



INSTITUTO

METRÓPOLE  
DIGITAL



# Deep Learning Outline Presentation

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@ivanovitchm

Lesson #01

<https://abre.ai/email-deeplearning>

# 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

**Carga horária mínima para obtenção do certificado: 360h**

**Estrutura curricular:**

<b>Código</b>	<b>Disciplina</b>	<b>Nível</b>	<b>CH</b>	<b>Tipo</b>
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

# 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



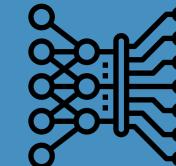
## MACHINE LEARNING

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



## DEEP LEARNING

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



TinyML

GNN

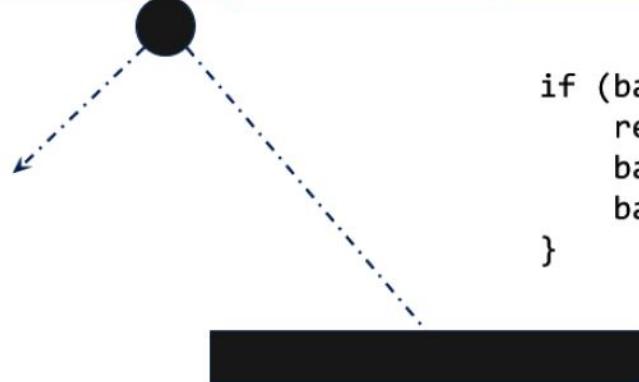
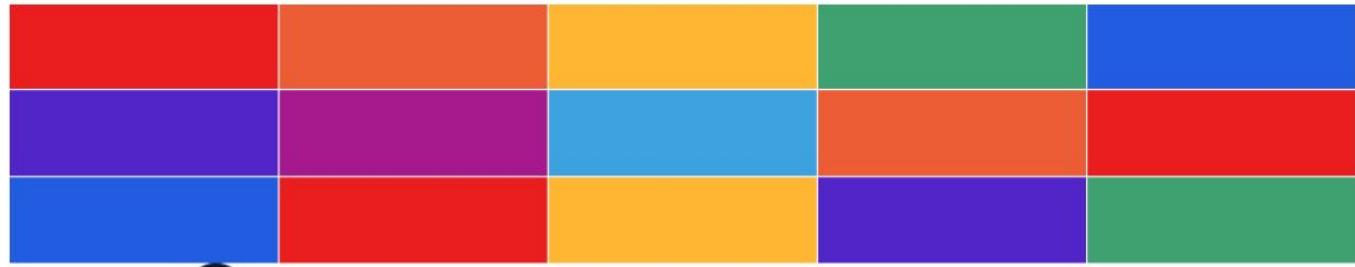
DATA SCIENCE

