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UNIVERSIDADE FEDERAL DO RIO DE JANEIRO

Construindo aplicações de aprendizado de máquina embarcado para Indústria 4.0

Claudio Miceli de Farias -Universidade Federal do Rio de Janeiro
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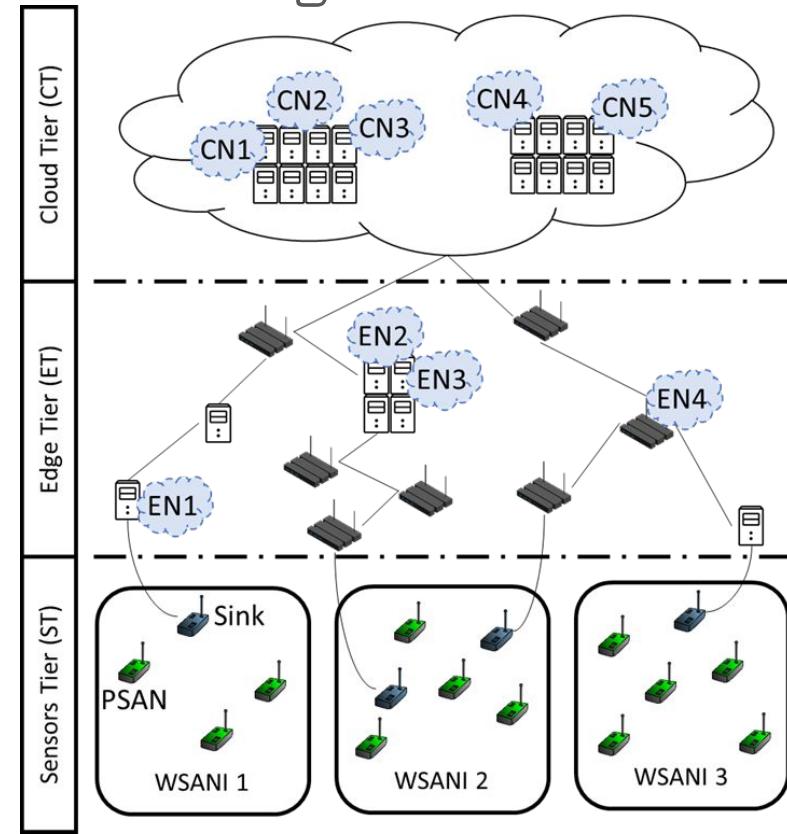
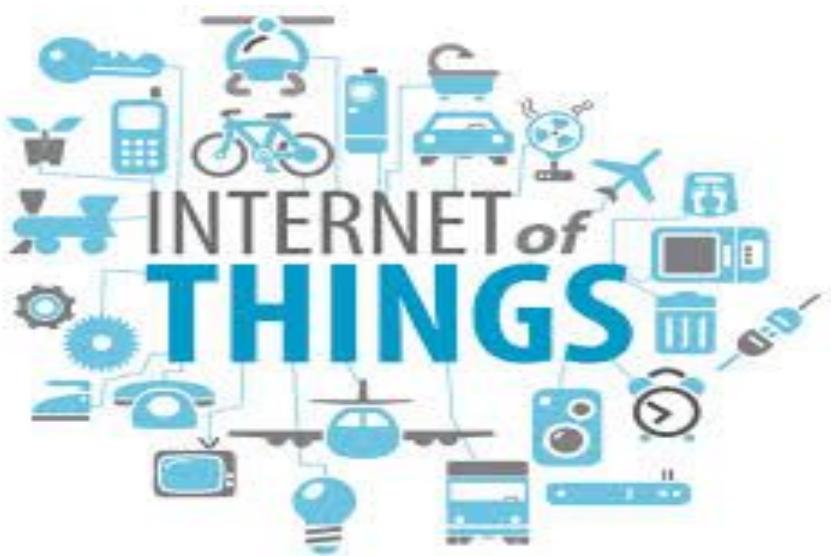


