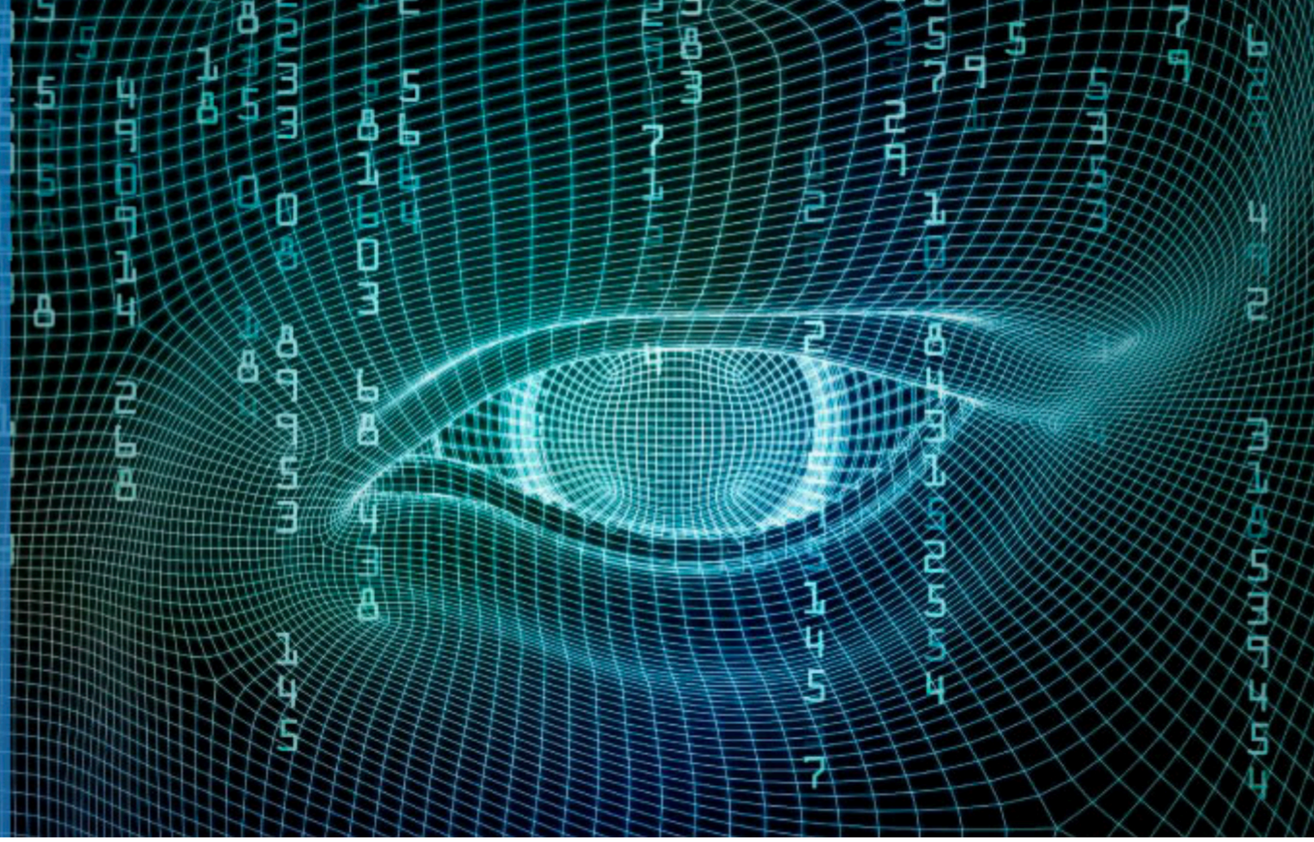
ACTO DE PRESENTACIÓN

CIDAI Centre of Innovation for Data tech and Artificial Intelligence



# *The good, the bad, and the ugly of Artificial Intelligence*

Dr. Francisco Martin
**BigML, Inc**

September 15, 2020

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

# Background and Influencers

CIDAI Centre of Innovation for Data tech and Artificial Intelligence



Ramón López de Mantaras
1995



John McCarthy
1997



Tom Dietterich
1998

# Machine Learning History

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

Arthur Samuel (IBM)

The world's first self-learning program: a checkers-playing program



Checkers

64 years

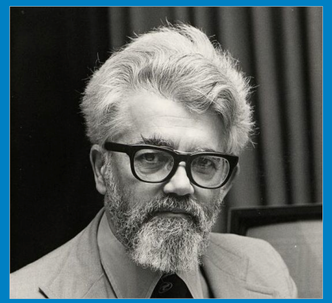
Deep Mind (Google)






Artificial Intelligence

**John McCarthy**



Machine Learning

**Rina Decther**

First-order and Second-order deep learning

Deep Learning

1950 1952 1956 1980 1986 1995 1997 2009 2011 2016 2020

Alan Turing
The Turing Test

Darmouth conferences



1st Workshop on Machine Learning, Carnegie-Mellon University, Pittsburgh

*Tom's paper*



IIIA

Workshop on Deep Learning for Speech Recognition

# Software is eating the world

CIDAI Centre of Innovation for Data tech and Artificial Intelligence



https://a16z.com/author/marc-andreessen/

Marc Andreessen

# Software is eating the world

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

Microsoft $1.55T

amazon $1.55T

Apple $2T

Google $1.03T

facebook $758B




**~$6.88 Trillions**

**~$617.3 Billions**

# Dimensions

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

**1M** → 1,000,000 seconds → **11.5 days**

**1B** → 1,000,000,000 seconds → **31.7 years**

**1T** → 1,000,000,000,000 seconds → **~31,710 years**

# A practical example

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

## Amazon's 33,000 job openings average $150K in pay, will begin as remote positions




FILE (Photo by David Ryder/Getty Images)