1950 - 1980

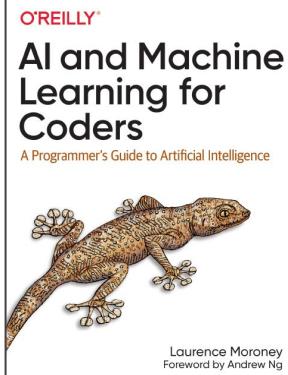
1980 - 2010

2010 - 2021

# 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;  
}
```

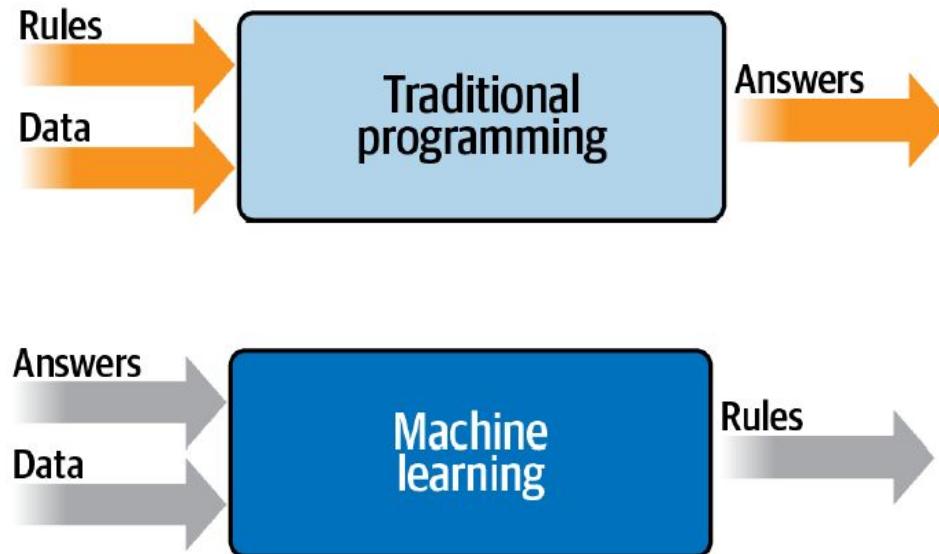


```
if(speed<4){  
    status=WALKING;  
} else if(speed<12){  
    status=RUNNING;  
} else {  
    status=BIKING;  
}
```



// ???

# 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

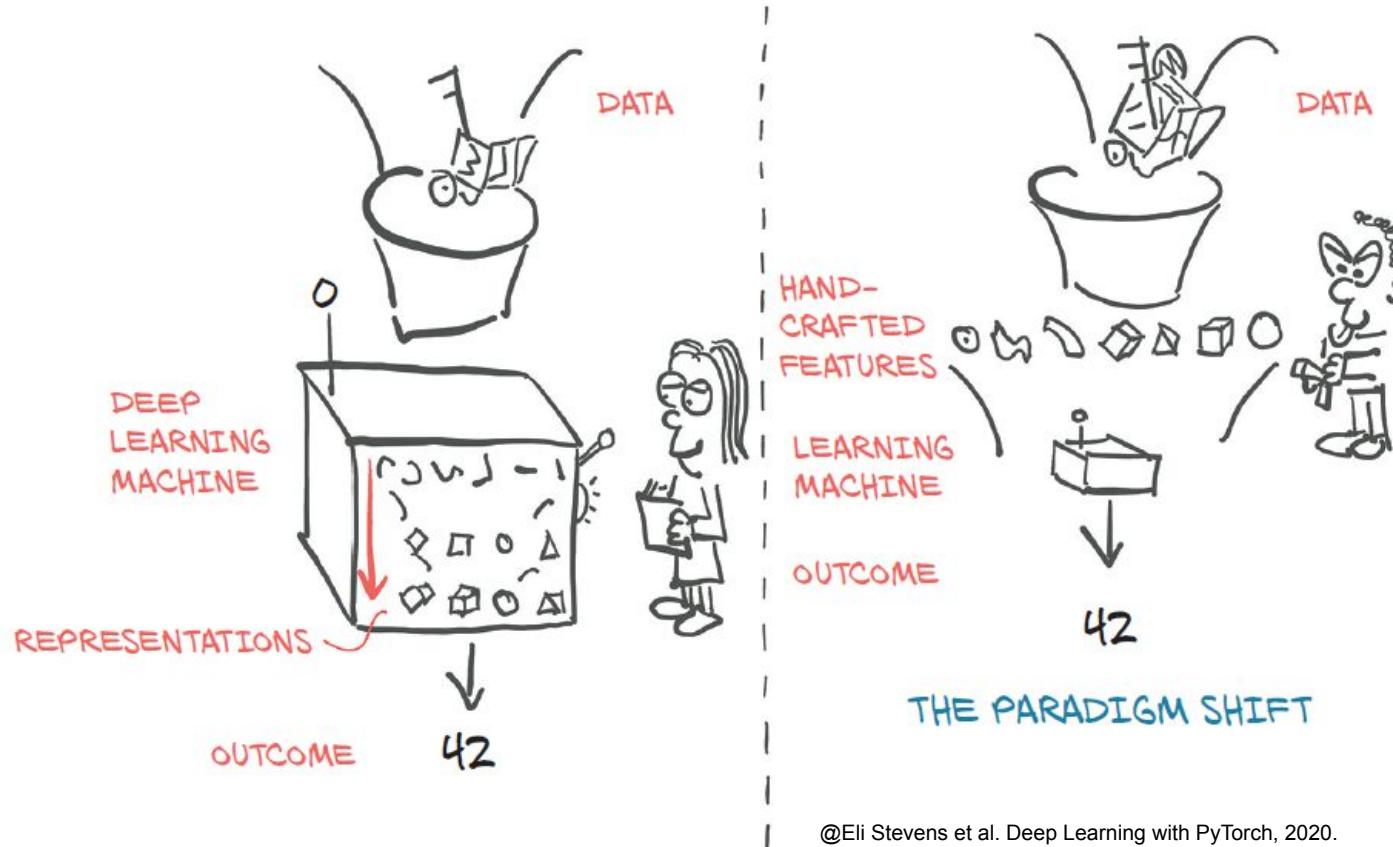
Label = WALKING

Label = RUNNING

Label = BIKING

Label = GOLFING

# Why Deep Learning?



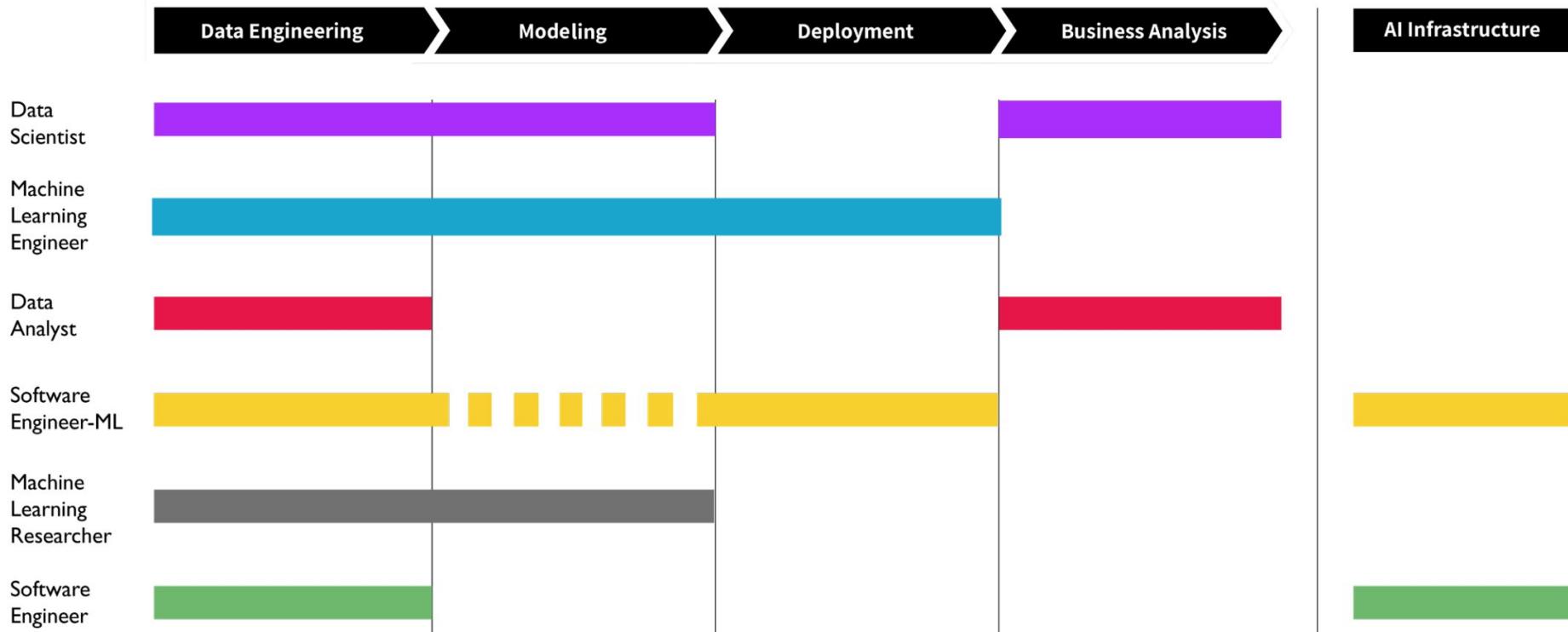
# Roles of an AI Team





# WORKERA

a deeplearning.ai company



# CS 329S: Machine Learning Systems Design

Stanford, Winter 2021

## Schedule & syllabus

The lecture slides, notes, tutorials, and assignments will be posted online here as the course progresses.

Lecture times are **2:30-3:50pm PST**. All deadlines are at **11:59pm PST**.

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

Date	Description	Materials	Events
Mon Jan 11	Understanding machine learning production	Note Slides	Lecture
Wed Jan 13	Intro to machine learning systems design	Note Slides	Lecture
Mon Jan 18	No class	Martin Luther King, Jr. Day	
Wed Jan 20	Data engineering	Slides Note	Lecture
Mon Jan 25	Model development	Slides Note	Lecture
Wed Jan 27	PyTorch & distributed training Tutorial by Shreya Shankar and Karan Goel	Slides - PyTorch (Shreya) Slides - scaling (Karan)	Lecture + Tutorial
Mon Feb 1	Model evaluation	Slides	Lecture
Wed Feb 3	Experiment tracking and versioning Weights & Biases tutorial by Lavanya Shukla DVC tutorial by DVC team	Slides	Lecture + Tutorial
Mon Feb 8	Deployment	Slides	Lecture





deeplearning.ai

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





Search...

All fields



Search

[Help | Advanced Search](#)

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**

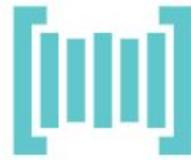
See COVID-19 SARS-CoV-2 preprints from

- [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

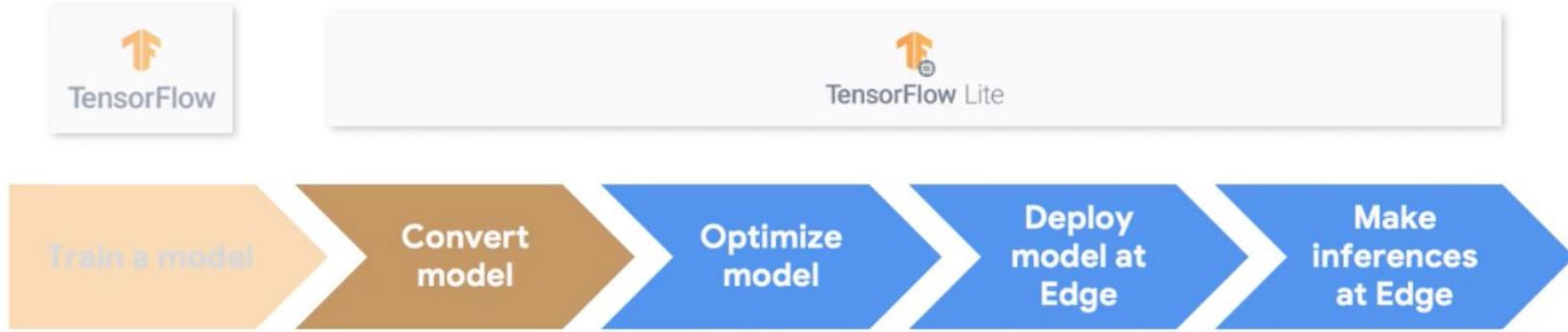
40 papers with code

[See all 199 tasks](#)

@paperwithcode



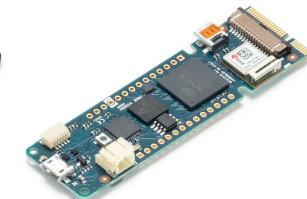
É o único aparelho de visão artificial vestível.



Portenta Vision Shield



Portenta H7



FPGA + Arduino Nano

# TinyML

A scene from Game of Thrones. In the foreground, Arya Stark (Maisie Williams) is looking up with a shocked expression, her mouth slightly open. She has short brown hair and is wearing a dark, simple tunic. To her left, the Hound (Rufus Sewell) stands in profile, facing away from the camera. He has long, reddish-brown hair and is wearing a heavy, light-colored cloak. They are in a large, dimly lit hall with stone walls and a series of steps or stairs leading upwards in the background.

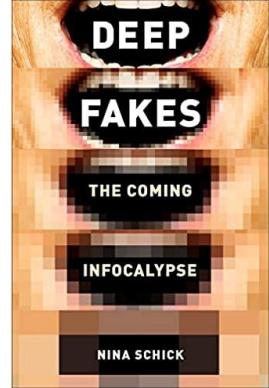
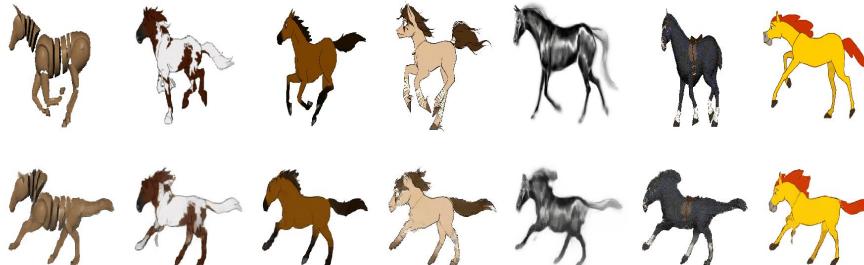
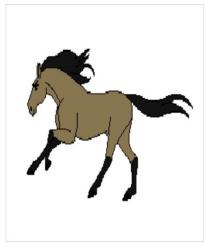
WELCOME TO

DEEPFACE**CO**LAB

<https://github.com/chervonij/DFL-Colab>



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



<https://abre.ai/deepfake-vacina>

# 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





# +100k 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>

<sup>a</sup> Universidade Federal do Rio Grande do Norte (UFRN), Rio Grande do Norte, Brazil

<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

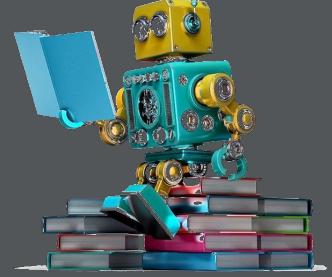
Scientometrics

---

### 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
```