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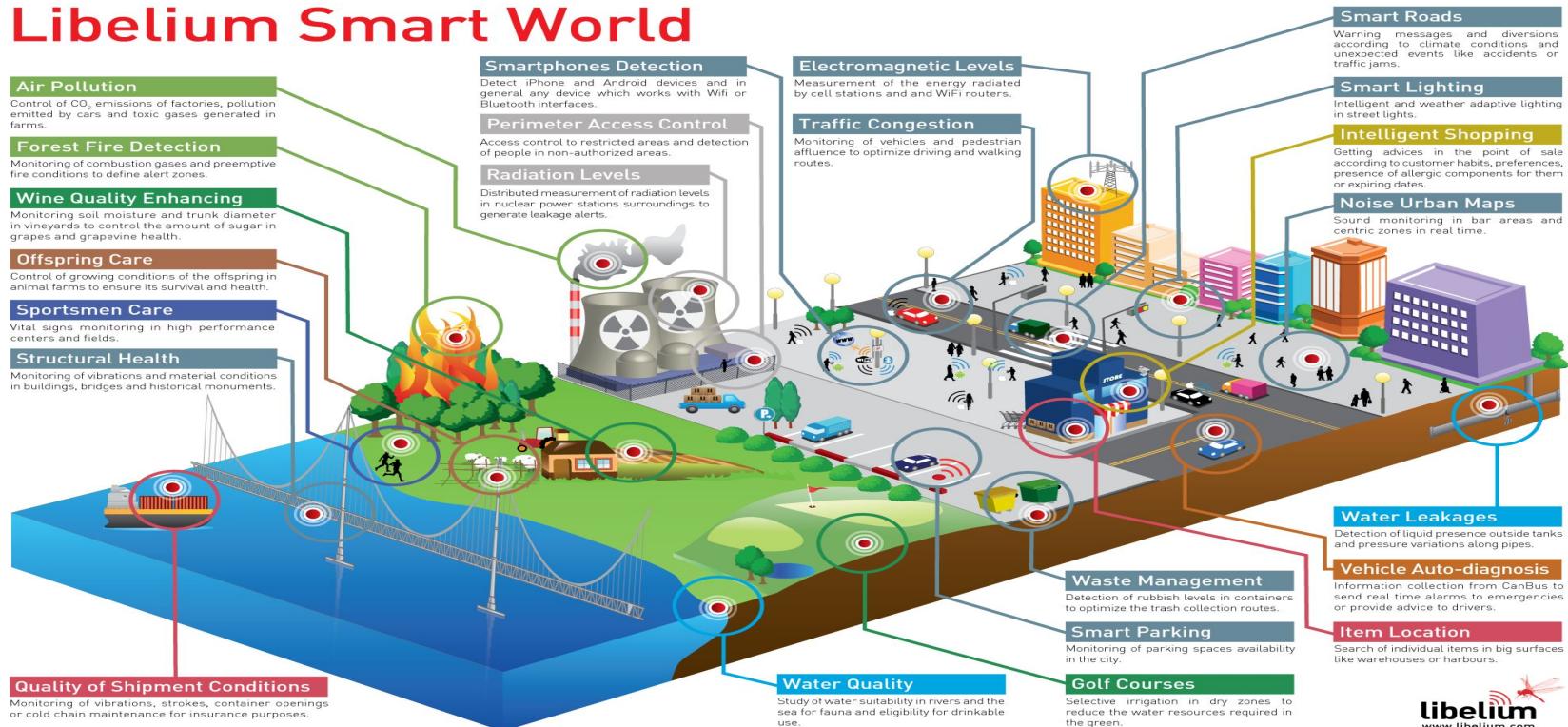


Internet das Coisas - *Internet of Things*

- Interconexão de dispositivos inteligentes com a internet



Libelium Smart World



Indústria 4.0

- Quarta revolução Industrial
- Mais do que somente sensores em fábricas - inclui toda a sociedade
- Impulsionado por diversas tecnologias



2022 disaster bingo

asteroid	riots	terrorists bombing	volcano	China invades Taiwan
sun flairs	new cold strain	financial crisis	mass shooting	dinosaurs back to life
civil war in any super power	nuclear warfair	global warming aka free space	dangerous tik tok trend	wwIII
queen of England dies	Russia invades Ukraine	scary animal discovery	wildfires	Cascadia earthquake or earthquake
great depression 2.0	poles switch	popular species goes extinct	zombies	poisoning of water

O mais preocupante

O Apocalipse Zumbi





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Usando IoT para resolver o apocalipse Zumbi

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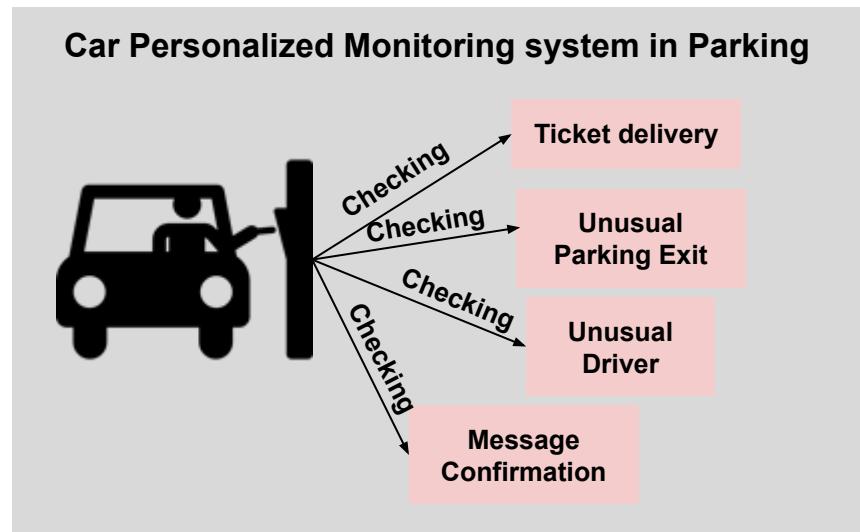
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O que eu preciso para
sobreviver?

Lidando com ambientes únicos

- Gerência de contexto
- Personalização do Monitoramento



Smart Buildings

- Prédios equipados com dispositivos inteligentes
- Minimizam o consumo de energia
- Tem como objetivo o conforto e segurança