Reference

TAXABLE INCOME

**~$5B/year**

AVG. INCOME IN CATALONIA

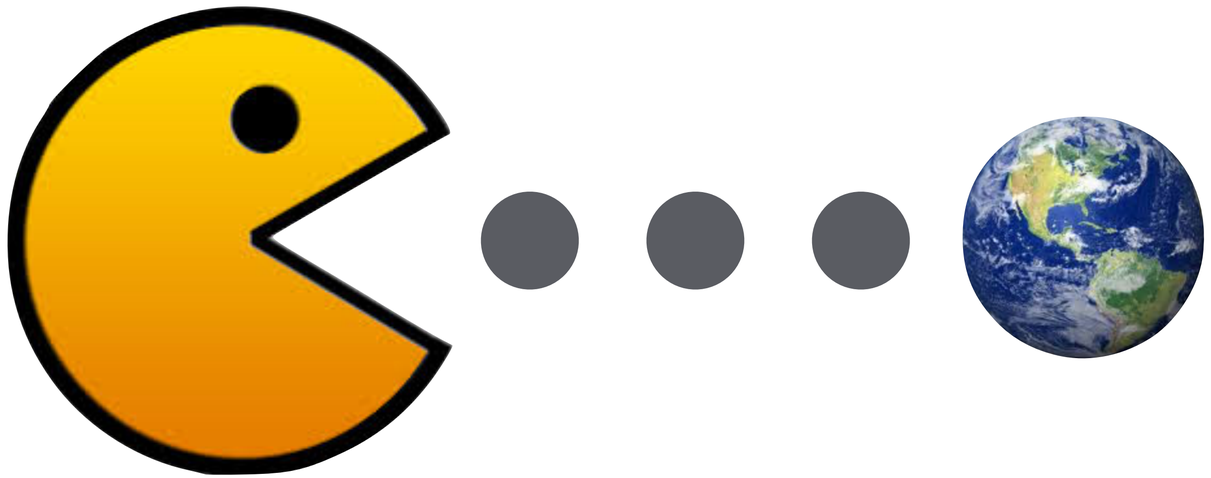
**~$30k/year**

NEW JOBS

**~150,000**

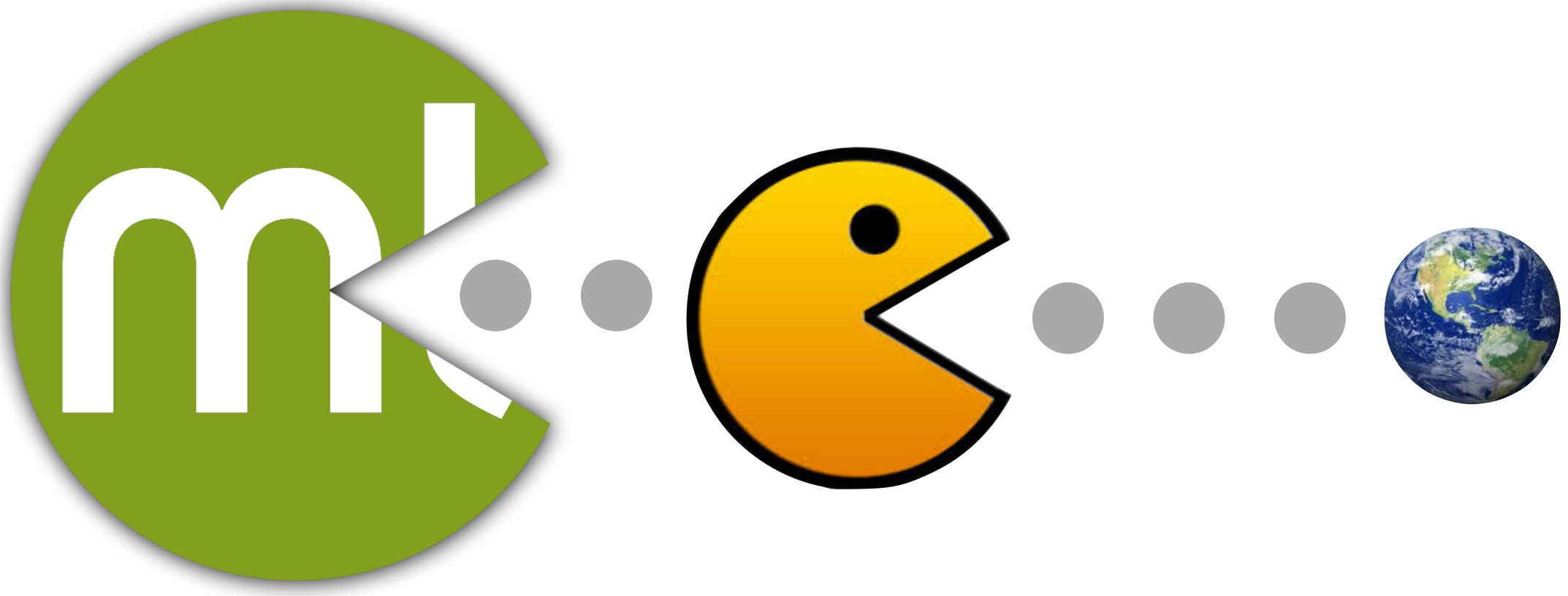
# Software has eaten the world

CIDAI Centre of Innovation for Data tech and Artificial Intelligence



# AI is eating software

CIDAI Centre of Innovation for Data tech and Artificial Intelligence



# Machine Learning

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

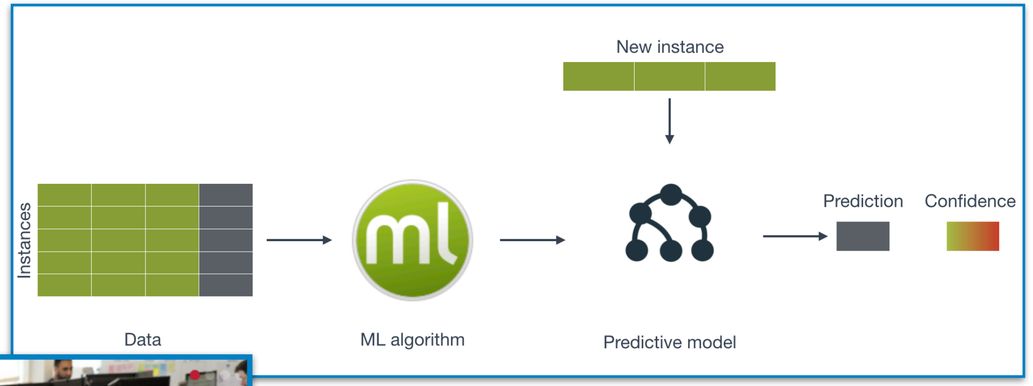
***"If you invent a breakthrough in Artificial Intelligence, so machines can learn, that is worth 10 Microsofts."***

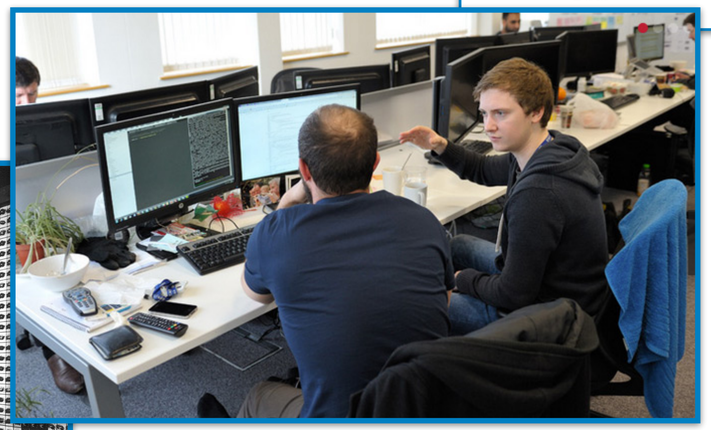
Bill Gates wasn't kidding. This special kind of Artificial Intelligence is called Machine Learning. Gates is not alone in his buoyancy. Some top entrepreneurs are on board as well. Jeff Bezos, the founder of Amazon thinks this machine learning is the key to Amazon's future. Greg Papadopoulos, the CEO of Sun is calling it a real revolution. Warren Buffett, the super investor says that it will have a hugely beneficial social effect.

