Matrices

- Matrices & Vector Arithmetics
- Types, Operations
- Factorization

## Calculus

- Derivatives

@ivanovitchm/imd0033\_2019\_1

## Exploratory Data Analysis

Measurements of Centrality (mean, mode, median, variance, std, z-score)

## Data Pipeline

Collect, clean, preparation, model, analysis, interpretation, viz  
Deploy, monitoring solution

@ivanovitchm/ppgeecmachinelearning2020.2

## Linear Algebra & Math

## Probability & Statistics

## Data Science

## Machine Learning

### Probability

- Conditional Probability
- Distributions
- Bayesian Probability

### Statistics

- Data Viz, Central Limit Theorem
- Hypothesis Tests, Correlation
- Resampling Methods

@ivanovitchm/datascience2020.6

### Supervised Learning

- KNN, Linear regression, Logistic Regression, Decision Tree, Random Forest, Ensemble, XGBoost, MLP

### Unsupervised Learning

- K-Means, PCA



# ARTIFICIAL INTELLIGENCE

## ARTIFICIAL INTELLIGENCE

Any technique which enables computer to mimic human behavior



1950 - 1980

## MACHINE LEARNING

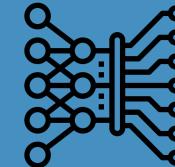
AI techniques that give computers the ability to learn without being explicitly programmed to do so



1980 - 2010

## DEEP LEARNING

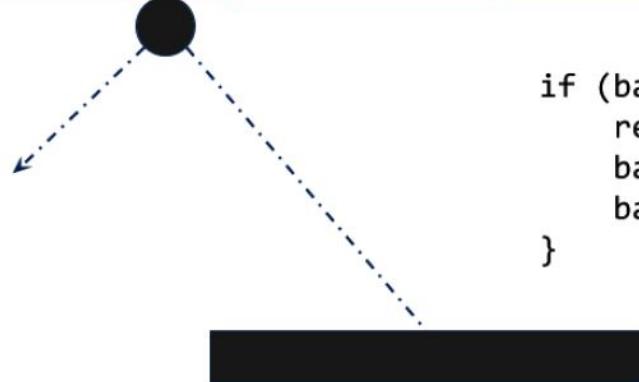
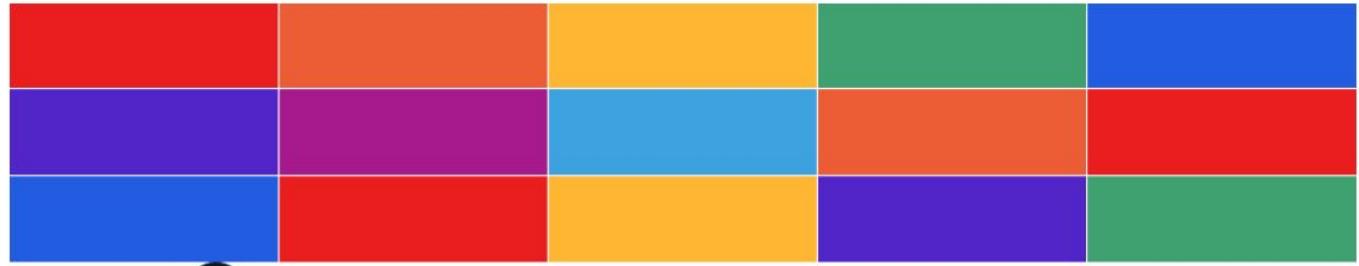
A subset of ML which make the computation of multi-layer neural network feasible