Inserção de Energias Renováveis



Smart Grid

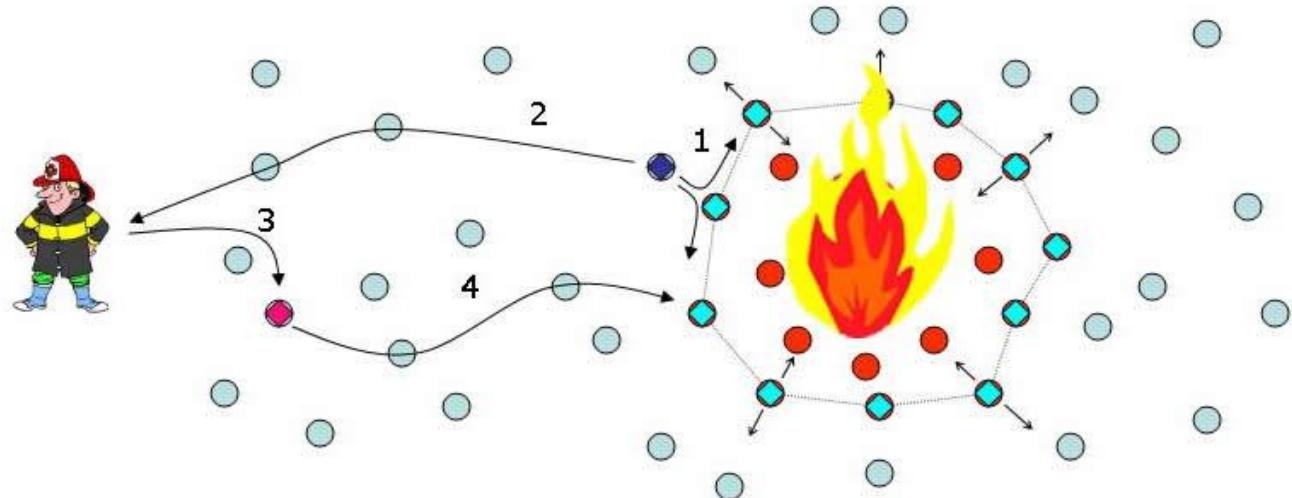


Energias Renováveis



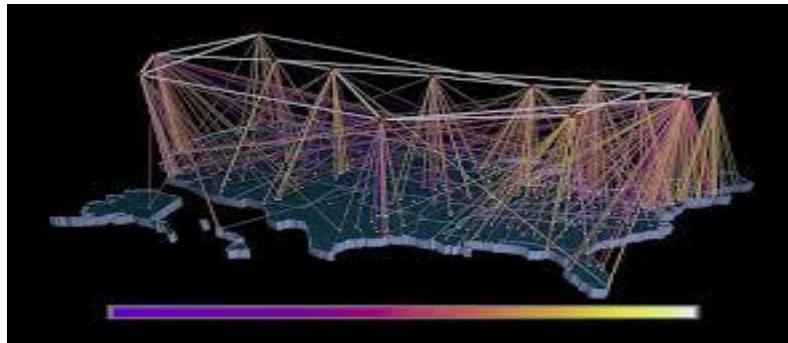
Emergências - Suporte

- Incêndios
- Desastres
- Assaltos
- Mordidas



Mobile Crowd Sensing

- Onde há mais sensores?
- Celulares e tablets já representam a maior parte do tráfego da Internet
- Por que não usar esse potencial?



Smart Farms





uaiCup



Robosub 2021

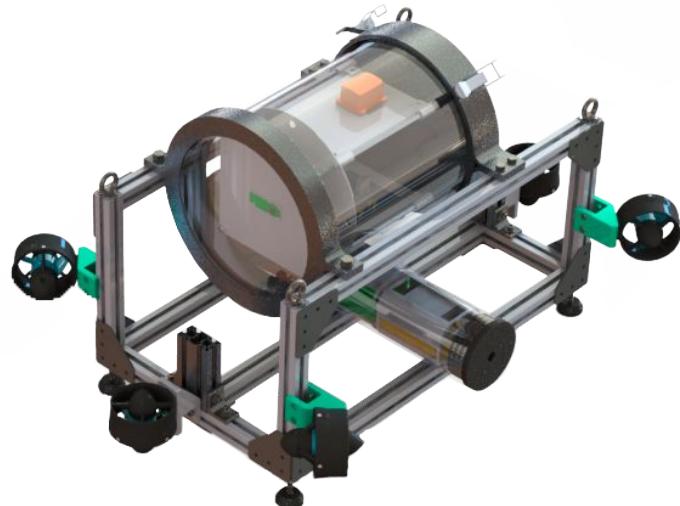
premiação



Classificação geral

Deslize para saber mais >

#gonautilus



Smart Health

- Healthcare IoT
- Ambient Assisted Living
- Smart Health
- Smart Surgery
- Smart Hospitals *
- Body Sensor Networks

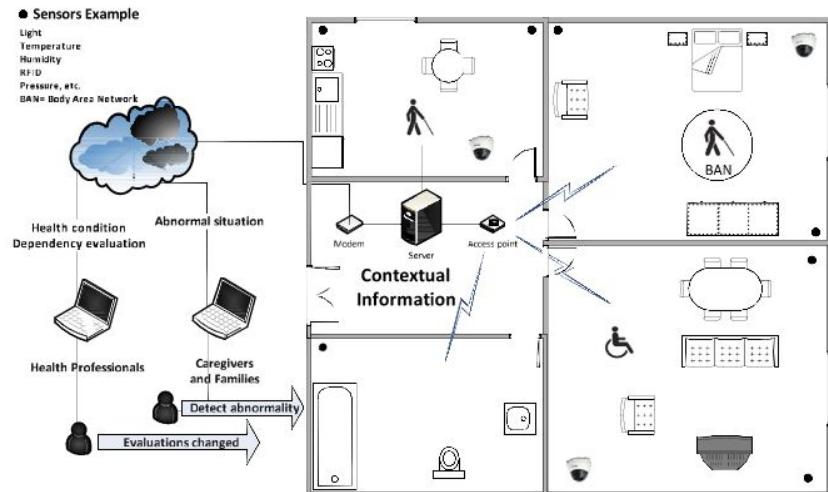


Fig. 1. General overview of a Health Monitoring System (HMS). The monitoring system applies either a regular evaluation of the person's condition, or a rapid intervention in the case of detection of abnormalities.