@jrmiranda

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

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MARCAS

PATENTES

DESENHOS  
INDUSTRIALIS

INDICAÇÕES  
GEOGRÁFICAS

PROGRAMAS DE  
COMPUTADOR

TOPOGRAFIAS  
DE CIRCUITOS  
INTEGRADOS

CONTRATOS DE  
TECNOLOGIA E  
DE FRANQUIA

ACADEM  
DO INP

Alguma dúvida?



Chatbot

Alguma dúvida?  
Chatbot do INPI  
DISPONÍVEL 24/7

DE  
MAIS

VALOR

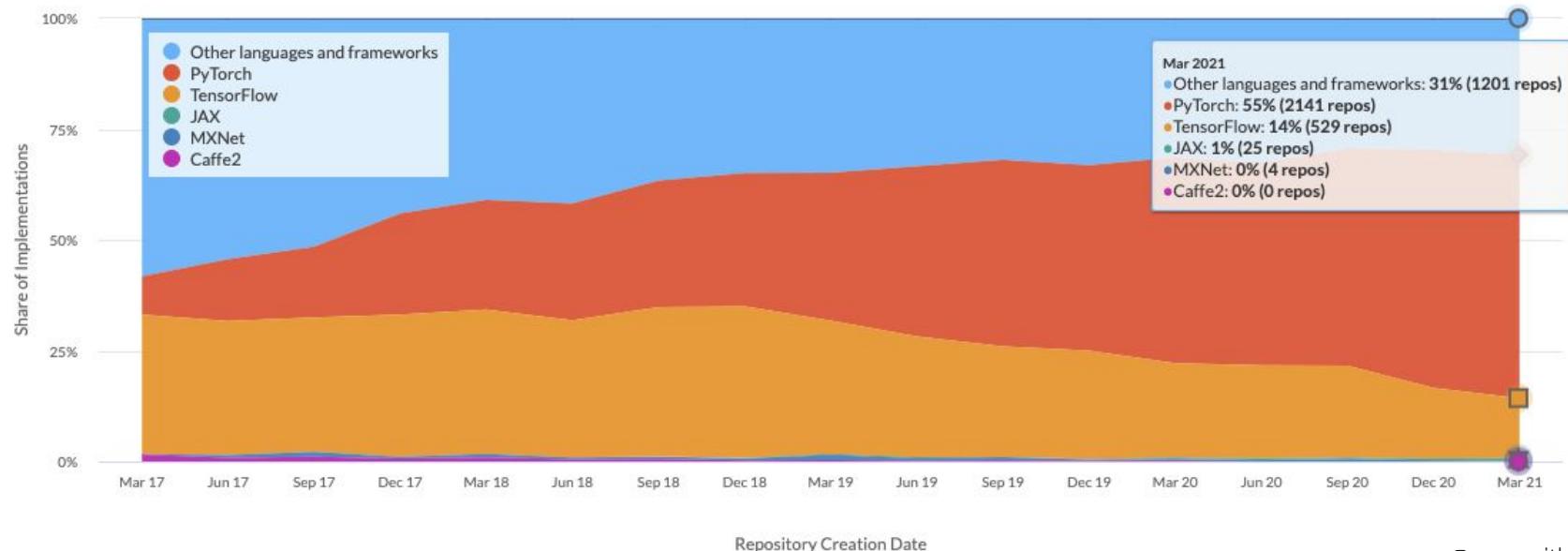
À SUA  
CRIAÇÃO!

DE  
MAIS

# Trends

## Frameworks

Paper Implementations grouped by framework



@paperwithcode





# Developer tools for machine learning

Experiment tracking, hyperparameter optimization,  
model and dataset versioning

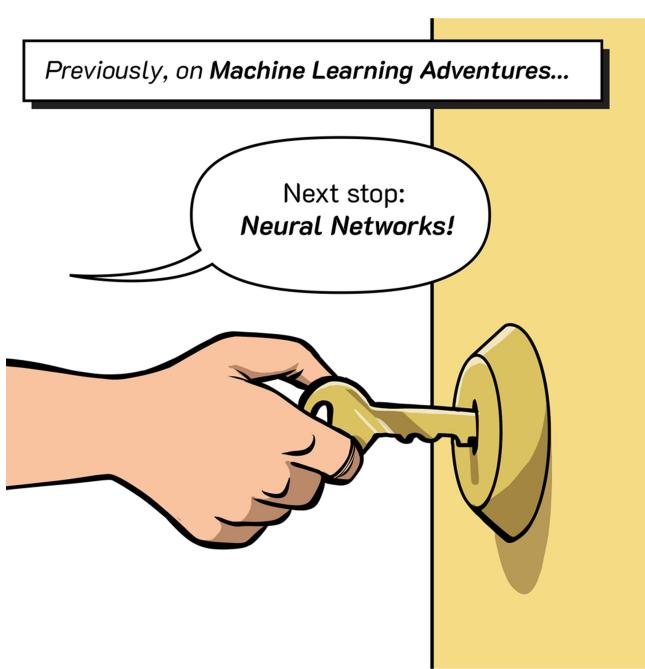
[Create a free account](#)[Request a demo](#)