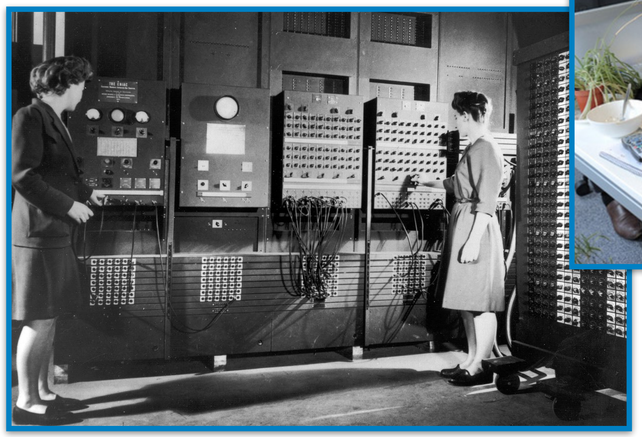
Reference

# Machine Learning

CIDAI Centre of Innovation for Data tech and Artificial Intelligence





COMPLEXITY OF TASKS +

-

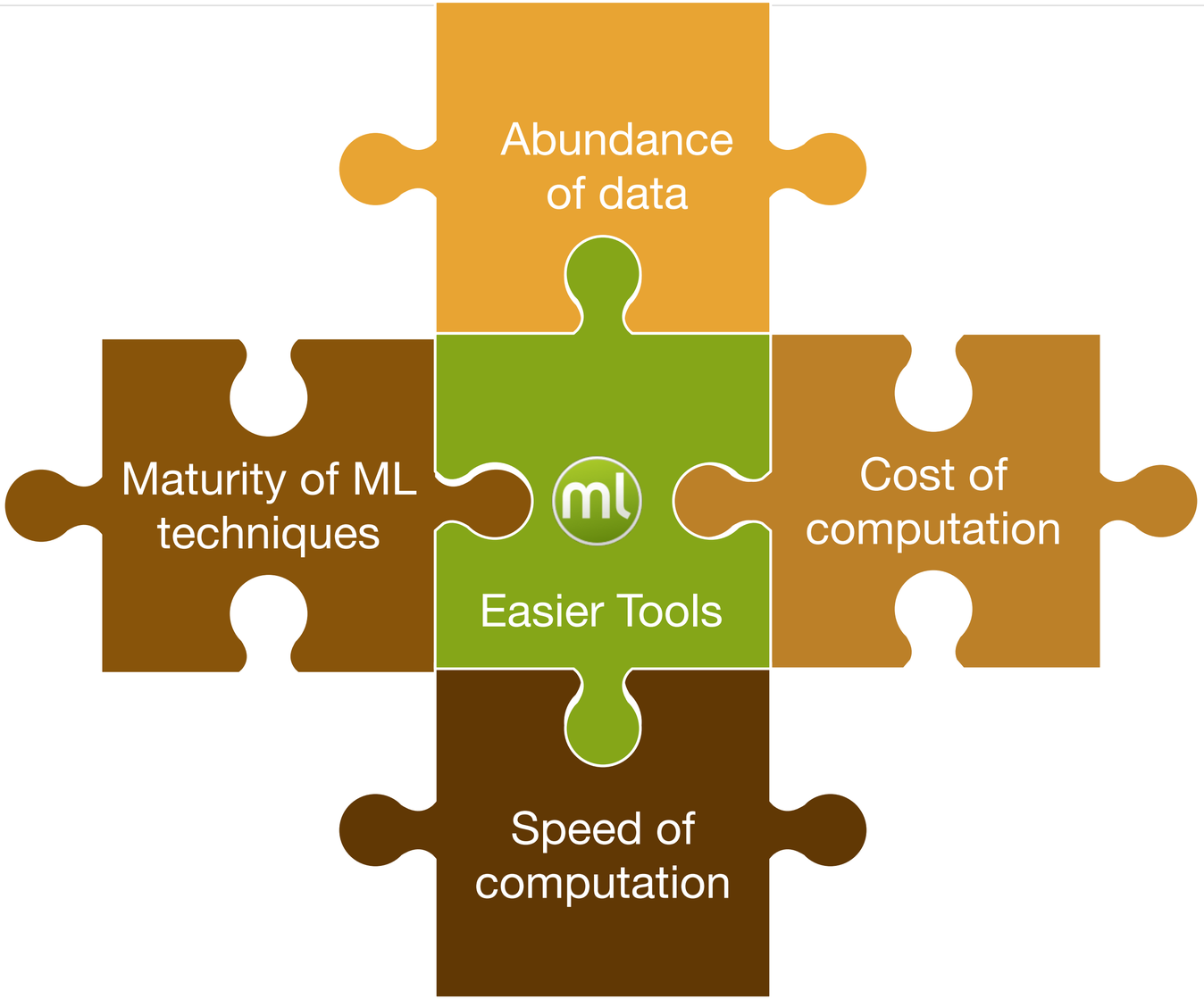
20th century

TIME

21st century

# Why Now?

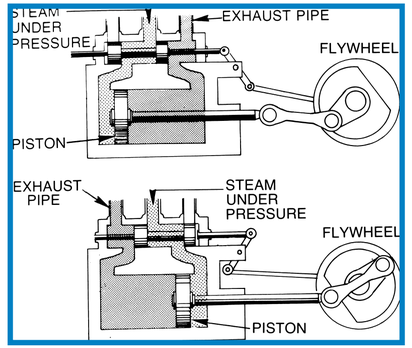
CIDAI Centre of Innovation for Data tech and Artificial Intelligence



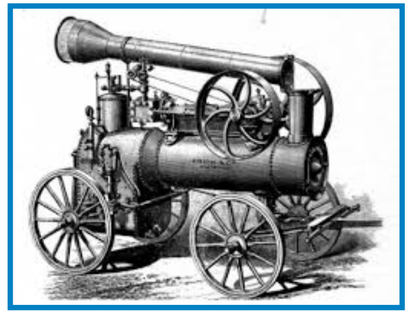
# Machine Learning

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

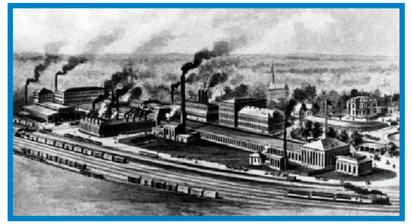
- Machine Learning is the steam engine of the XXI century

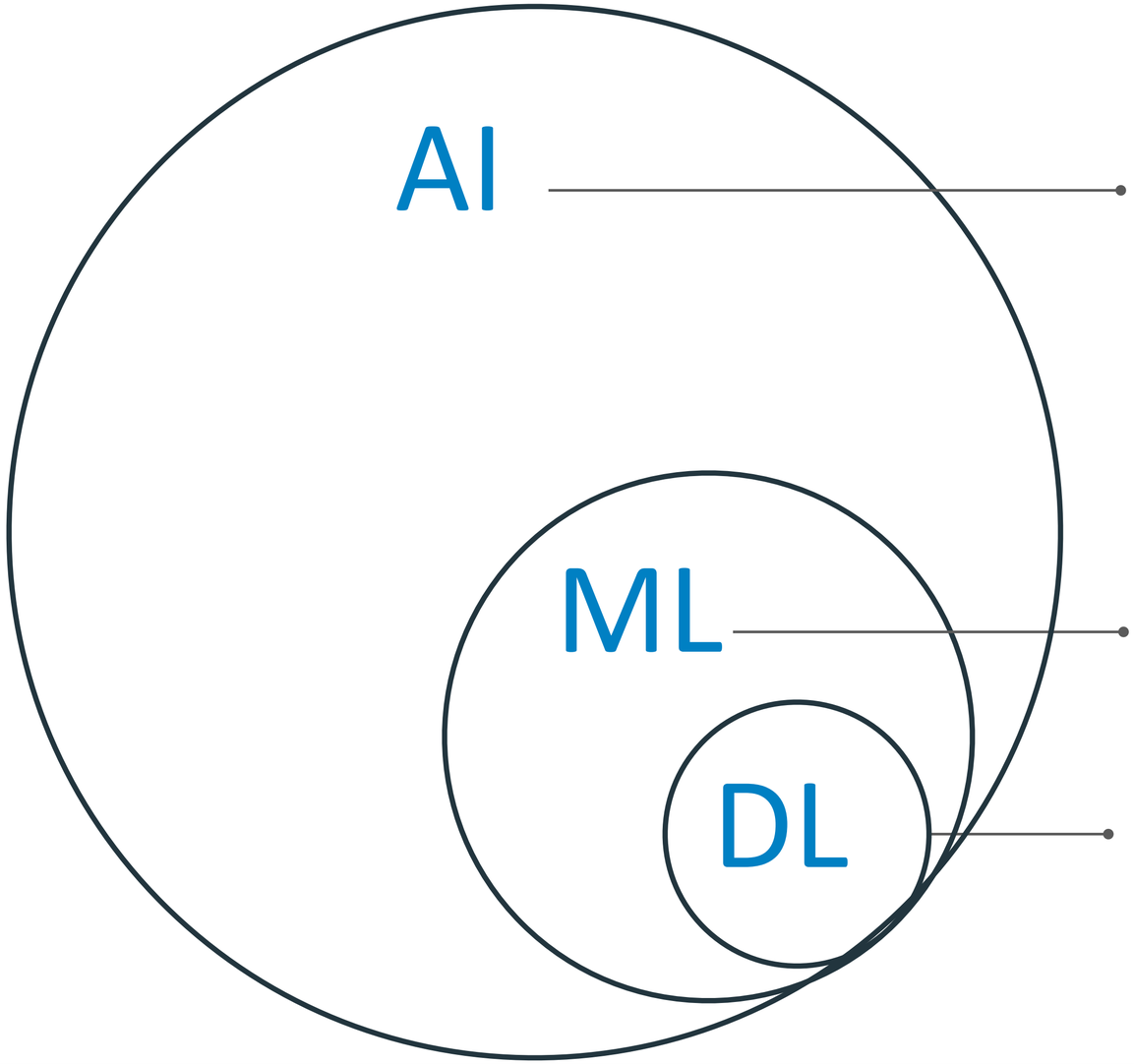



- When applied methodically, it helps solve complex problems at human-level performance



- When applied systematically, it can dramatically improve the performance of an organization (of all sizes and in all sectors).






*Many other areas need to evolve at the level of ML until we see something "intelligent": planning, optimization, reasoning, knowledge representation, etc.*

*Well-studied and being commoditized*

*Quickly evolving with great success in specific domains. Requires huge volumes of data, computation, and experience*