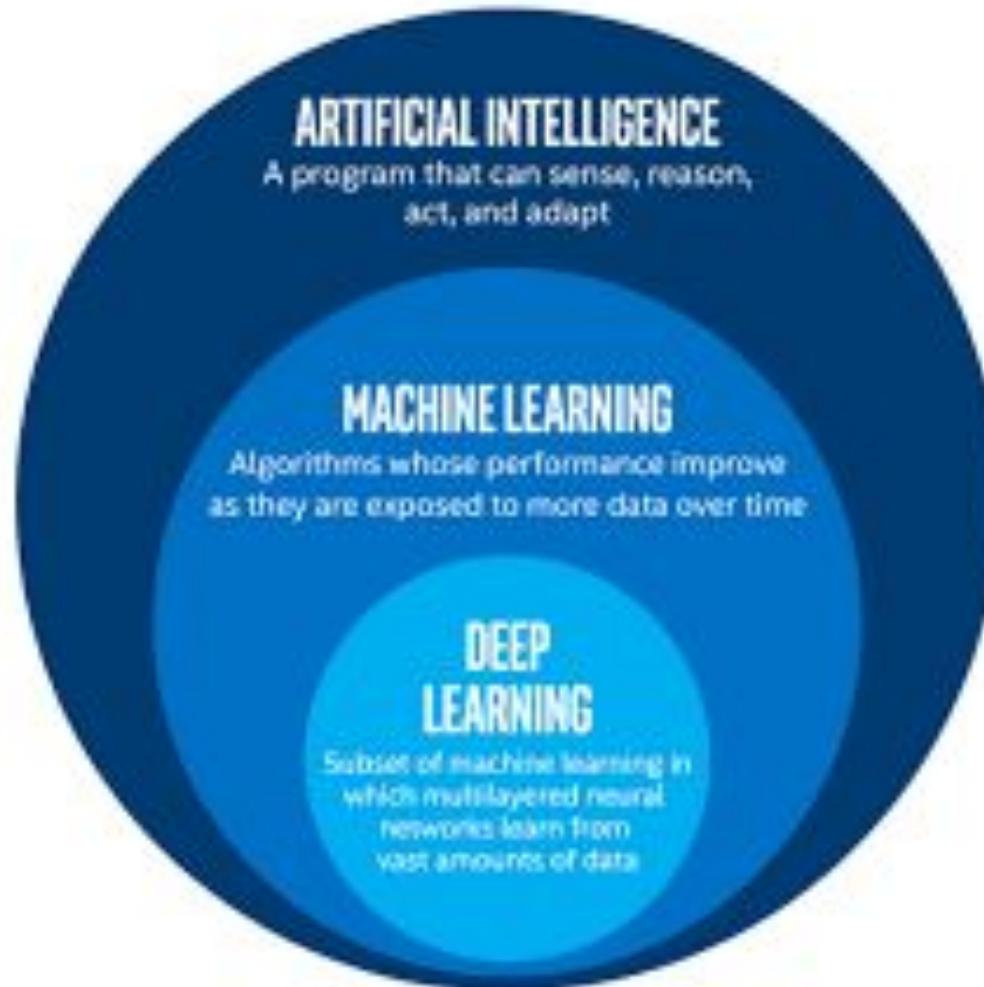
Mas eu não sei nada!
Quem pode me ajudar?

LET'S TAKE THE DATA



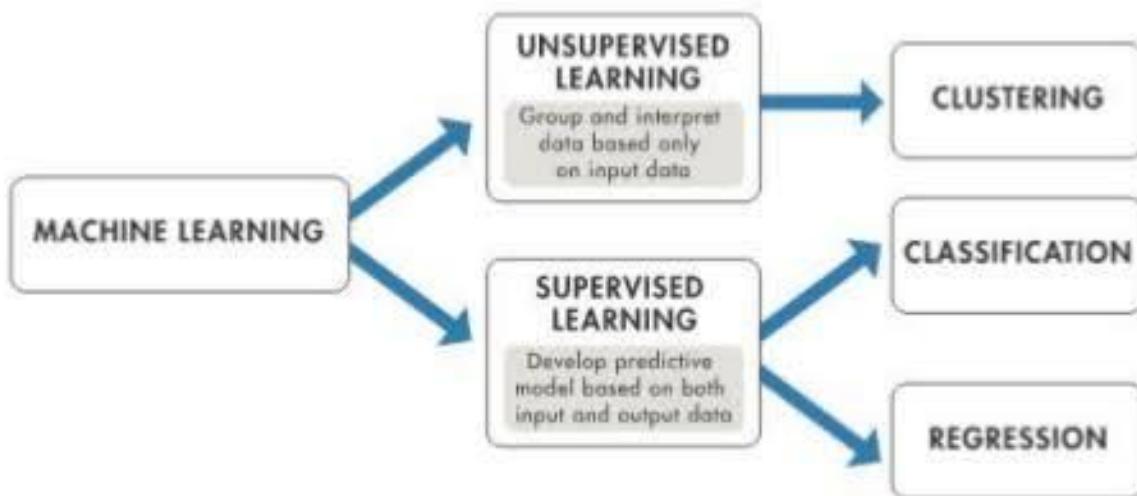
AND PUSH IT SOMEWHERE ELSE

AI vs ML vs DL

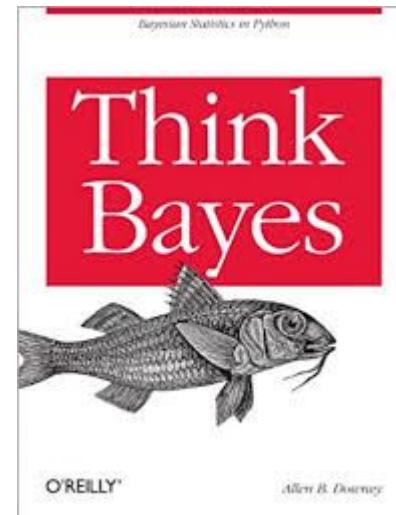
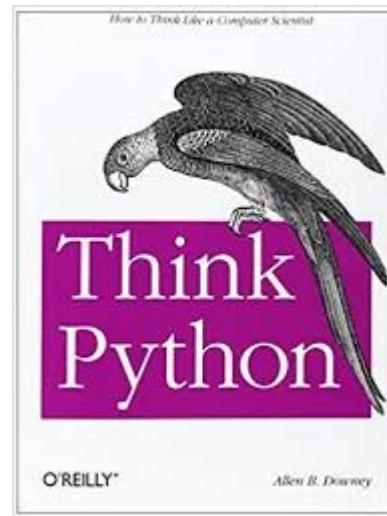
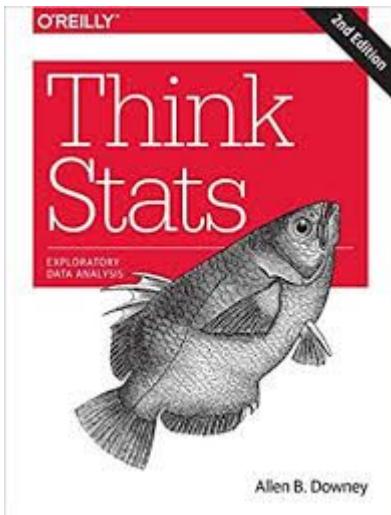