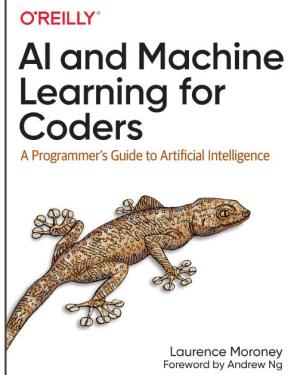
2010 - 2021

TinyML

# 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;  
}
```

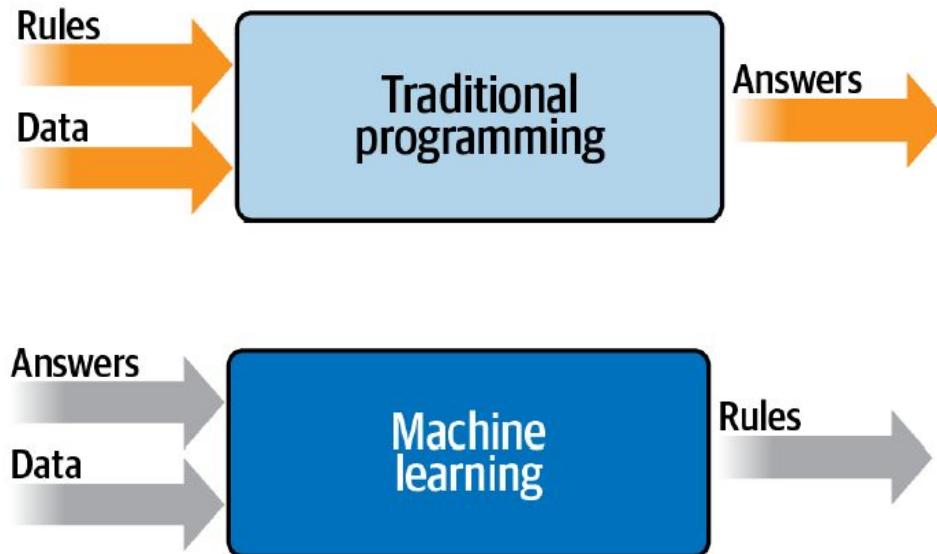


```
if(speed<4){  
    status=WALKING;  
} else if(speed<12){  
    status=RUNNING;  
} else {  
    status=BIKING;  
}
```



// ???

# From programming to learning



# From coding to ML

<gathering and label data>



0101001010100101010  
1001010101001011101  
0100101010010101001  
0101001010100101010

1010100101001010101  
0101010010010010001  
001001111010101111  
1010100100111101011

1001010011111010101  
1101010111010101110  
1010101111010101011  
1111110001111010101

111111111010011101  
0011111010111110101  
0101110101010101110  
1010101010100111110

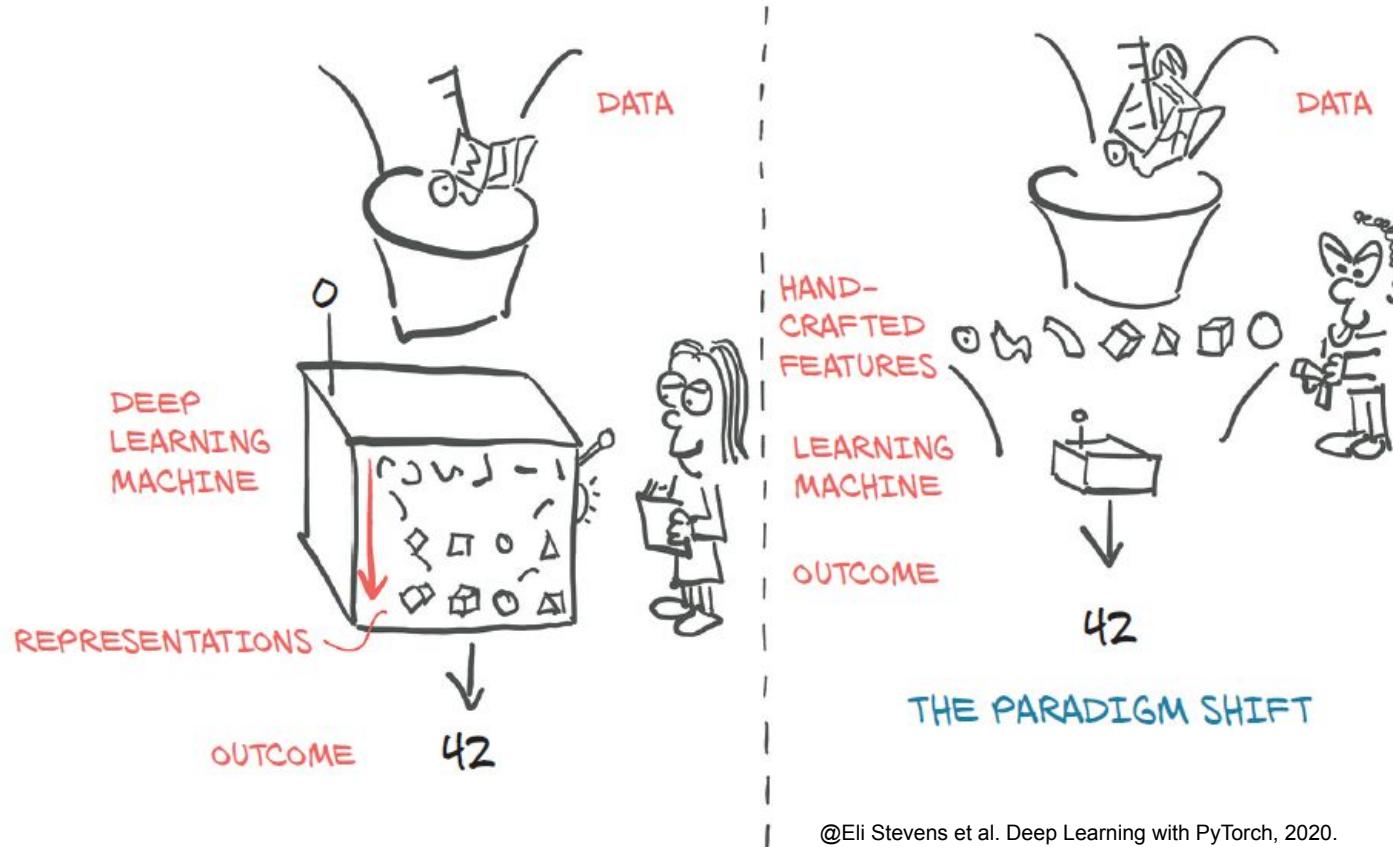
Label = WALKING

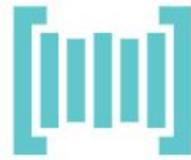
Label = RUNNING

Label = BIKING

Label = GOLFING

# Why Deep Learning?





# 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](#)

@paperwithcode



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

# 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](#)

@paperwithcode





# +80k papers



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

Breno Santana Santos<sup>a,b,\*</sup>, Ivanovitch Silva<sup>a</sup>, Marcel da Câmara Ribeiro-Dantas<sup>c</sup>, Gislainy Alves<sup>a</sup>, Patricia Takako Endo<sup>d</sup> and Luciana Lima<sup>a</sup>

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<sup>b</sup> Núcleo de Pesquisa e Prática em Inteligência Competitiva (NUPIC), Universidade Federal de Sergipe (UFS), Itabaiana/SE, Brazil

<sup>c</sup> Institut Curie (UMR168), Sorbonne Université (EDITE), Paris, France

<sup>d</sup>Universidade de Pernambuco (UPE), Pernambuco, Brazil

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### ARTICLE INFO

**Keywords:**

COVID-19