# The good

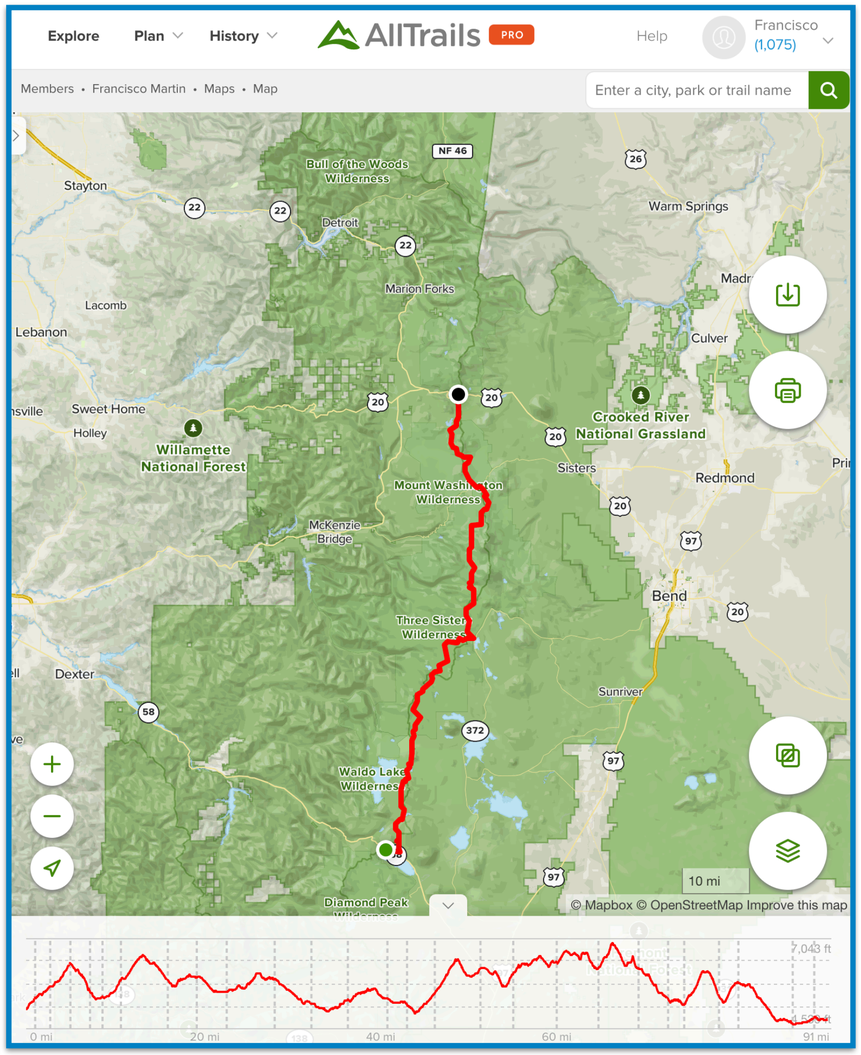
CIDAI Centre of Innovation for Data tech and Artificial Intelligence

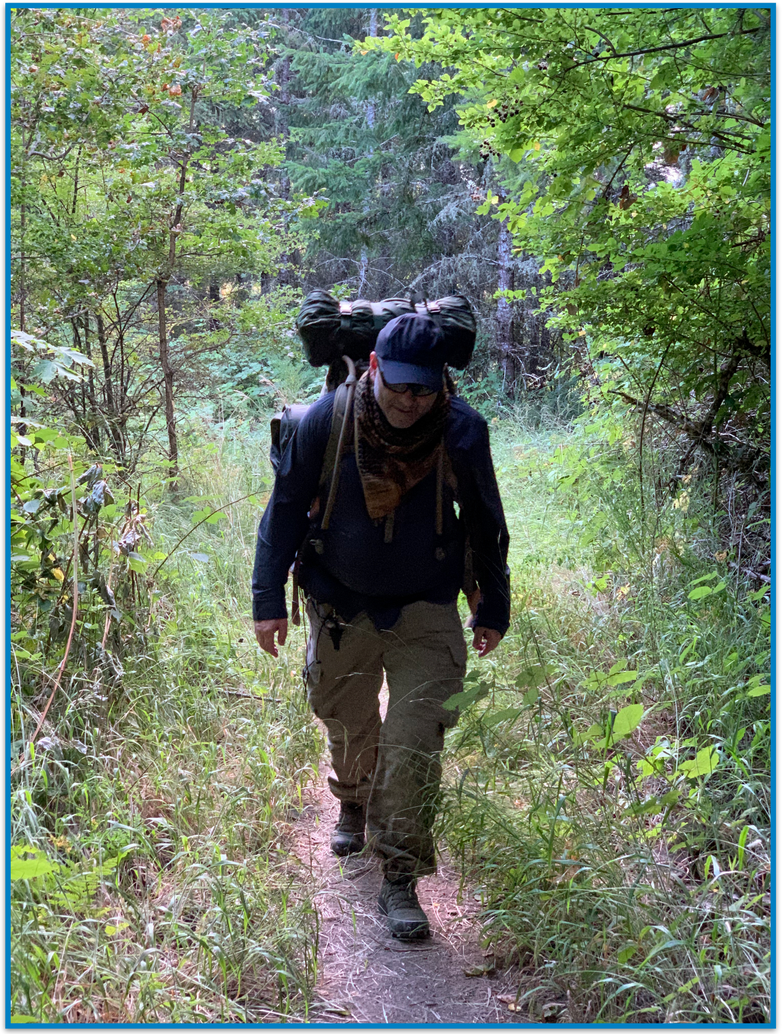


# Planning

CIDAI Centre of Innovation for Data tech and Artificial Intelligence



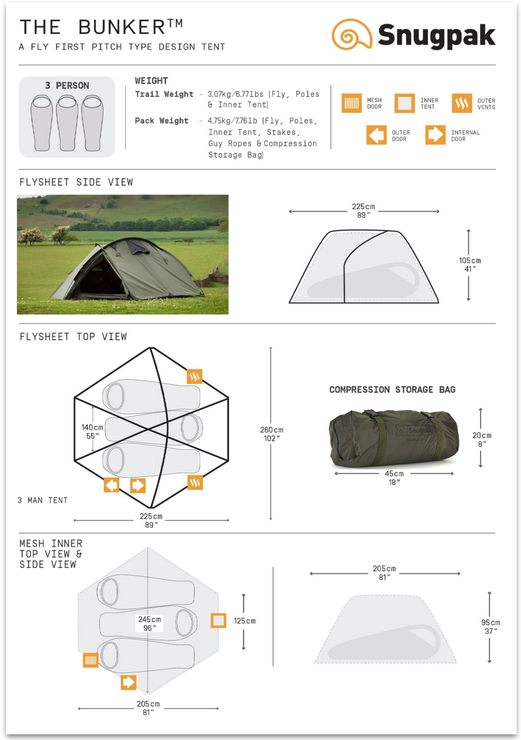



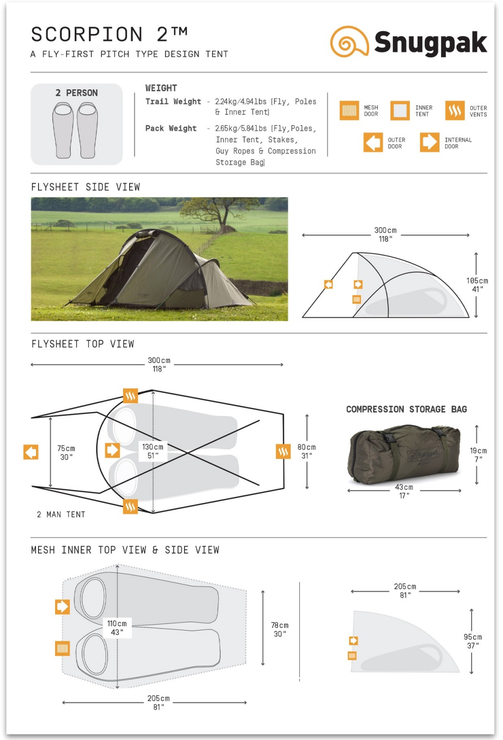



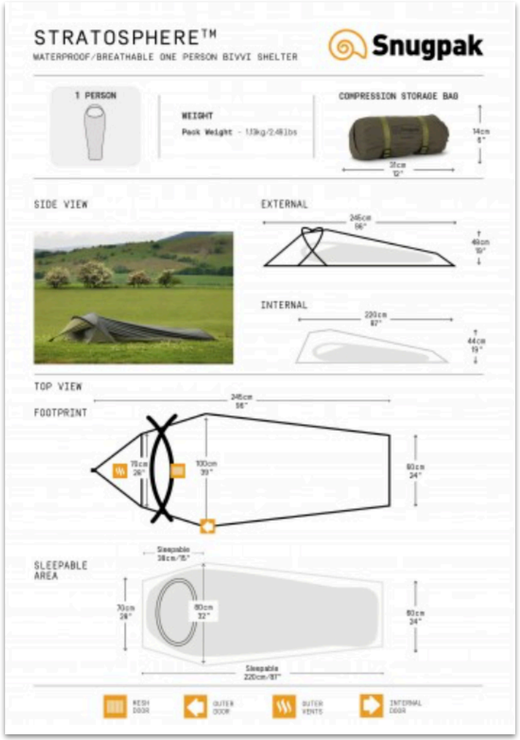
# Optimization

CIDAI Centre of Innovation for Data tech and Artificial Intelligence




## Weight vs Space

# Reasoning

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

## A Rare Wind Event Has Northwest Oregon Under a Critical Fire Warning

**The winds arrived in Portland mid-afternoon Monday, bringing with them smoke from the Lionshead Fire near Mount Jefferson and the Beachie Creek Fire in Opal Creek.**



Eagle Creek Fire in 2017. IMAGE: Tristan Fortsch.