ML Diagram

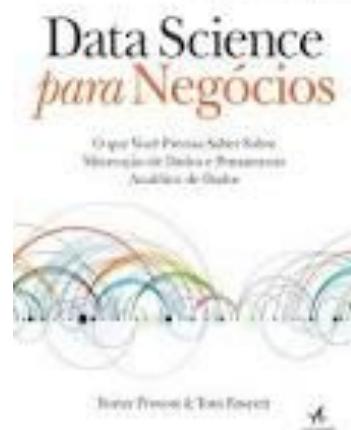


Por onde começar?





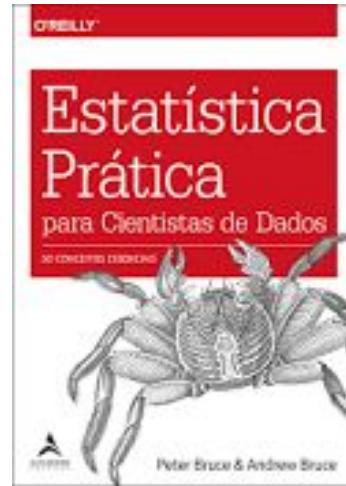
Joel Grus



Peter Bruce & Andrew Bruce



Peter Bruce & Andrew Bruce



Peter Bruce & Andrew Bruce



Wes McKinney

Browse > Data Science > Machine Learning

Machine Learning

Top Instructor

4.9 ★★★★★ 159,470 ratings

4,124,356 already enrolled

Instructor(s): Andrew Ng 

Subtitles: English, Arabic, +11 more

Offered By

Stanford | ONLINE

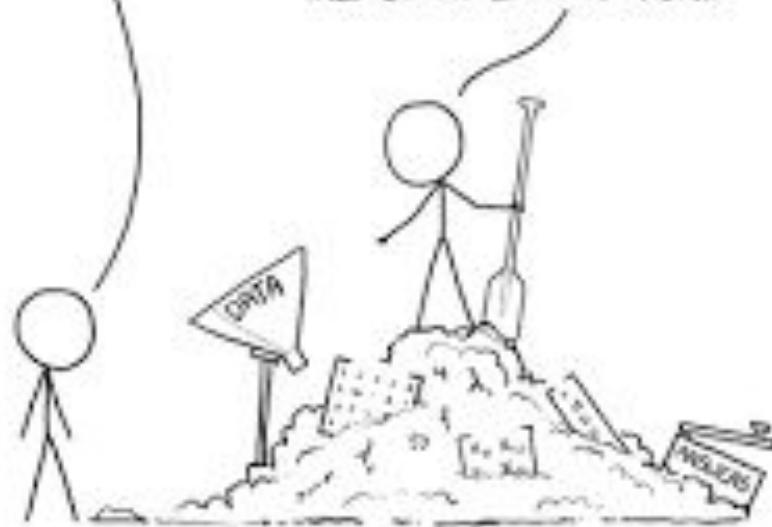
Go To Course

THIS IS YOUR MACHINE LEARNING SYSTEM?

YUP! YOU POUR THE DATA INTO THIS BIG
PILE OF LINEAR ALGEBRA, THEN COLLECT
THE ANSWERS ON THE OTHER SIDE.

WHAT IF THE ANSWERS ARE WRONG?