SARS-CoV-2

Pandemic

Data Science

Bibliometrics

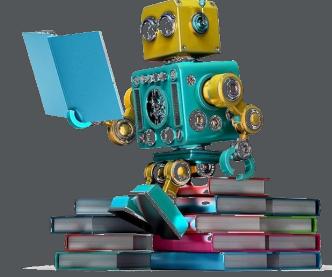
Scientometrics

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### ABSTRACT

COVID-19 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.





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

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

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

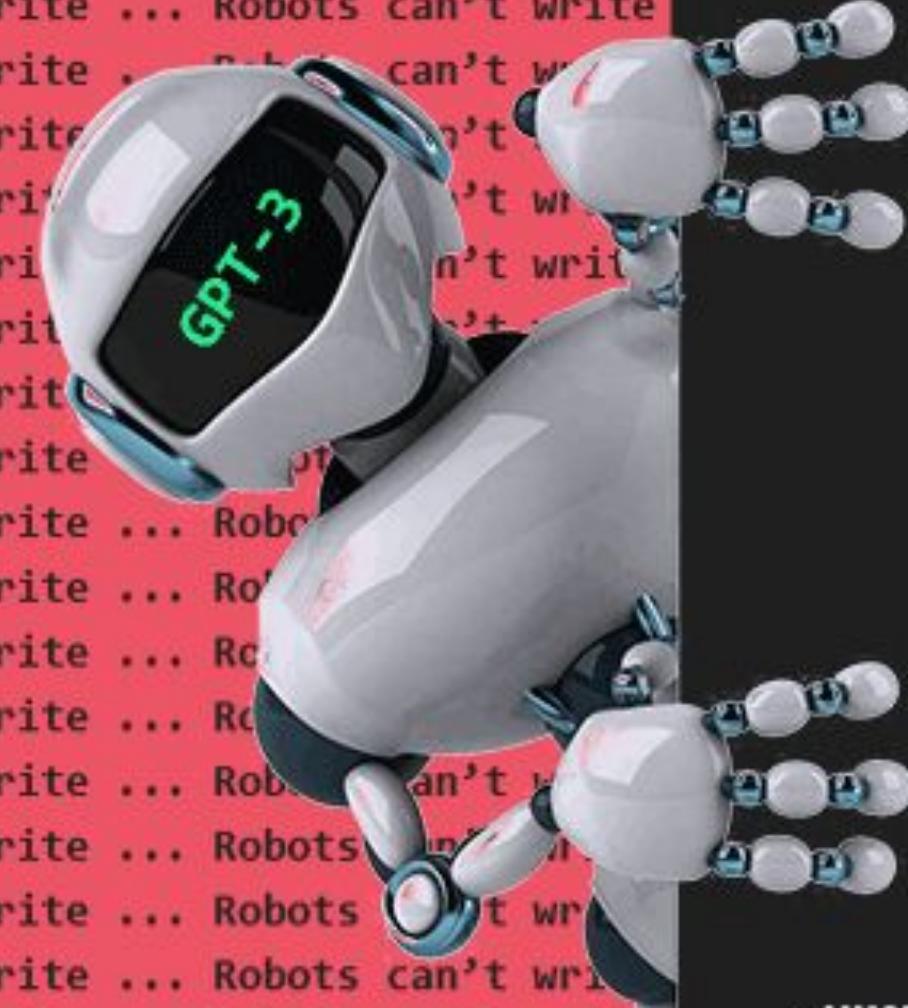
# Who would be the author of that text?



100%  
Unique

0%  
Plagiarism

175B vs 1.5B  
355GPU/y  
4.6M U\$





# Welcome to Simplify

Type your text below and we will explain it back to you in a simplified fashion:

Your text

Recent work has demonstrated substantial gains on many NLP tasks and benchmarks by pre-training on a large corpus of text followed by fine-tuning on a specific task. While typically task-agnostic in architecture, this method still requires task-specific fine-tuning datasets of thousands or tens of thousands of examples. By contrast, humans can generally perform a new language task from only a few examples or from simple instructions – something which current NLP systems still largely struggle to do. Here we show that scaling up language models greatly improves task-agnostic, few-shot performance, sometimes even reaching competitiveness with prior state-of-the-art finetuning approaches. Specifically, we train GPT-3, an autoregressive language model with 175 billion parameters, 10x more than any previous non-sparse language model, and test its performance in the few-shot setting. For all tasks, GPT-3 is applied without any gradient updates or fine-tuning with tasks and few-shot

Simplify

Simplified