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

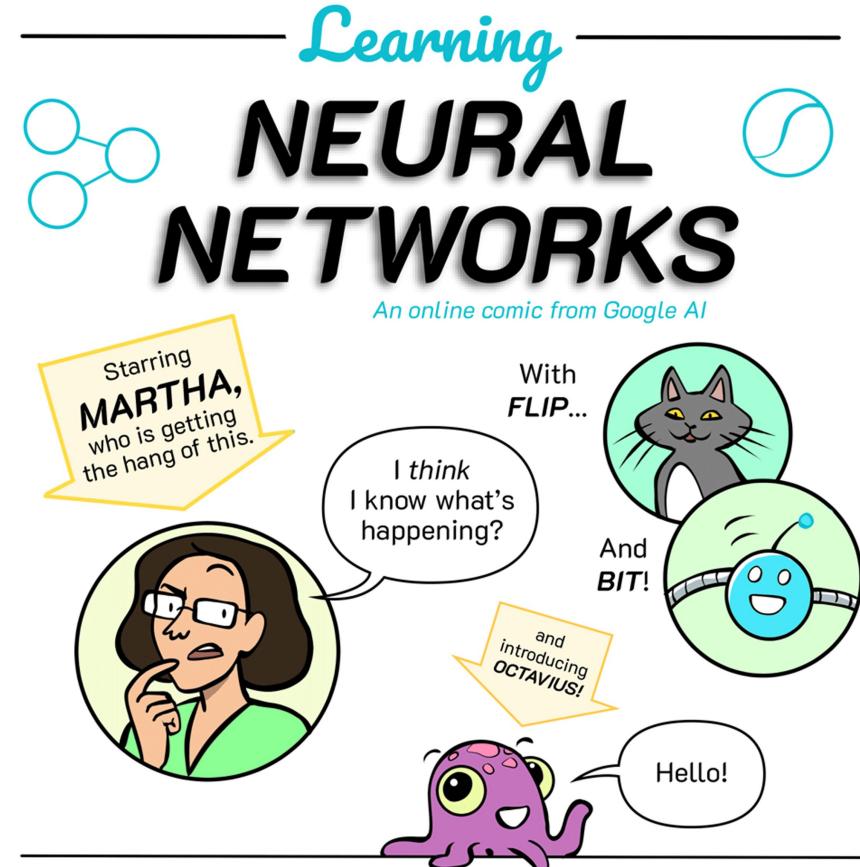
[Try a live notebook](#)

<https://wandb.ai>

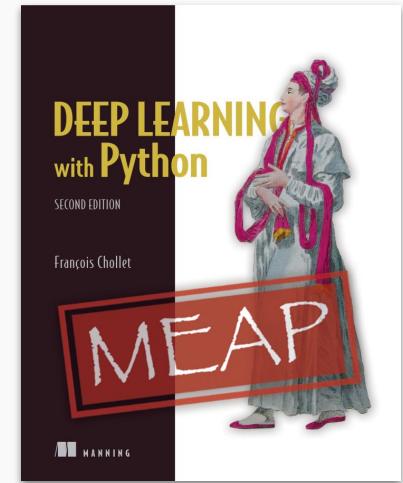
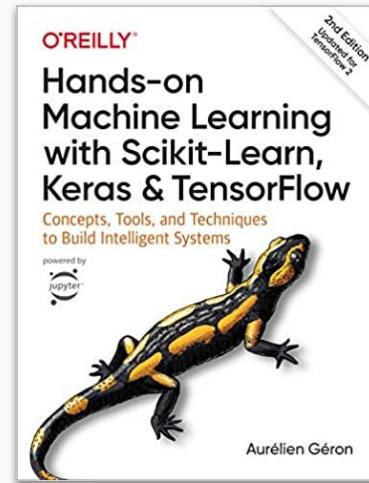
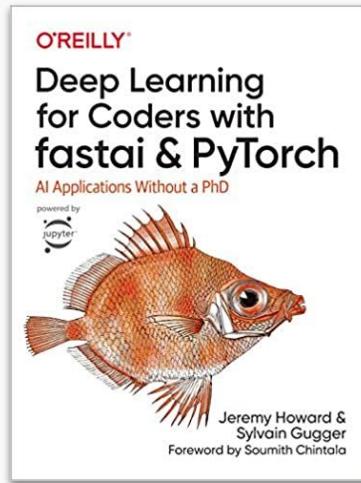
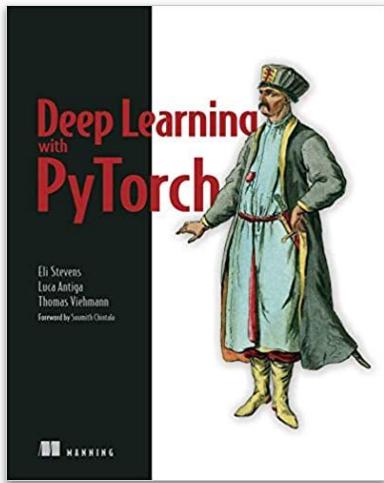
# References



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



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





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PAPERS

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DeepFake Detector AIs Are Good Too!

Two Minute Papers 1.1M views • 1 year ago

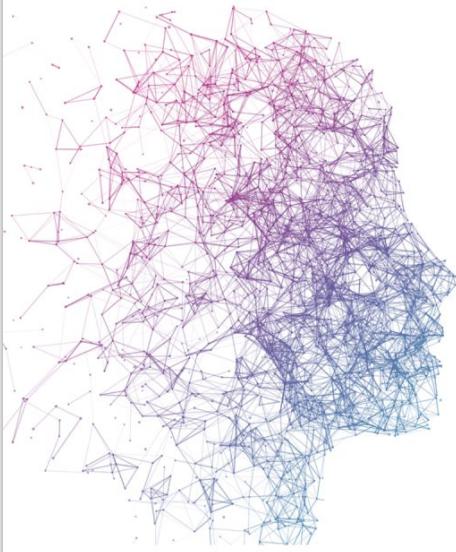
♥ Pick up cool perks on our Patreon page: <https://www.patreon.com/TwoMinutePapers> 🎉 The paper "FaceForensics++: Learning to Detect Manipulated Facial Images" is available here: <http://www....>





**UFRN.ai**

**EXPANDINDO OS HORIZONTES  
DA INTELIGÊNCIA ARTIFICIAL**



# INTELIGÊNCIA ARTIFICIAL

## DISTRITO . REPORT 2021

REALIZAÇÃO:

**DISTRITO**

APOIO ESTRATÉGICO:



PIXEON

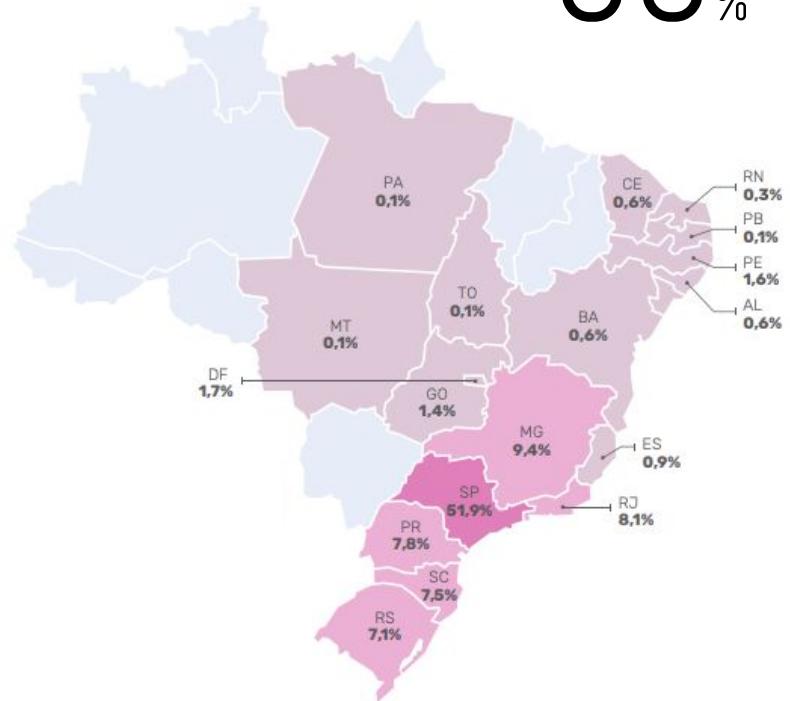
stradigi



<https://distrito.me/dataminer/reports/>

AS STARTUPS DE INTELIGÊNCIA  
ARTIFICIAL ESTÃO CONCENTRADAS NO  
EIXO SUL-SUDESTE

**93%**



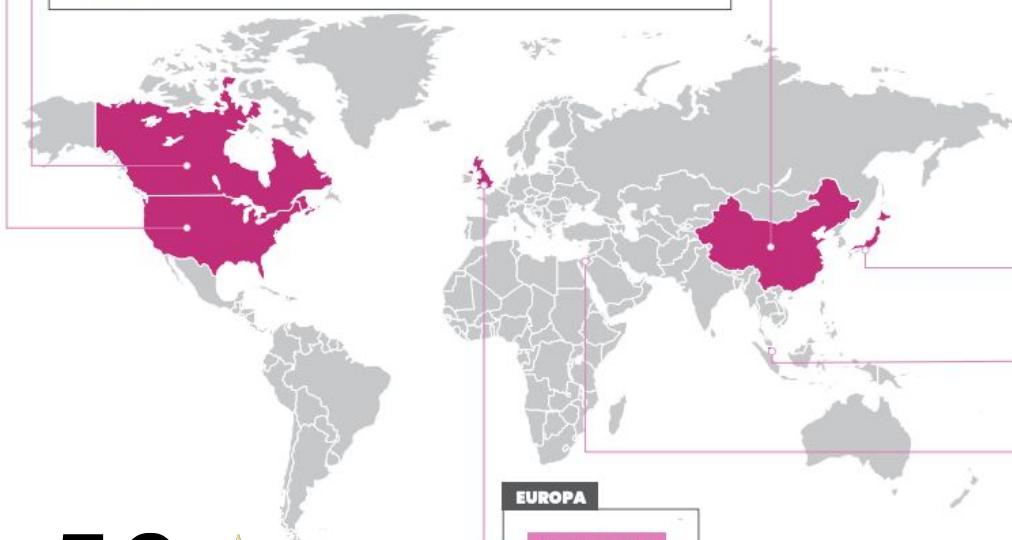
Contextualização

## AMÉRICA DO NORTE

### ESTADOS UNIDOS



### CANADÁ



+50



# Decacórnios

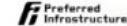


## ÁSIA

### CHINA



### JAPÃO



### CINGAPURA

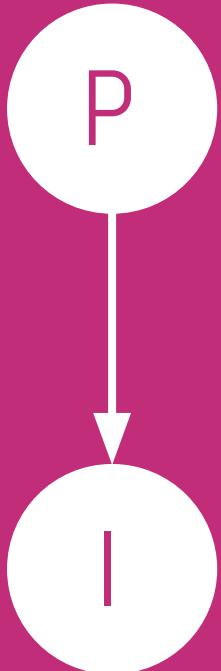


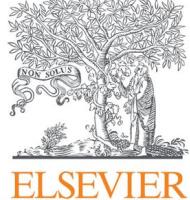
### ISRAEL



Fonte: Hurun Unicorn Index; Crunchbase; Tracxn

Qual a influência  
da Pesquisa  
nessa realidade?





Pesquisador@s

Colaboração

Tópicos

Empresas

Dados não-estruturados



↑  
Informação



Alphabet

facebook.



twitter

HIKVISION®

amazon

GoPro®  
Be a HERO.