By Matthew Singer | Published September 7 • Updated September 7

Hot, dry weather and high winds are never a good combination. It's even worse when the winds are of potentially historic strength.

The National Weather Service has placed Northwest Oregon and Southwest Washington under a critical fire weather warning due to the confluence of high temperatures, low humidity and rare easterly winds that are predicted to hit upward of 35 mph in the Portland area beginning in the late afternoon.

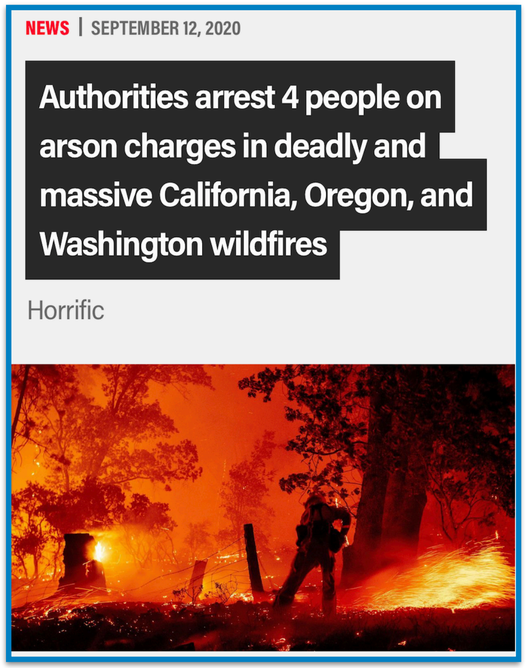



## Oregon, California and Washington wildfires are a once-in-a-generation event

# Causal Reasoning

CIDAI Centre of Innovation for Data tech and Artificial Intelligence







## Abductive Reasoning vs Deductive and Inductive Reasoning

## Partial Observations → Predictions (maybe true)

# Emotional Reasoning

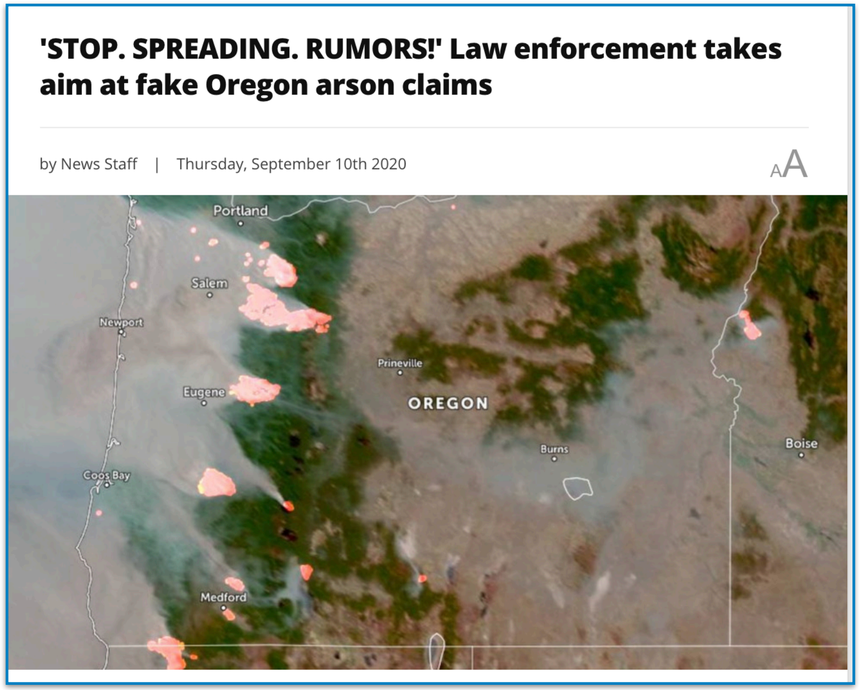
CIDAI Centre of Innovation for Data tech and Artificial Intelligence






# Deceptive Reasoning

CIDAI Centre of Innovation for Data tech and Artificial Intelligence




Reference




Terminator 3 I LIED!!! HD

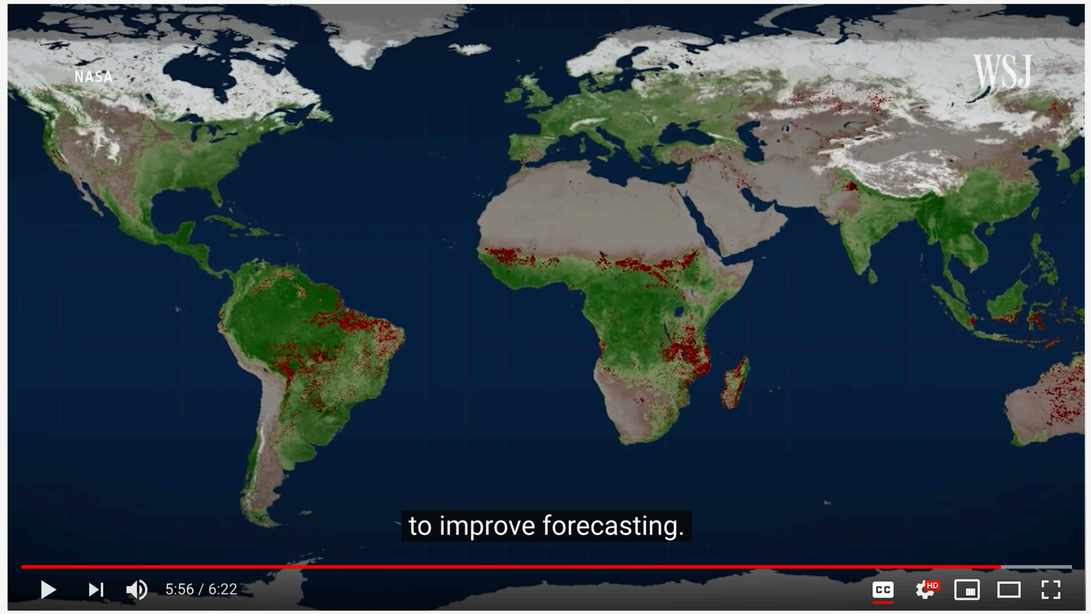
Reference

# Knowledge Transfer

CIDAI Centre of Innovation for Data tech and Artificial Intelligence




#WSJ #Wildfires #Science
The Science of Wildfires: Why They're Getting Worse | WSJ
130,491 views • Sep 1, 2020 2.4K 106 SHARE SAVE

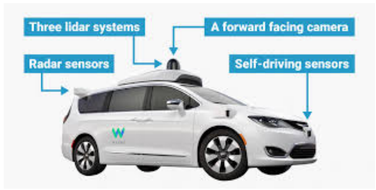



#WSJ #Wildfires #Science
The Science of Wildfires: Why They're Getting Worse | WSJ
130,491 views • Sep 1, 2020 2.4K 106 SHARE SAVE

https://www.youtube.com/watch?v=gN-T6NDWQ1g

# AI Tasks

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

| Scenario \ Objective | Well-defined | Undefined |
|---|---|---|
| Adversarial | ? | ? |
| Imprecise | ? | ? |
| Dynamic |   | ? |
| Static |   | ? |

# The bad

CIDAI Centre of Innovation for Data tech and Artificial Intelligence



# AI is further than it may appear

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

- AI has been popularized and exaggerated far beyond its current limits
- Most people advocating for new regulations against self-conscious machines have never ever developed any real-world software
- We are still decades (or even centuries) away from AI

# Objects in mirror are closer than they appear

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

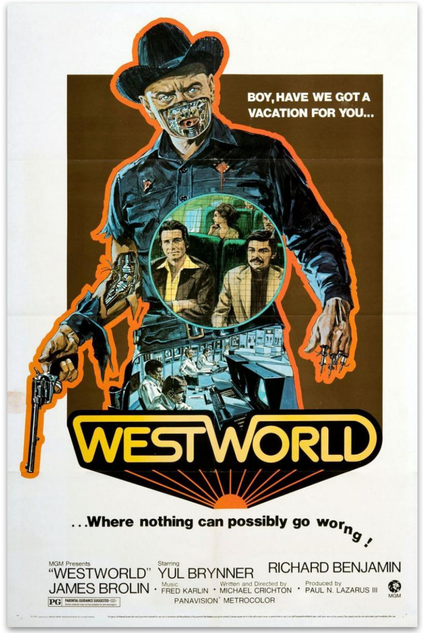



*In the U.S, PART 571 Federal Motor Vehicle Safety Standards, Section 571.111 S5.4.2 "Each convex mirror shall have permanently and indelibly marked at the lower edge of the mirror's reflective surface, in letters not less than 4.8 mm nor more than 6.4 mm high the words “Objects in Mirror Are Closer Than They Appear.”*