We took the most powerful language model ever trained, 175 billion parameters, 10x more than any previous non-sparse language model, and applied it to tasks without any training, fine tuning, or gradient updates. We tested it on many NLP datasets and tasks, including translation, question answering, and cloze tasks, as well as several tasks that require on the fly reasoning or domain adaptation, such as unscrambling words, using a novel word in a sentence, or performing 3-digit arithmetic. The results were very impressive.



# GPT3 *Examples*

</>

## What is GPT-3?

GPT-3 is a language model developed by OpenAI

Developers have built an impressively diverse range of applications using the GPT-3 API, including an all purpose Excel function, a recipe generator, a layout generator (translates natural language to JSX), a search engine and several others.

▼ SHOW ME



# Google trained a trillion-parameter AI language model

Kyle Wiggers

@Kyle\_L\_Wiggers

January 12, 2021 10:36 AM

f t in

<https://venturebeat.com/2021/01/12/google-trained-a-trillion-parameter-ai-language-model/>



# Por que a demissão de pesquisadora negra do Google se transformou em escândalo global

O silenciamento e a saída de Timnit Gebru geram novas dúvidas sobre o compromisso das grandes empresas de tecnologia com seus propósitos éticos



Jeff Dean (@)  
@JeffDean

On behalf of the entire Google Research & @GoogleAI communities, I'm excited to share an overview of some of our research in 2020.

Thanks to everyone who helped make this work possible!



Google Research: Looking Back at 2020, and Forward to 2...  
Posted by Jeff Dean, Senior Fellow and SVP of Google Research and Health, on behalf of the entire Google ...  
[ai.googleblog.com](https://ai.googleblog.com)

5:40 PM · Jan 12, 2021 · Twitter Web App

333 Retweets 82 Quote Tweets 1.5K Likes

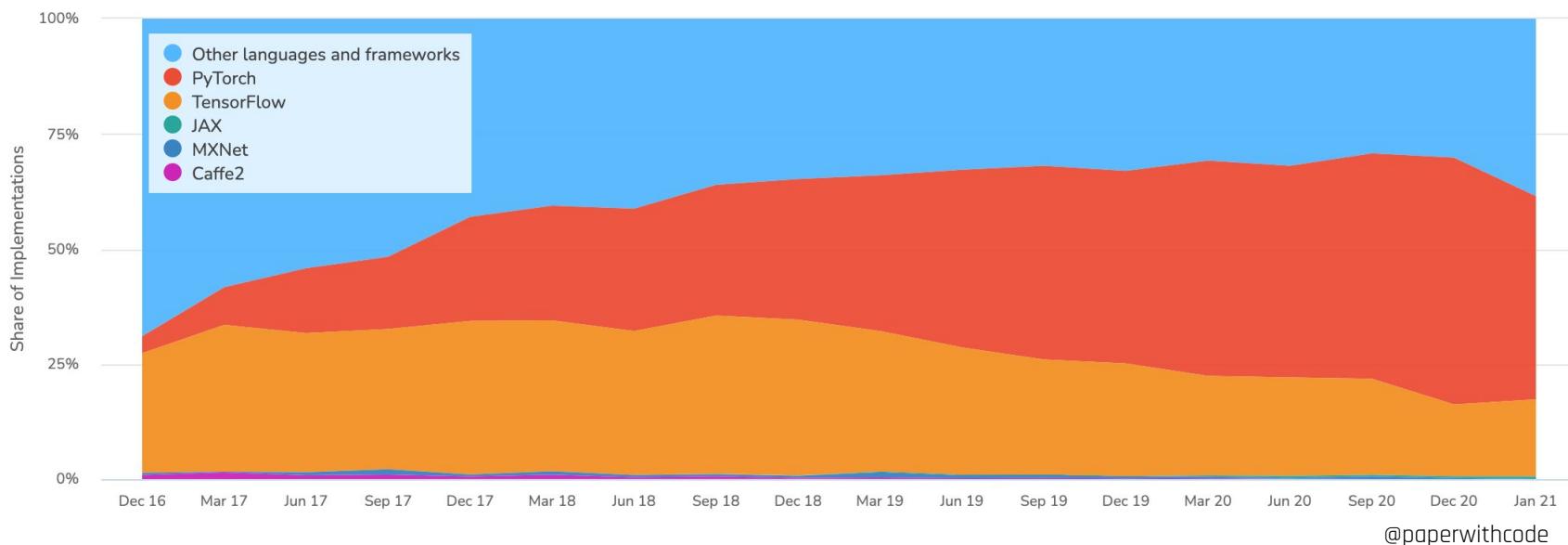
# Trends

Quarter ▾

2016-12-01 to 2021-01-17

## Frameworks

Paper Implementations grouped by framework