OpenAI

Uber



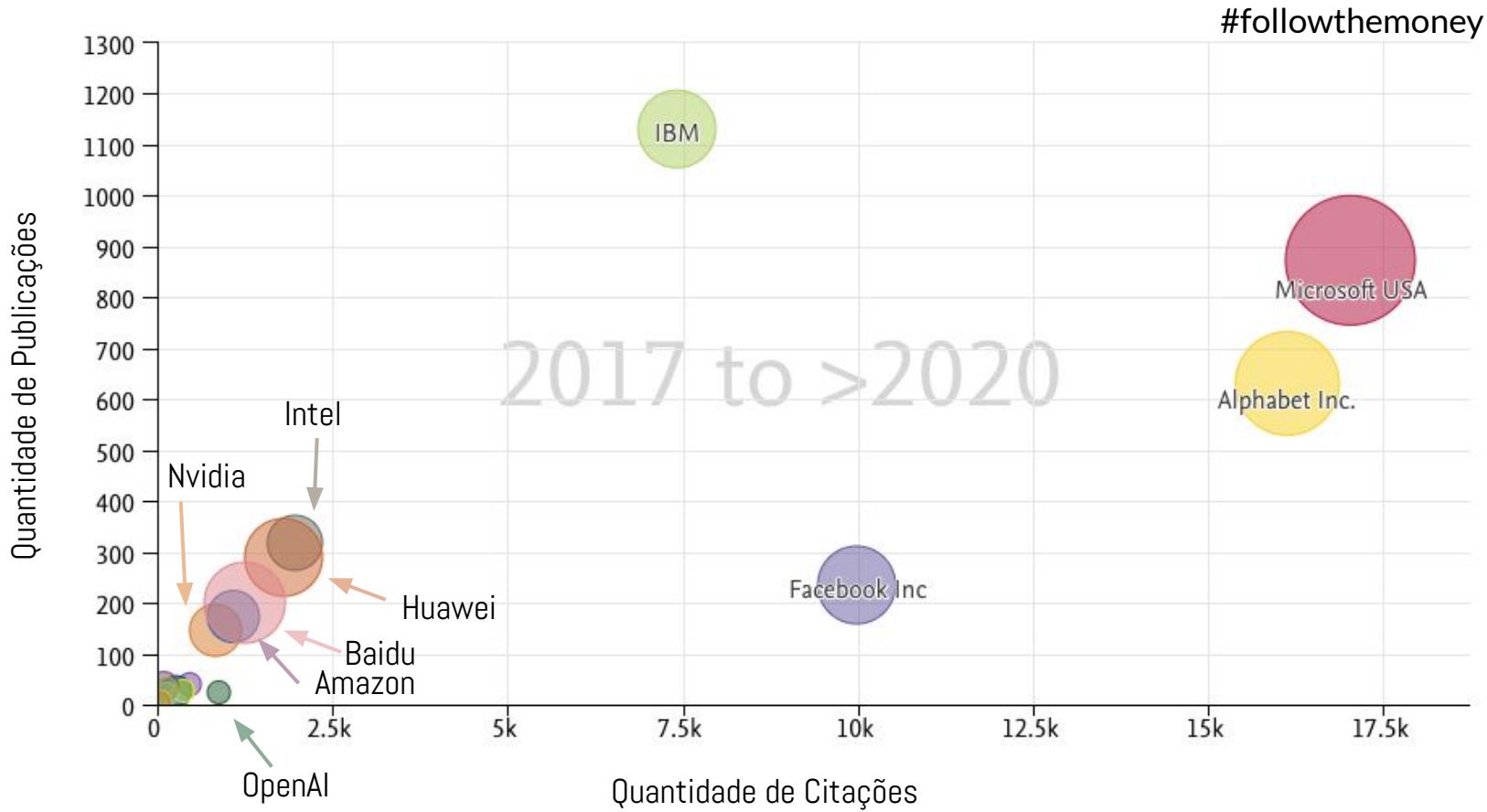
intel®

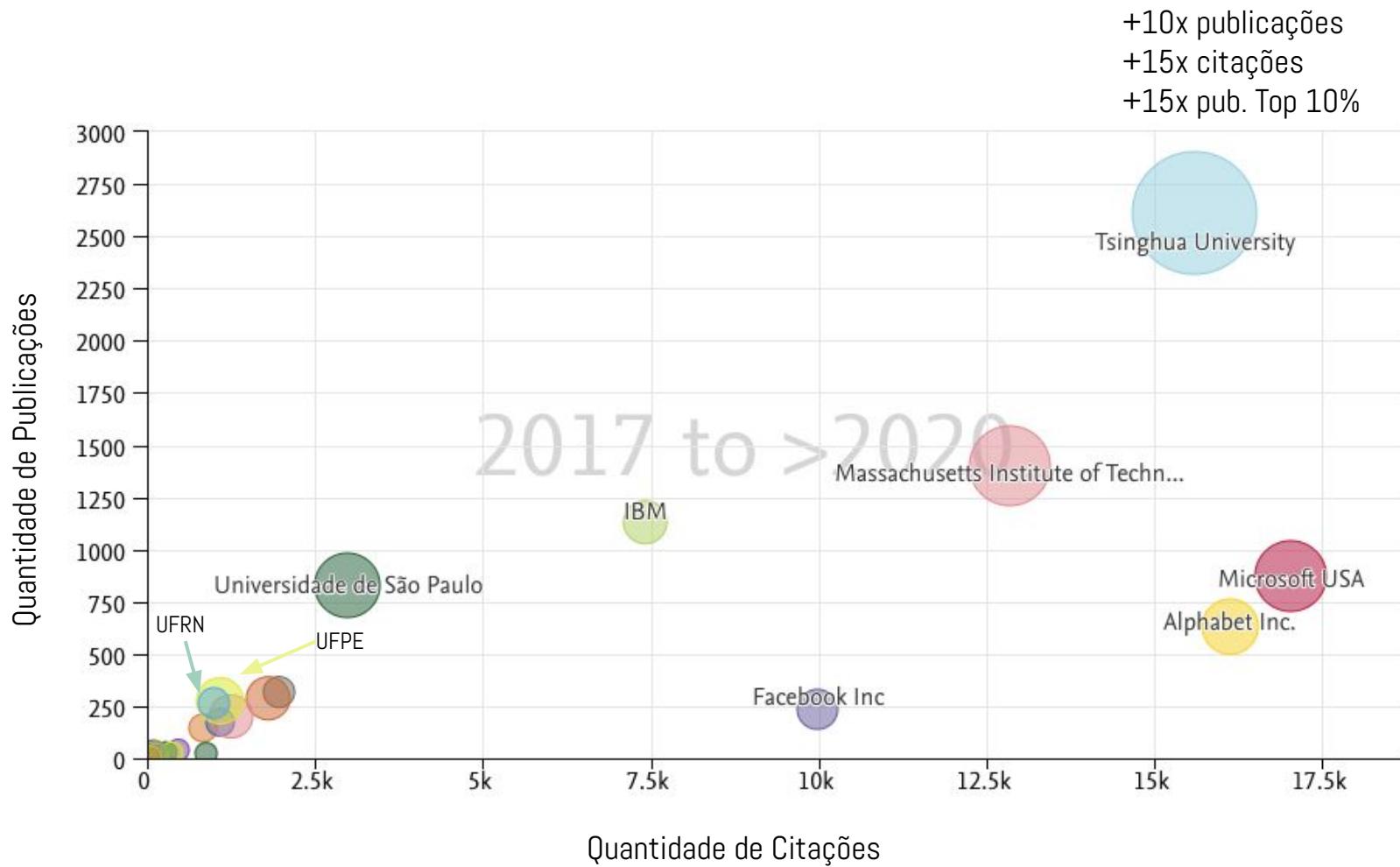
lyft

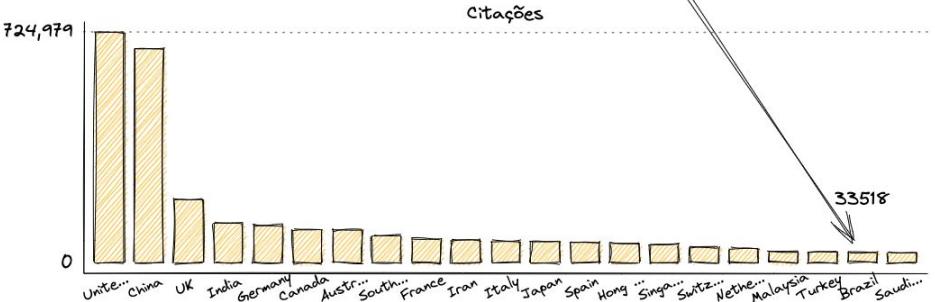
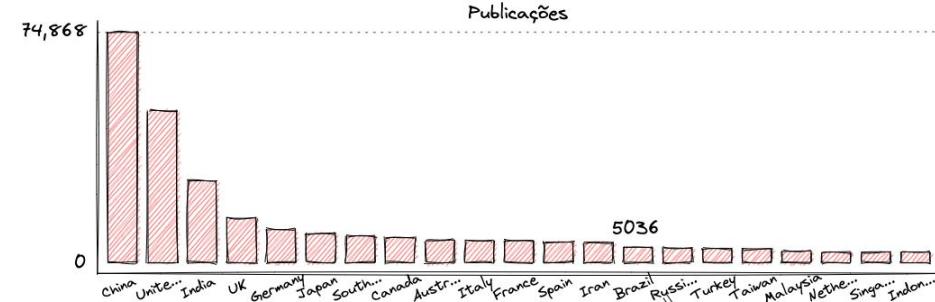
ORACLE