# AI in movies is further than it appears

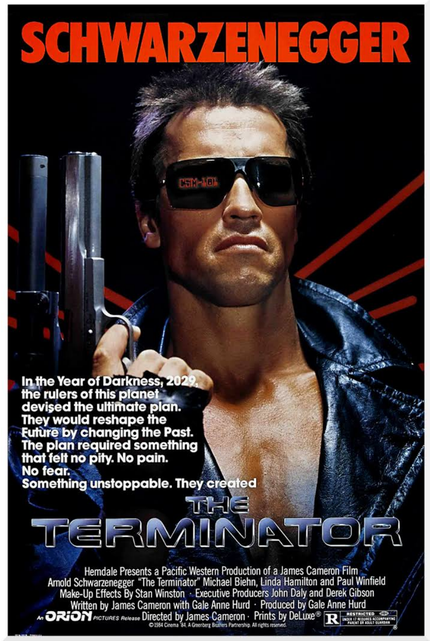
CIDAI Centre of Innovation for Data tech and Artificial Intelligence









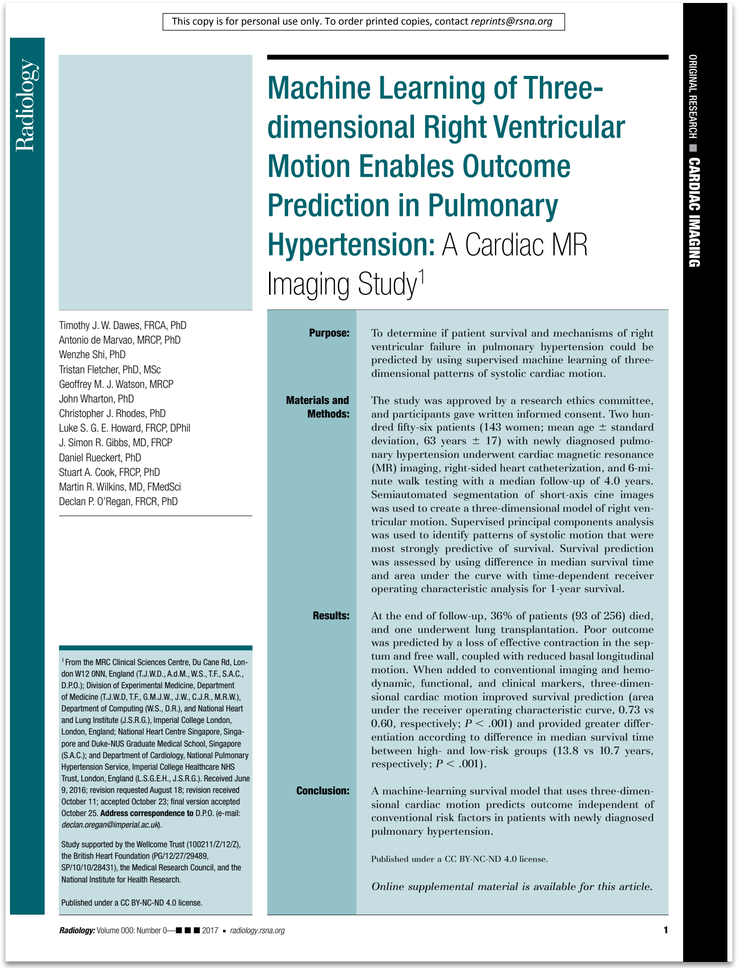

A new Hollywood regulation:

*movies portraying AI **must permanently** display on the screen:*

*ROBOTS AND AI IN MOVIE ARE FURTHER THAN THEY APPEAR*

# The AI-mplification of the Press

CIDAI Centre of Innovation for Data tech and Artificial Intelligence



This copy is for personal use only. To order printed copies, contact *reprints@rsna.org*

Radiology

## Machine Learning of Three-dimensional Right Ventricular Motion Enables Outcome Prediction in Pulmonary Hypertension: A Cardiac MR Imaging Study[1]

Timothy J. W. Dawes, FRCA, PhD
Antonio de Marvao, MRCP, PhD
Wenzhe Shi, PhD
Tristan Fletcher, PhD, MSc
Geoffrey M. J. Watson, MRCP
John Wharton, PhD
Christopher J. Rhodes, PhD
Luke S. G. E. Howard, FRCP, DPhil
J. Simon R. Gibbs, MD, FRCP
Daniel Rueckert, PhD
Stuart A. Cook, FRCP, PhD
Martin R. Wilkins, MD, FMedSci
Declan P. O'Regan, FRCR, PhD

**Purpose:** To determine if patient survival and mechanisms of right ventricular failure in pulmonary hypertension could be predicted by using supervised machine learning of three-dimensional patterns of systolic cardiac motion.

**Materials and Methods:** The study was approved by a research ethics committee, and participants gave written informed consent. Two hundred fifty-six patients (143 women; mean age ± standard deviation, 63 years ± 17) with newly diagnosed pulmonary hypertension underwent cardiac magnetic resonance (MR) imaging, right-sided heart catheterization, and 6-minute walk testing with a median follow-up of 4.0 years. Semiautomated segmentation of short-axis cine images was used to create a three-dimensional model of right ventricular motion. Supervised principal components analysis was used to identify patterns of systolic motion that were most strongly predictive of survival. Survival prediction was assessed by using difference in median survival time and area under the curve with time-dependent receiver operating characteristic analysis for 1-year survival.

**Results:** At the end of follow-up, 36% of patients (93 of 256) died, and one underwent lung transplantation. Poor outcome was predicted by a loss of effective contraction in the septum and free wall, coupled with reduced basal longitudinal motion. When added to conventional imaging and hemodynamic, functional, and clinical markers, three-dimensional cardiac motion improved survival prediction (area under the receiver operating characteristic curve, 0.73 vs 0.60, respectively; $P < .001$) and provided greater differentiation according to difference in median survival time between high- and low-risk groups (13.8 vs 10.7 years, respectively; $P < .001$).

**Conclusion:** A machine-learning survival model that uses three-dimensional cardiac motion predicts outcome independent of conventional risk factors in patients with newly diagnosed pulmonary hypertension.

Published under a CC BY-NC-ND 4.0 license.

*Online supplemental material is available for this article.*

[1] From the MRC Clinical Sciences Centre, Du Cane Rd, London W12 0NN, England (T.J.W.D., A.d.M., W.S., T.F., S.A.C., D.P.O.); Division of Experimental Medicine, Department of Medicine (T.J.W.D., T.F., G.M.J.W., J.W., C.J.R., M.R.W.), Department of Computing (W.S., D.R.), and National Heart and Lung Institute (J.S.R.G.), Imperial College London, London, England; National Heart Centre Singapore, Singapore and Duke-NUS Graduate Medical School, Singapore (S.A.C.); and Department of Cardiology, National Pulmonary Hypertension Service, Imperial College Healthcare NHS Trust, London, England (L.S.G.E.H., J.S.R.G.). Received June 9, 2016; revision requested August 18; revision received October 11; accepted October 23; final version accepted October 25. **Address correspondence to** D.P.O. (e-mail: *declan.oregan@imperial.ac.uk*).