@paperwithcode





**Soumith Chintala**   
@soumithchintala



Debates on PyTorch vs TensorFlow were fun in 2017.  
There was healthy competition to innovate, and  
philosophical differences like Theano vs Torch, Emacs vs  
vim, or android vs iOS.  
Now both products look exactly the same, the debates  
are nonsense and boring. Please stop.

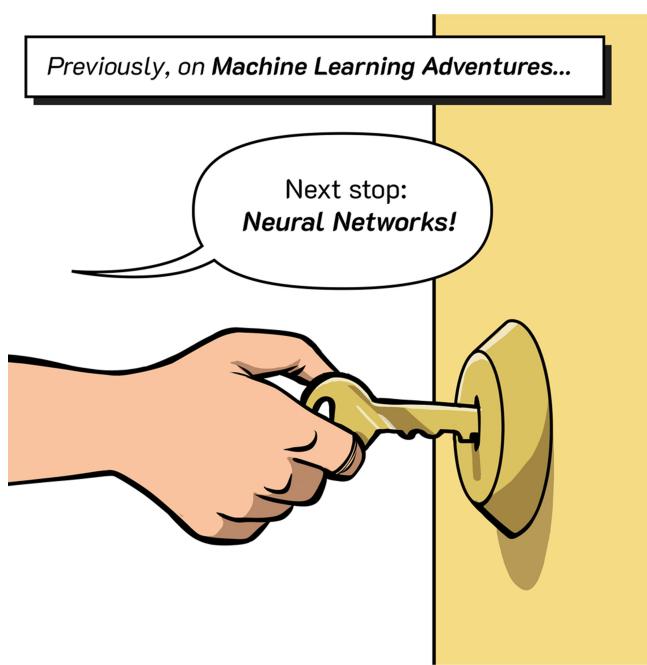
12:27 PM · May 22, 2020 · [Twitter Web App](#)

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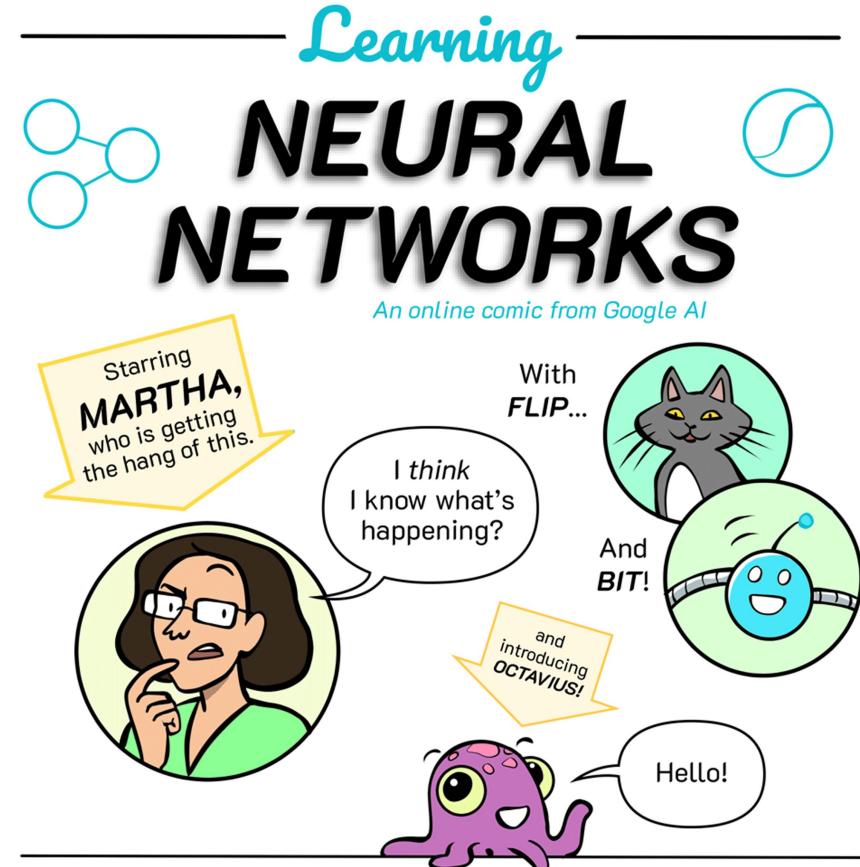
**121** Retweets and comments    **866** Likes



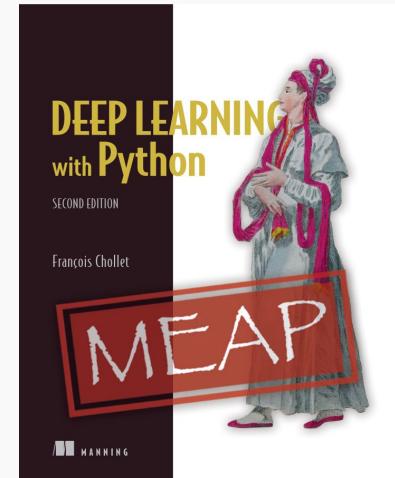
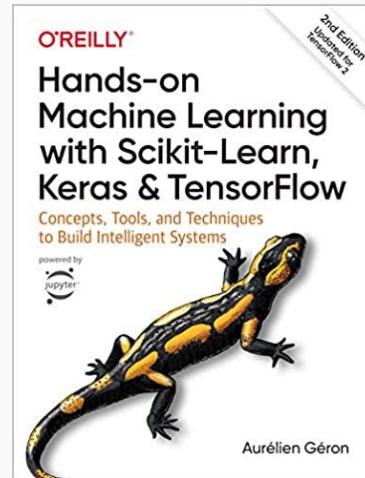
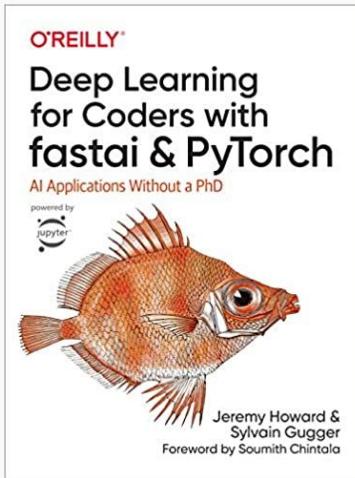
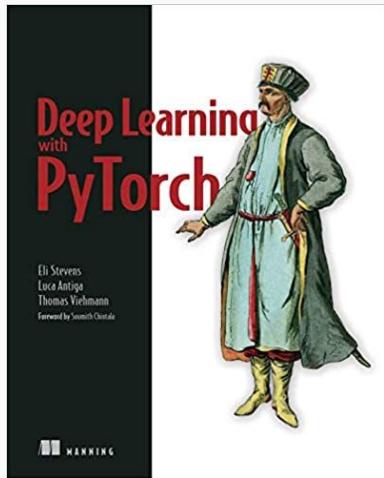
# References



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

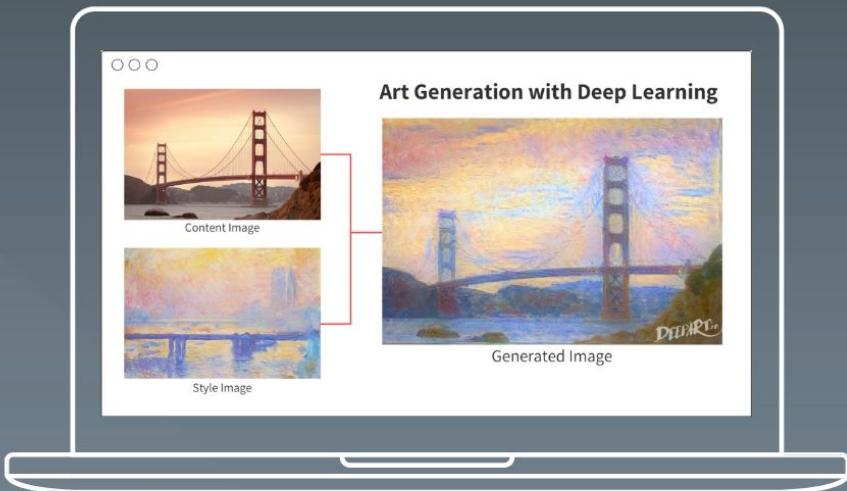


<https://cloud.google.com/products/ai/ml-comic-2>



# Break Into AI

Whether you want to build algorithms or build a company, deeplearning.ai's courses will teach you key concepts and applications of AI.

[Take the Deep Learning Specialization](#)



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LinkedIn

# TOP VOICES

2020

## Data Science & AI



1

## Rana el Kaliouby

CEO and Co-founder, Affectiva



**What she talks about:** A scientist-turned-entrepreneur, el Kaliouby co-founded MIT spin-off Affectiva. Its AI detects complex emotions, cognitive states, activities and objects people use. This year, el Kaliouby published her memoir, **Girl Decoded: A Scientist's Quest to Reclaim Our Humanity by Bringing Emotional Intelligence to Technology**. Her 41,000+ followers follow her for **insights into AI innovation, data in machine learning and automotive tech updates**, as well as reflections on **empathetic leadership, women in tech** and country of origin, **Egypt**. She frequently covers topics such as **these trends from 53,000 ads tested** and brings attention to the importance of diversity in tech.

2