IBM

SMIC



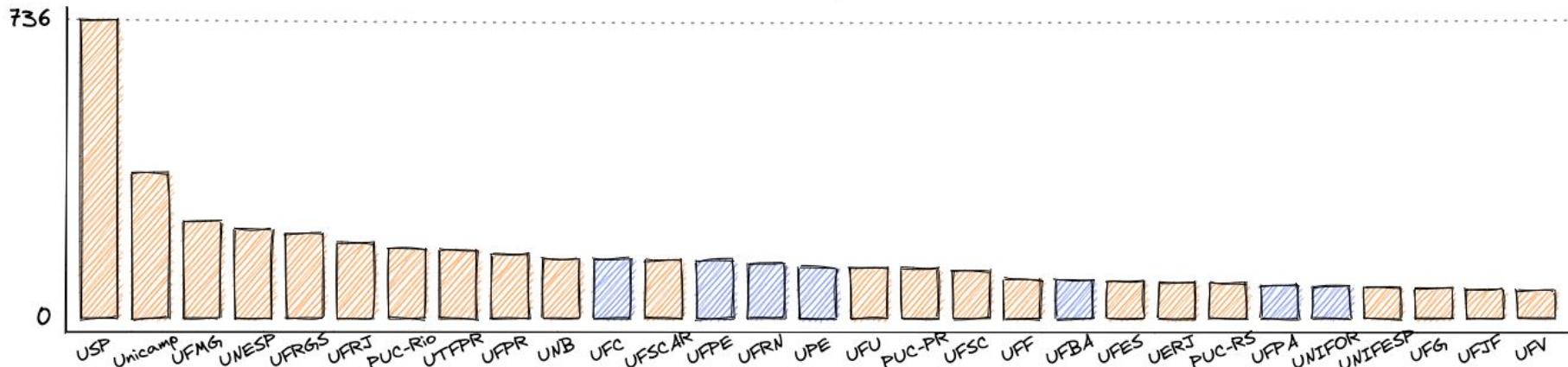




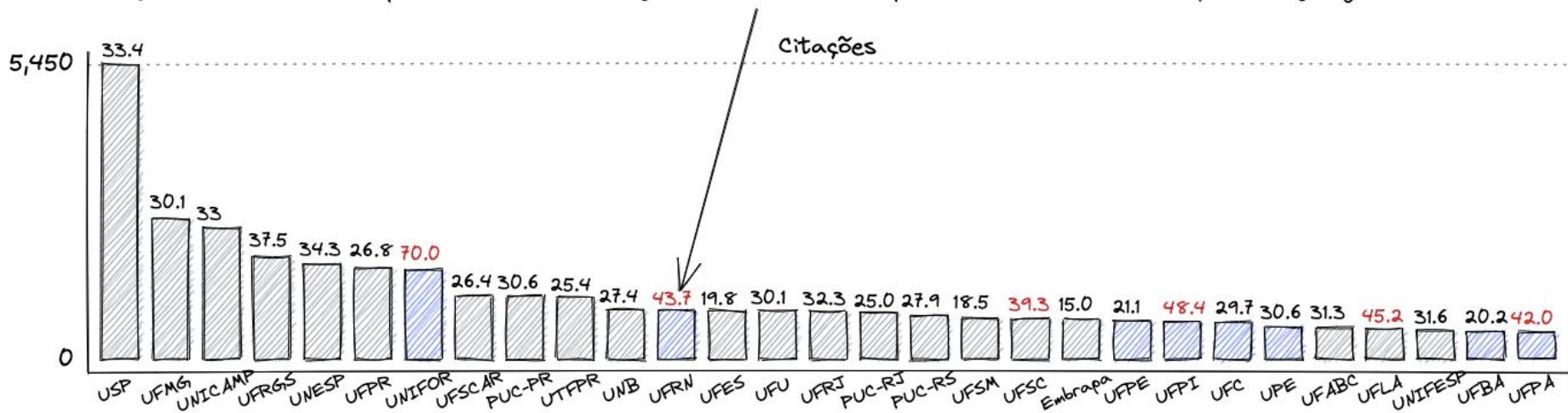
+265k  
publicações

Internet of Thing   Long Short-term Memory   Transfer of Learning  
Support Vector Machine   Artificial Neural Network  
Collaborative Filtering   Classifier   Recommendation System  
Recommende System   Deep Learning  
Learning System   Semantic Facial Recognition   Image Recognition  
Malware Embedding   Segmentation   Object Detection  
Embedding   Learning Method   Generative  
Segmentation   Recurrent Neural Network   Big Data  
Learning Method   Machine Learning   Computer Vision   Decision Tree  
Reinforcement Learning   Neural Network   Feature Selection  
Data Mining   Learning Algorithm   CNN   Feature Extraction  
Multi-agent System   Extreme Learning Machine   Autonomous Vehicle  
Natural Language Processing System   Convolution   Learning Model  
Extreme Learning Machine   Image Classification