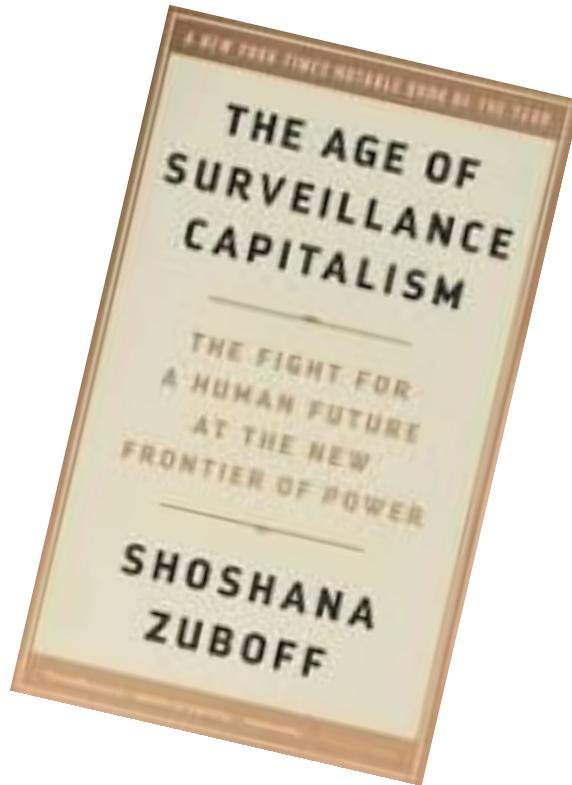
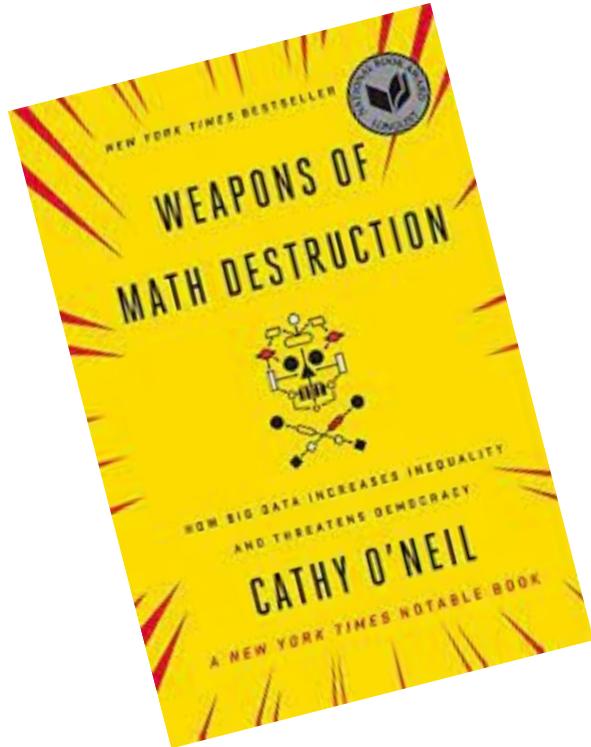
JUST STIR THE PILE UNTIL
THEY START LOOKING RIGHT.



Nem um pouco ...

Justiça dá 30 dias para Metrô provar que
reconhecimento facial não fere lei





3 Types of Artificial Intelligence

Artificial Narrow Intelligence (ANI)



Stage-1

Machine Learning

- ▶ Specialises in one area and solves one problem



Siri



Alexa



Cortana

Artificial General Intelligence (AGI)



Stage-2

Machine Intelligence

- ▶ Refers to a computer that is as smart as a human across the board

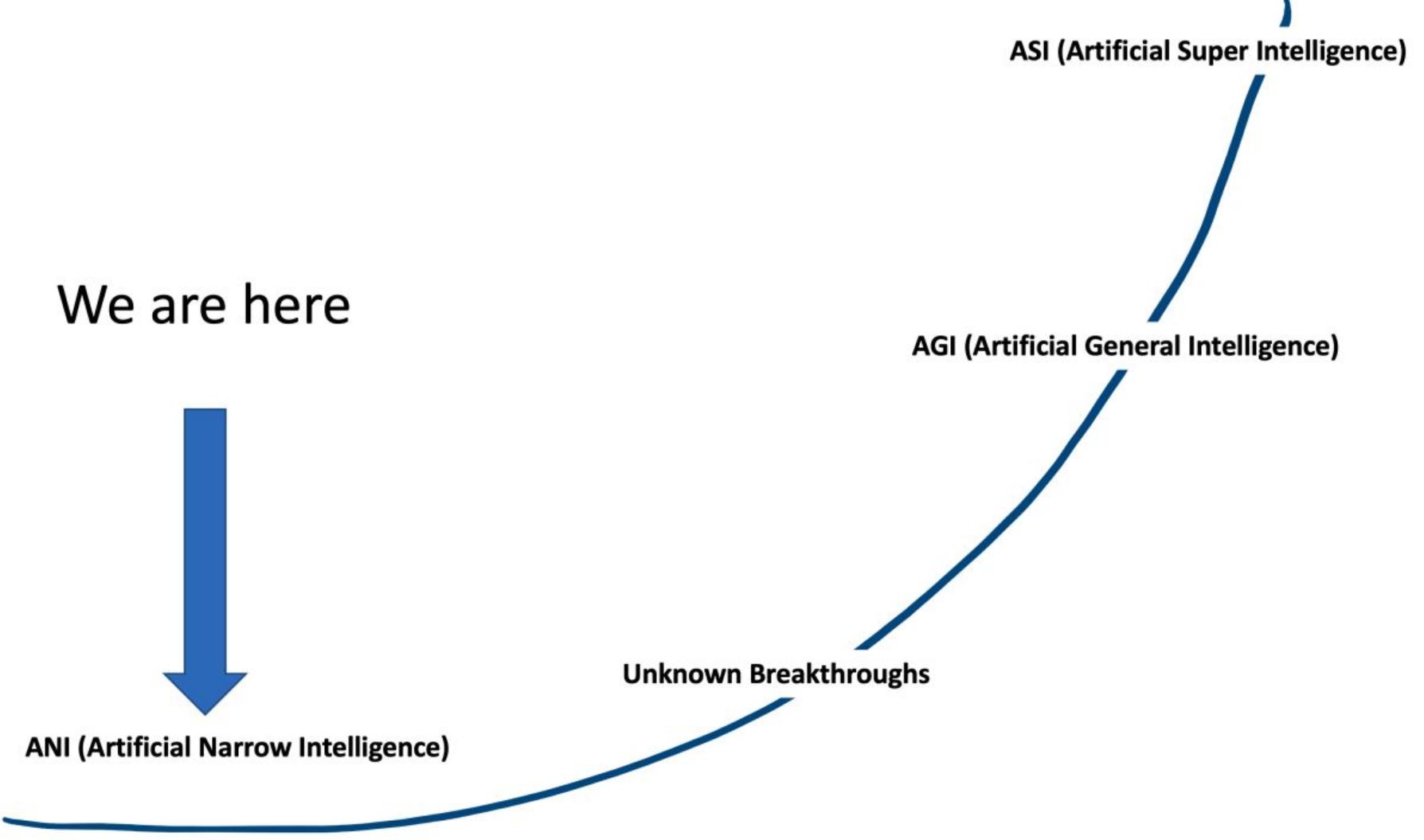
Artificial Super Intelligence (ASI)