## Greg Coquillo

Globalization Program Manager, Amazon



**What he talks about:** Coquillo offers practical tips on how to use data science as a business strategy. His 25,000+ followers tune in to pick up smart, specific advice **on what to consider when using a data set** (and where to find reliable, free ones) and lessons **on how to identify an experienced data science team**. Earlier this year, Coquillo joined Amazon, and he also offers smart commentary on Amazon-specific developments like **the company's current revenue model**, or the recently announced **Amazon One**. His conversations with members on his posts are as interesting as the posts themselves.

# 3

## Andrew Ng

Founder & CEO, Landing AI  
Cofounder & Chairman, Coursera



**What he talks about:** Ng is among the most significant AI pioneers of our time. His posts on everything from **current company projects**, like **a platform to help manufacturers build and deploy visual inspection systems**, to **an article about his father**, who completed 146 online courses on the platform he helped found, Coursera, receive hundreds of comments from fans as well as other AI practitioners. Ng's 325,000 followers look to him for **broad thought leadership on the field's future** and specific developments like **this new course on Generative Adversarial Networks (GANs)**.



# 4

## Cassie Kozyrkov

Chief Decision Scientist, Google



**What she talks about:** Kozyrkov notes that the “days of the ‘I’m-not-a-data-person’ are fading fast” and she wants to make decision intelligence available to more people. She draws from her focus on the intersection between information and decision-making to point her 245,000 followers to podcast episodes like [\*\*this selection on the relationship between analytics and storytelling\*\*](#) and short tutorial videos offering, for example, [\*\*advice on the machine learning skills\*\*](#) you should learn. This year, she has focused a good deal of her commentary on [\*\*bias and its impact\*\*](#) on technology.

# 5

## Chip Huyen

Machine Learning Engineer  
& Open Source Lead, Snorkel AI



**What she talks about:** Huyen posts about **how to put machine learning into practice**, from landing jobs in the field to **what skills to prioritize learning**. Having worked at prominent tech companies including Netflix and NVIDIA, Huyen **joined the AI startup Snorkel** last December. A Stanford graduate, Huyen turned to LinkedIn to find reviewers for **the course she'll start teaching there** in January, Machine Learning Systems Design. Before coming to the U.S., Chip helped launch Vietnam's second most popular web browser, **Coc Coc**. She's currently writing a book on how to interview for machine learning roles.

## Results for : machine+learning

		Rank	Influence	Followers
	<b>Pratham Prasoon</b> 	1	8.10	42,067
	<b>Machine Learning Bot</b> 	2	7.97	5,160
	<b>Santiago</b> 	3	4.10	41,322
	<b>elvis</b> 	4	3.64	16,706
	<b>Dr. Ganapathi Pulipaka</b> 	5	2.82	106,180
	<b>Kirk Borne</b> 	6	2.31	272,636
	<b>KDnuggets</b> 	7	2.20	184,400



# Course Outline



# Unit 01

The perceptron  
Building neural networks  
Applying neural networks  
Training neural networks  
Neural networks in practice  
Hyperparameter Tuning  
Batch Normalization  
Multiclass classification  
Structuring DL Projects

40% Project Medium #01  
60% Project Medium #02

# Unit 02

Convolutional Neural Networks  
100% Project Medium #03



# Unit 03

Recurrent Neural Networks  
100% Project Medium #04