## Publicações

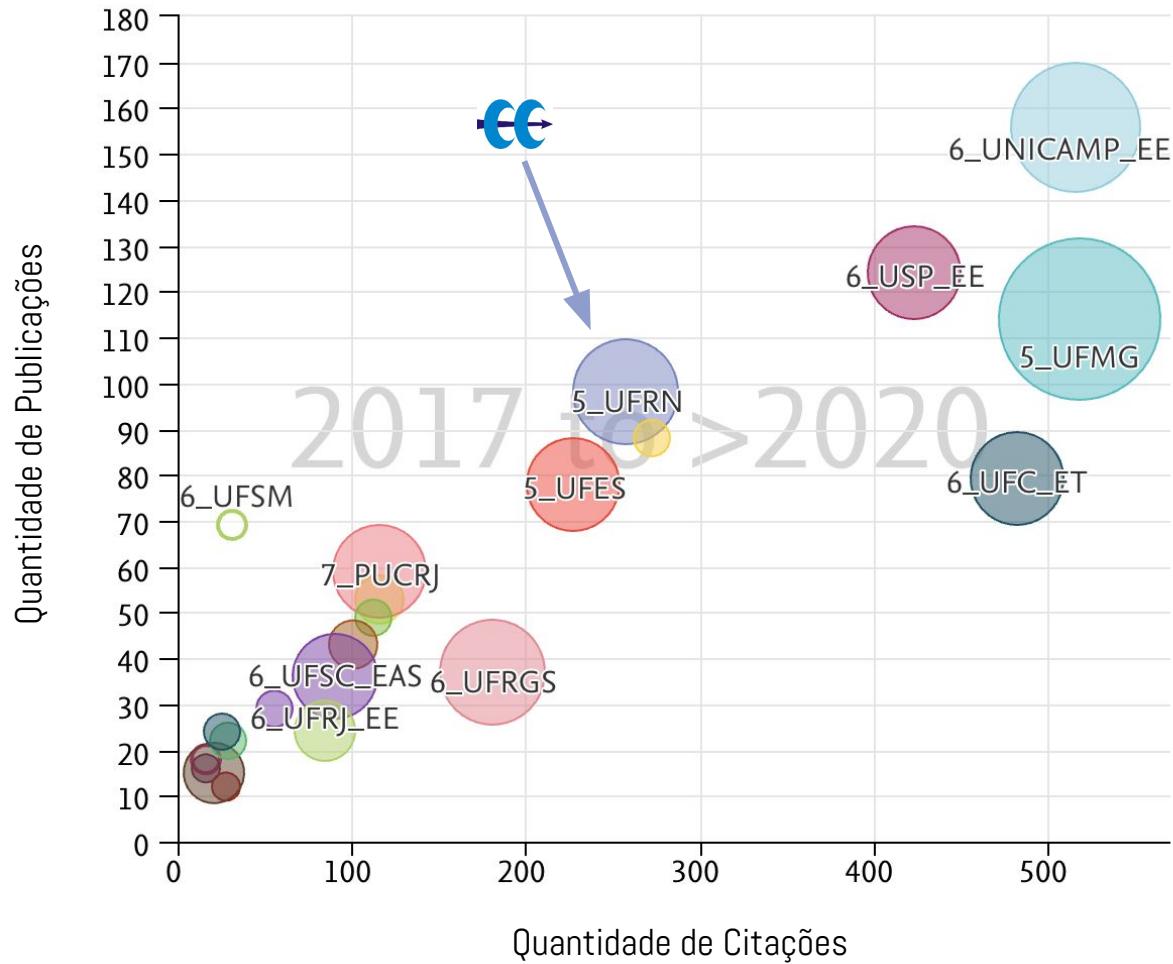


## Citações



+1500

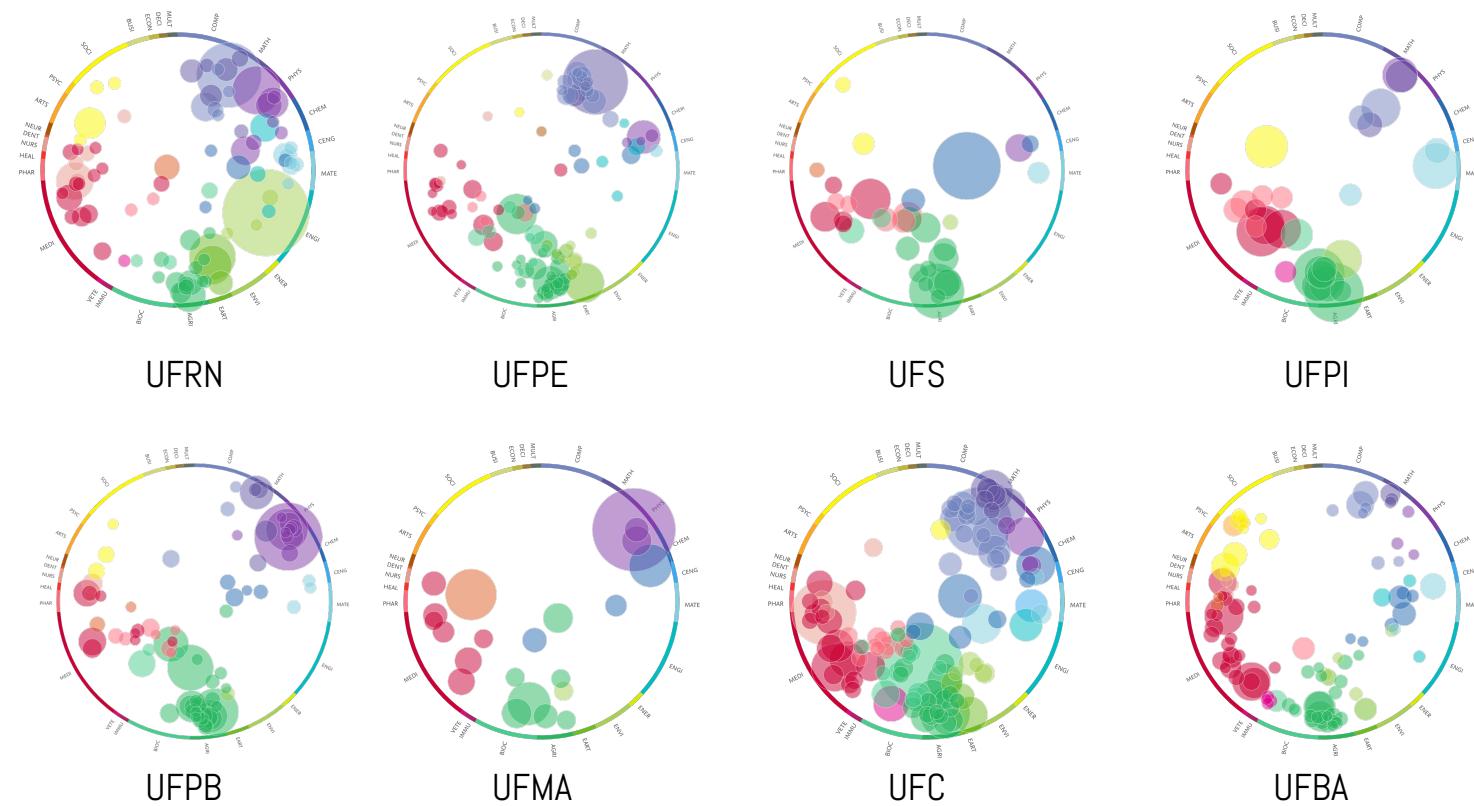




#### Computer Science (13)

- Artificial Intelligence
- Computational Theory and Mathematics
- Computer Graphics and Computer-Aided Design
- Computer Networks and Communications
- Computer Science (miscellaneous)
- Computer Science Applications
- Computer Vision and Pattern Recognition
- General Computer Science
- Hardware and Architecture

# Tópicos e Áreas de Atuação entre Instituições



# Course Outline





2021 JUNE						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

Printable Calendar From Wishshi.com

2021 JULY						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Printable Calendar From Wishshi.com

2021 AUGUST						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

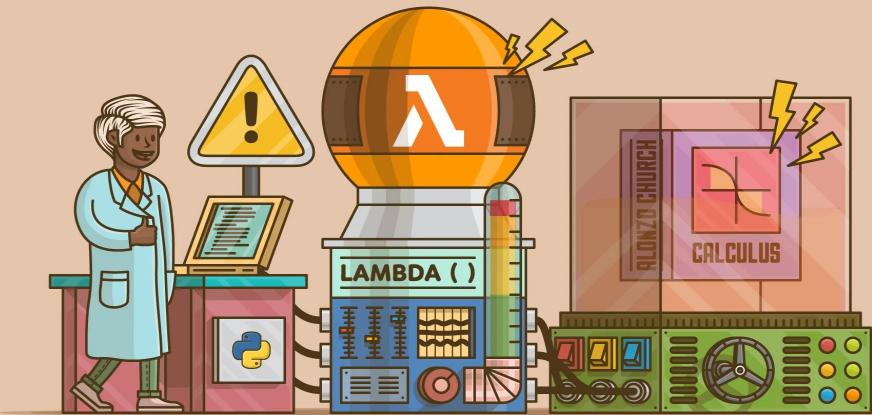
  

2021 SEPTEMBER						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

- Week #01 - Course Outline
- Week #02 - Neural Networks Fundamentals
- Week #03 - Better Generalization vs Better Learning
- Week #04 - Better Generalization vs Better Learning
- Week #05 - Hyperparameter Tuning & Batch Normalization
- Week #06 - Fundamentals of CNN
- Week #07 - Fundamentals of CNN
- Week #08 - LeNet-5 & AlexNet
- Week #09 - VGG & GoLeNet
- Week #10 - Resnet
- Week #11 - Transfer Learning
- Week #12 - Final Project
- Week #13 - Final Project
- Week #14 - Final Project



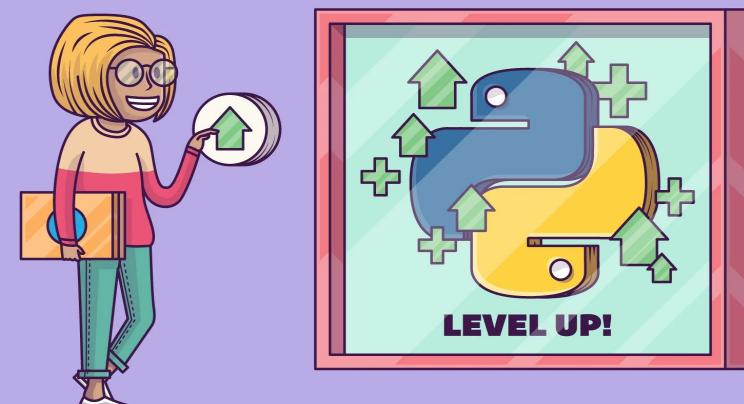
Real Python



Real Python



Real Python



Real Python



INSTITUTO

METRÓPOLE  
DIGITAL



Next ....

<https://github.com/ivanovitchm/deeplearning>