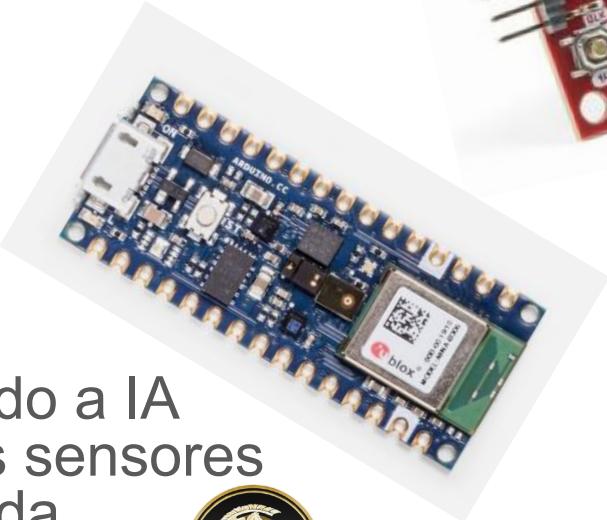
Stage-3

Machine Consciousness

- ▶ An intellect that is much smarter than the best human brains in practically every field



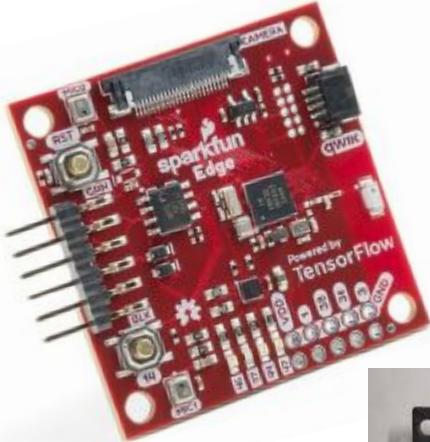
Aprendizado de Máquina embarcado



Trazendo a IA
para os sensores
e a borda



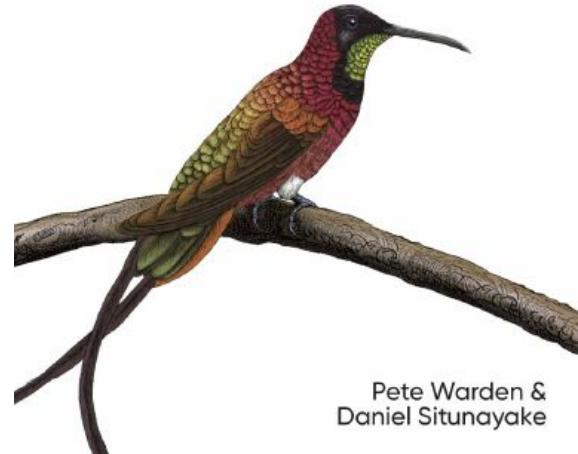
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O'REILLY®

TinyML

Machine Learning with TensorFlow Lite on Arduino and Ultra-Low-Power Microcontrollers



Pete Warden &
Daniel Situnayake



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Pretty wide ecosystem



arm CMSIS-NN

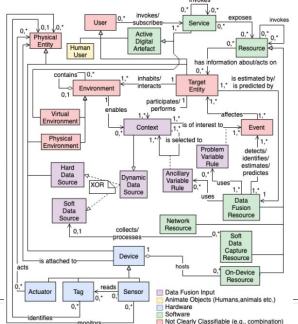
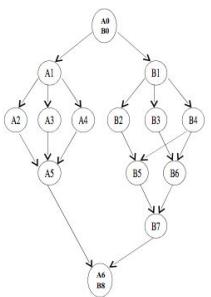
microTensor



O que nós precisamos para construir aplicações nesse cenário

- **Formas de desenvolver aplicações**
 - Arquiteturas
 - Modelos cientes de contexto
- Integração de aplicações
- Gerência do conhecimento
- Condições ambientais únicas
- Transações confiáveis
- MLOps
- Aprendizado Federado