**Janeiro ▼ 2021 ▼**

Wk	Dom	Seg	Ter	Qua	Qui	Sex	Sáb
53					1	2	
1	3	4	5	6	7	8	9
2	10	11	12	13	14	15	16
3	17	18	19	20	21	22	23
4	24	25	26	27	28	29	30
5	31						

**Fevereiro ▼ 2021 ▼**

Wk	Dom	Seg	Ter	Qua	Qui	Sex	Sáb
5		1	2	3	4	5	6
6	7	8	9	10	11	12	13
7	14	15	16	17	18	19	20
8	21	22	23	24	25	26	27
9	28						

**Março ▼ 2021 ▼**

Wk	Dom	Seg	Ter	Qua	Qui	Sex	Sáb
End unit #01	9	1	2	3	4	5	6
	10	7	8	9	10	11	12
	11	14	15	16	17	18	19
	12	21	22	23	24	25	26
End unit #02	13	28	29	30	31		

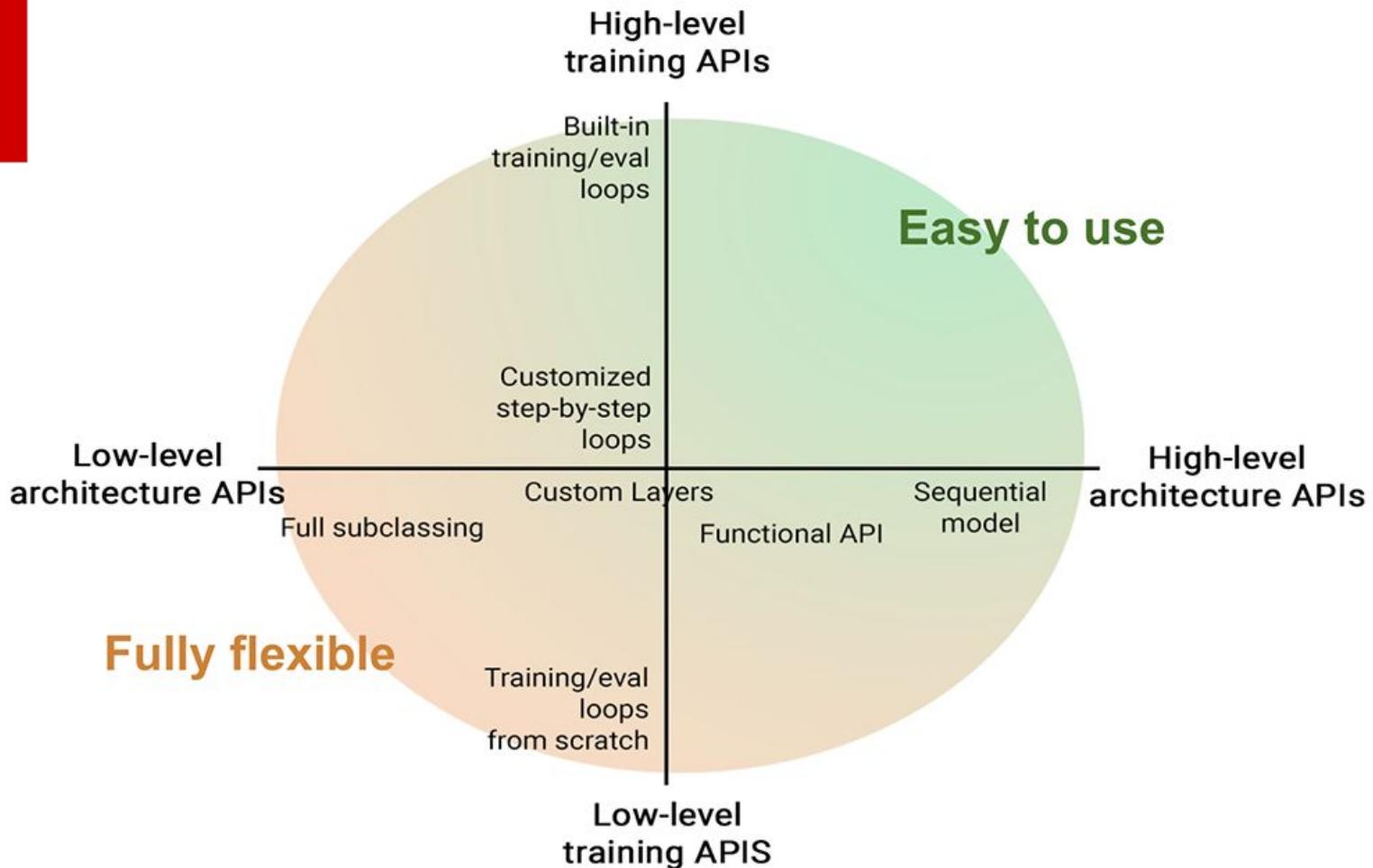
 Live class

 Recorded class

**Abril ▼ 2021 ▼**

Wk	Dom	Seg	Ter	Qua	Qui	Sex	Sáb
13				1	2	3	
14	4	5	6	7	8	9	10
15	11	12	13	14	15	16	17
16	18	19	20	21	22	23	24
17	25	26	27	28	29	30	

End unit #03





Search or jump to...

Pull requests Issues Marketplace Explore

Notifications + ⚙️

ivanovitchm / **imd1122**

Unwatch 1

Star 0

Fork 0



Code



Issues



Pull requests



Actions



Projects



Wiki



Security



Insights



Settings



main ▾



1 branch



0 tags

Go to file

Add file ▾



Code ▾

## About

Repository for IMD1122 2021.1, an undergraduate course about AI

Readme



ivanovitchm Update README.md

4fcb717 1 hour ago

2 commits



README.md

Update README.md

1 hour ago

README.md



# Universidade Federal do Rio Grande do Norte

## Instituto Metrópole Digital

### IMD1122 - Special Topics in Computational Intelligence

- Lesson #01
  - Course Outline & Presentation
- Lesson #02
  - Introduction to Neural Network

## Releases

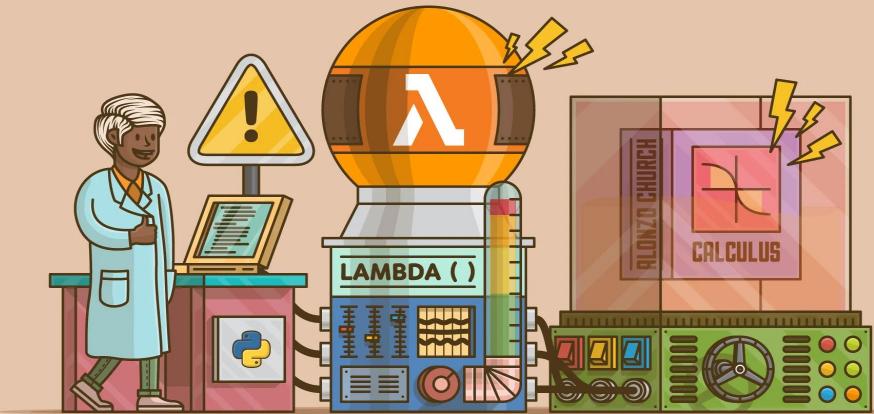
No releases published  
[Create a new release](#)

## Packages

No packages published  
[Publish your first package](#)



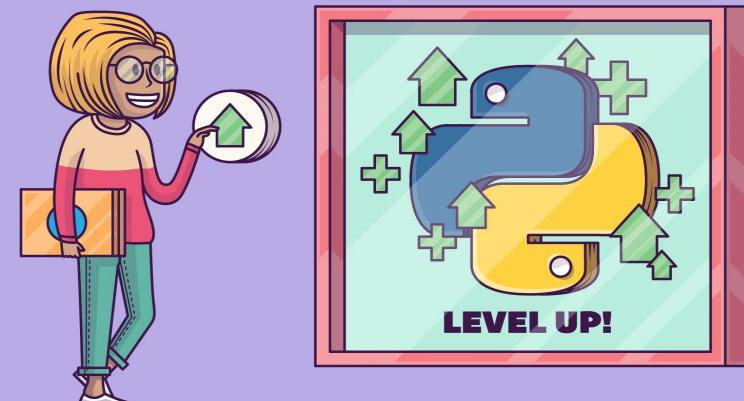
Real Python



Real Python



Real Python



Real Python



INSTITUTO

METRÓPOLE  
DIGITAL



Next ....

<https://www.imd.ufrn.br/>

<https://github.com/ivanovitchm>