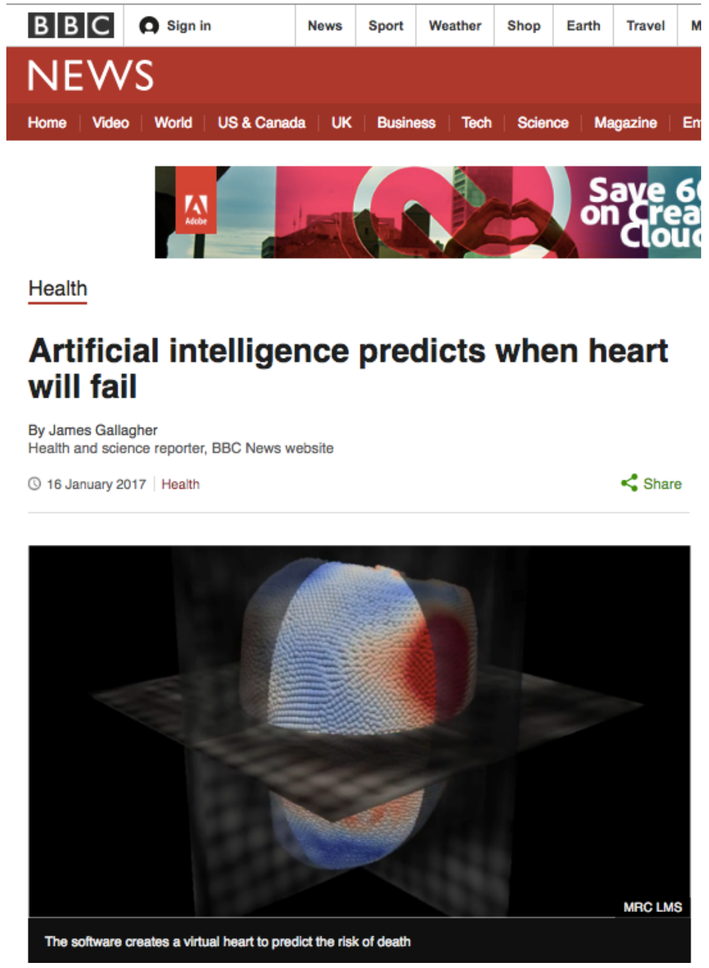
Study supported by the Wellcome Trust (100211/Z/12/Z), the British Heart Foundation (PG/12/27/29488, SP/10/10/28431), the Medical Research Council, and the National Institute for Health Research.

Published under a CC BY-NC-ND 4.0 license.



ORIGINAL RESEARCH ■ CARDIAC IMAGING

Radiology Society of North America



BBC Sign in News Sport Weather Shop Earth Travel M

NEWS

Home Video World US & Canada UK Business Tech Science Magazine En

Health

### Artificial intelligence predicts when heart will fail

By James Gallagher
Health and science reporter, BBC News website

16 January 2017 | Health

Share



The software creates a virtual heart to predict the risk of death

BBC

A mix of lack of education and sensationalism is dramatically amplifying the expectations of what AI can really do now.

# A cat for a hare

CIDAI Centre of Innovation for Data tech and Artificial Intelligence






# Machine Learning History

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

Arthur Samuel (IBM)

The world's first self-learning program: a checkers-playing program



Checkers

64 years

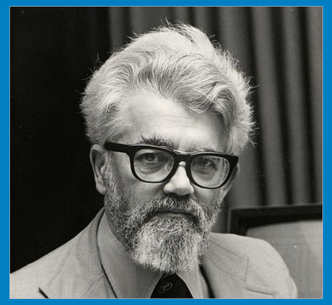
Deep Mind (Google)





Artificial Intelligence

**John McCarthy**



Machine Learning

**Rina Decther**

First-order and Second-order deep learning

Deep Learning

1950 1952 1956 1980 1986 1997 2009 2016 2020

Alan Turing
The Turing Test

Darmouth conferences



1st Workshop on Machine Learning, Carnegie-Mellon University, Pittsburgh

*Tom's paper*

Workshop on Deep Learning for Speech Recognition

# A cat for a hare

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

IEEE SPECTRUM Topics Reports Blogs Multimedia

Feature | Biomedical | Diagnostics

2 Apr 2019 | 15:00 GMT

## How IBM Watson Overpromised and Underdelivered on AI Health Care

After its triumph on *Jeopardy!*, IBM's AI seemed poised to revolutionize medicine. Doctors are still waiting

By **Eliza Strickland**

**In 2014, IBM opened** swanky new headquarters for its artificial intelligence division, known as IBM Watson. Inside the glassy tower in lower Manhattan, IBMers can bring prospective clients and visiting journalists into the "immersion room," which resembles a miniature planetarium. There, in the darkened space, visitors sit on swiveling stools while fancy graphics flash around the



IEEE Spectrum

THE WALL STREET JOURNAL.

CIO JOURNAL

## Data Challenges Are Halting AI Projects, IBM Executive Says

The cost and hassle of collecting and preparing data comes as a shock for some companies, according to Arvind Krishna



Arvind Krishna, IBM's senior vice president of cloud and cognitive software, speaking at The Wall Street Journal's Future of Everything Festival on Wednesday. **PHOTO:** ANDY DAVIS/THE WALL STREET JOURNAL

*By Jared Council*

May 28, 2019 5:30 a.m. ET

WSJ

# AI can’t solve this

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

## AI can’t solve this: The coronavirus could be highlighting just how overhyped the industry is



Home » News, insights & Trends » Business » AI can’t solve this: The coronavirus could be highlighting just how overhyped the industry is