Application Integration ICOIN 2013



Context-Aware - domain models

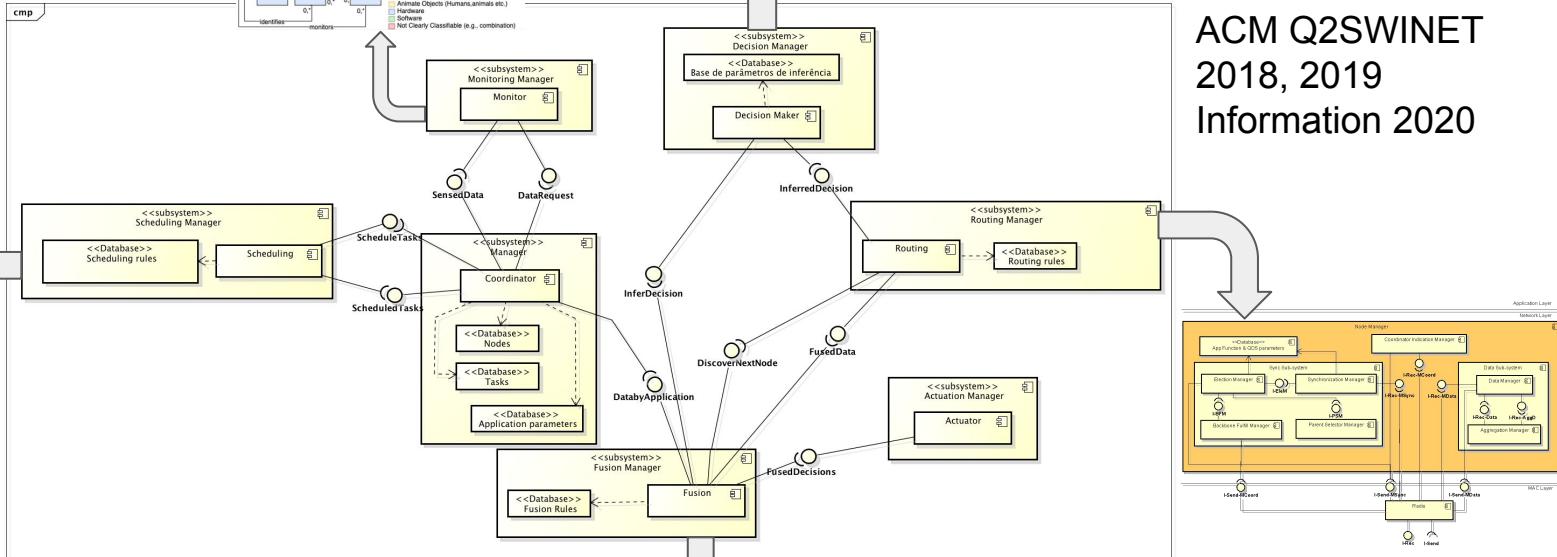
Fusion 2020

Federated Learning and distributed decisions

Athena

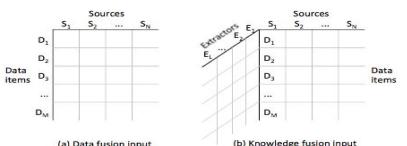


ACM Q2SWINET
2018, 2019
Information 2020



Knowledge
management/
Trusted
Transactions

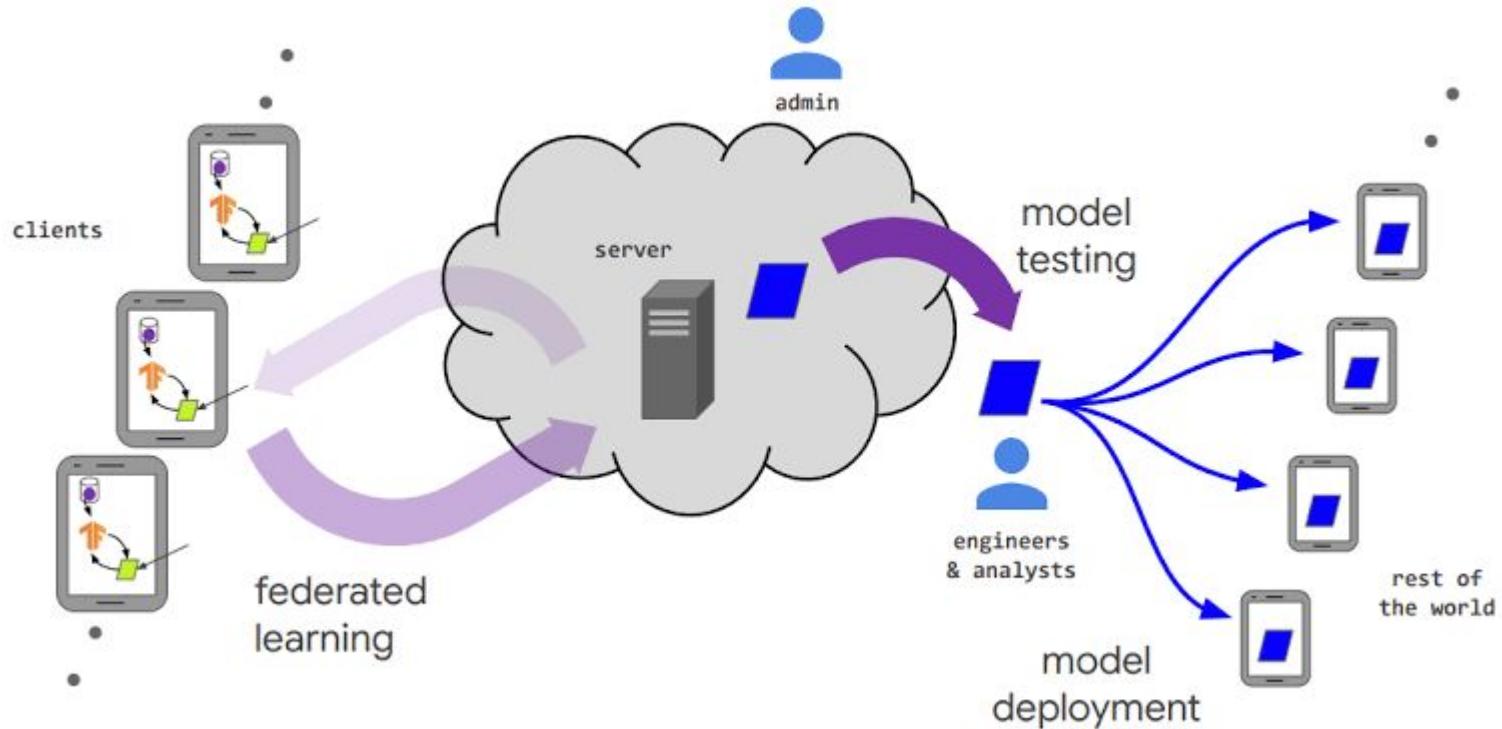
Fusion 2016,
2018, 2019
PICOM 2017-2021
FGCS 2019



powered by Astah

CIT 2015

Dealing with
unpredictable
environmental conditions



Conclusões

- Coisas têm seu lugar na Internet
- Melhor monitoramento significa dados melhores
- Dados melhores significam decisões melhores
- O que leva a políticas melhores





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UMBRELLA
CORPORATION