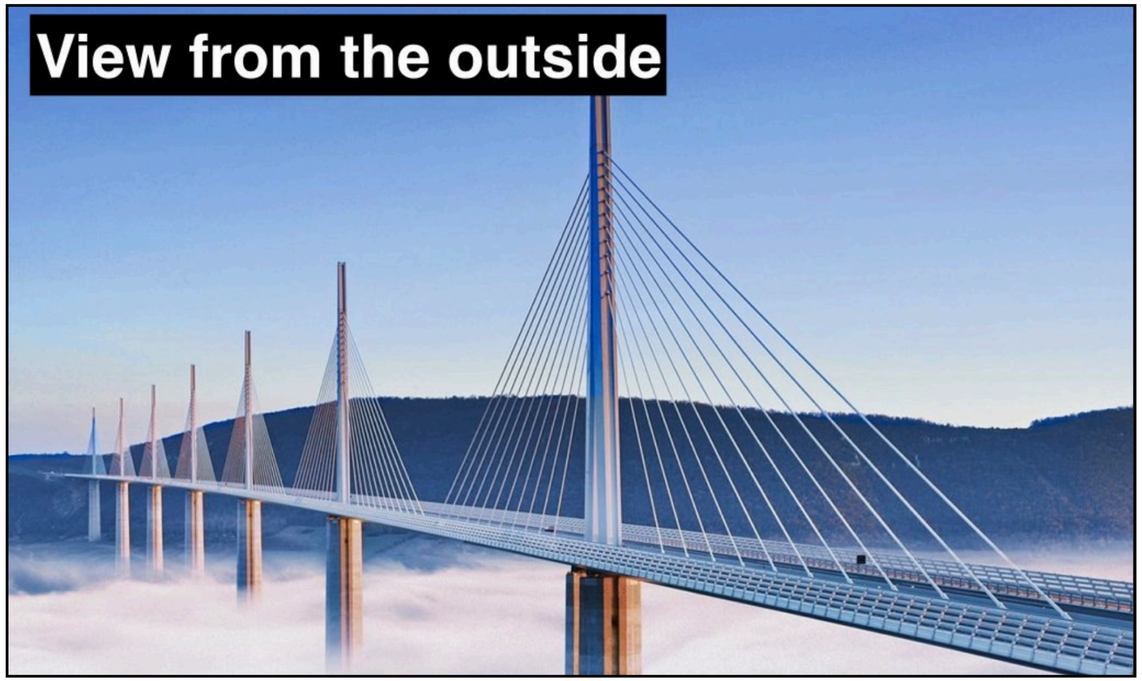
# The ugly

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

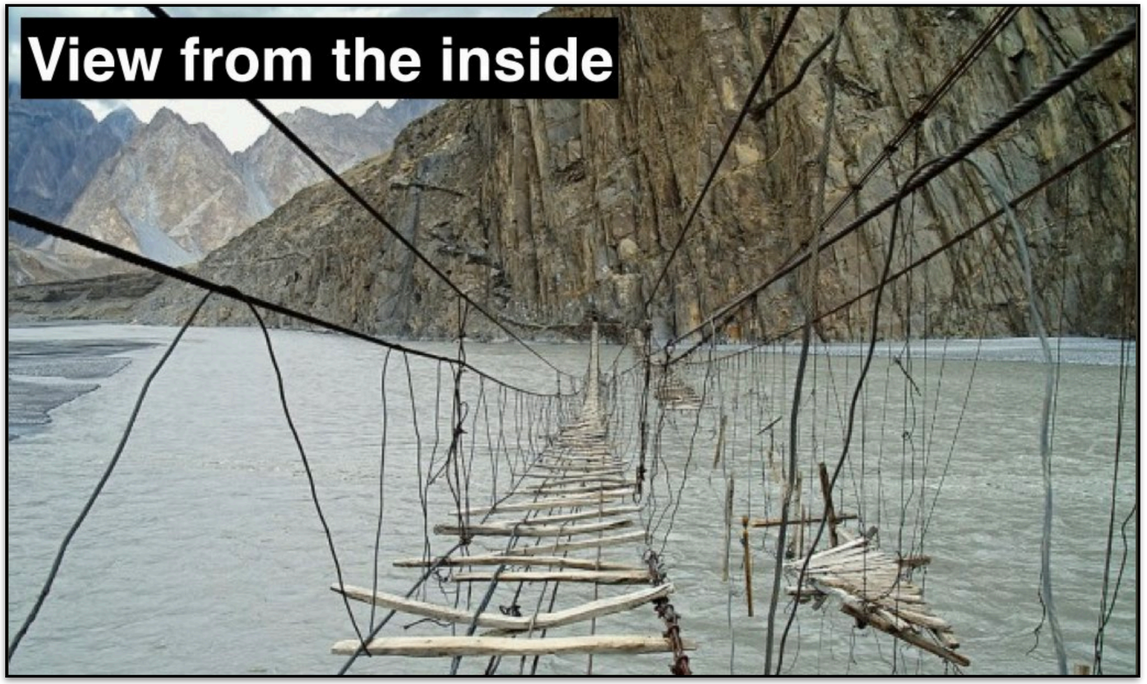


# Oops! It's software & data after all!

CIDAI Centre of Innovation for Data tech and Artificial Intelligence




@suchisaria




@suchisaria

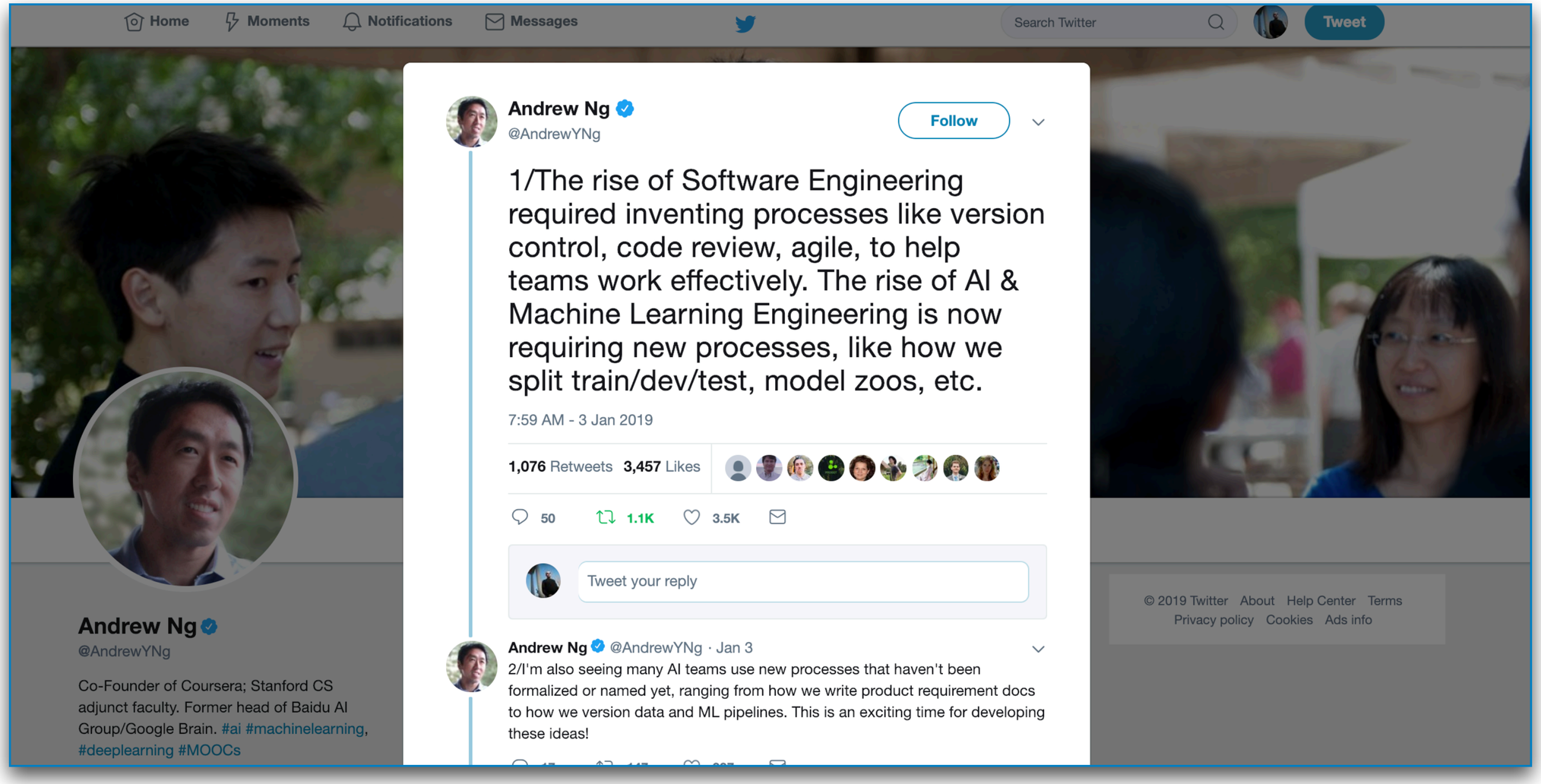
# Reliable and Robust AI

CIDAI Centre of Innovation for Data tech and Artificial Intelligence



# The awakening

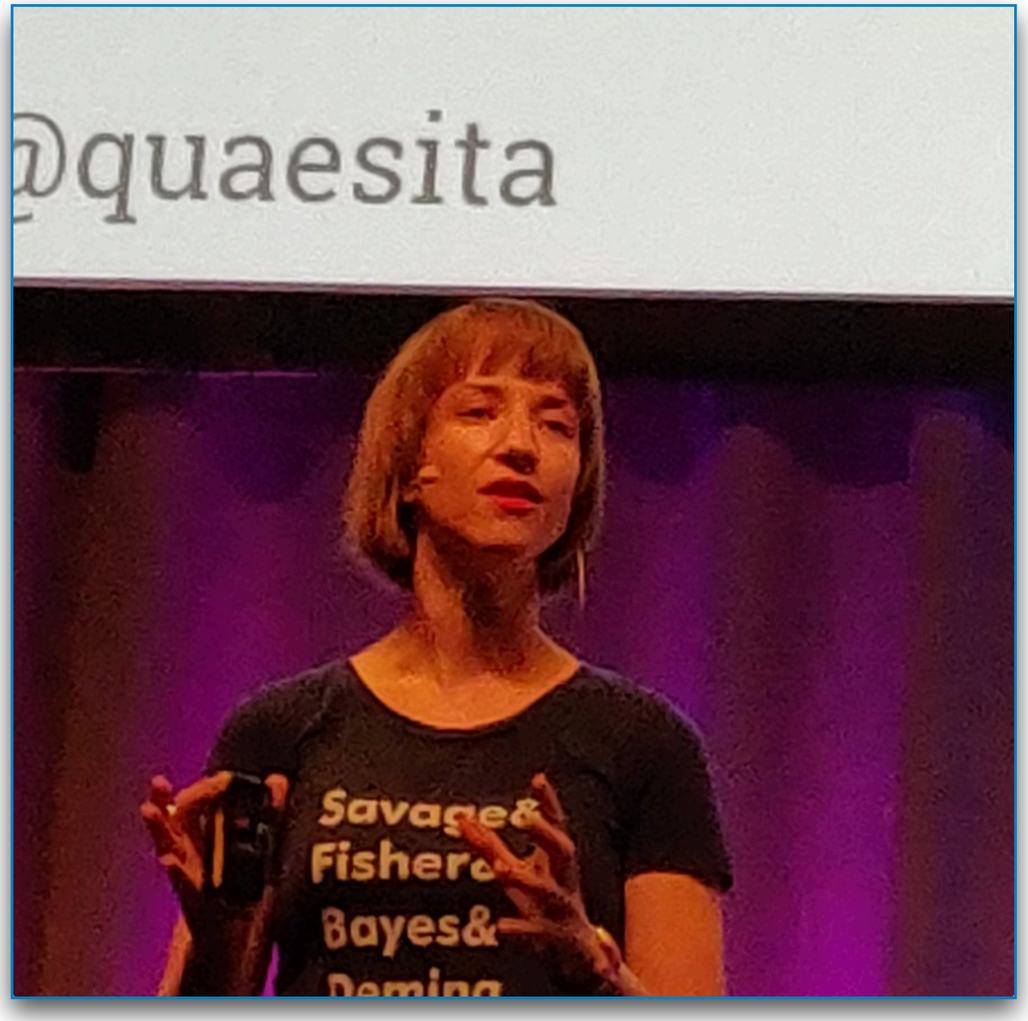
CIDAI Centre of Innovation for Data tech and Artificial Intelligence



# Is Data Science a Bubble?

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

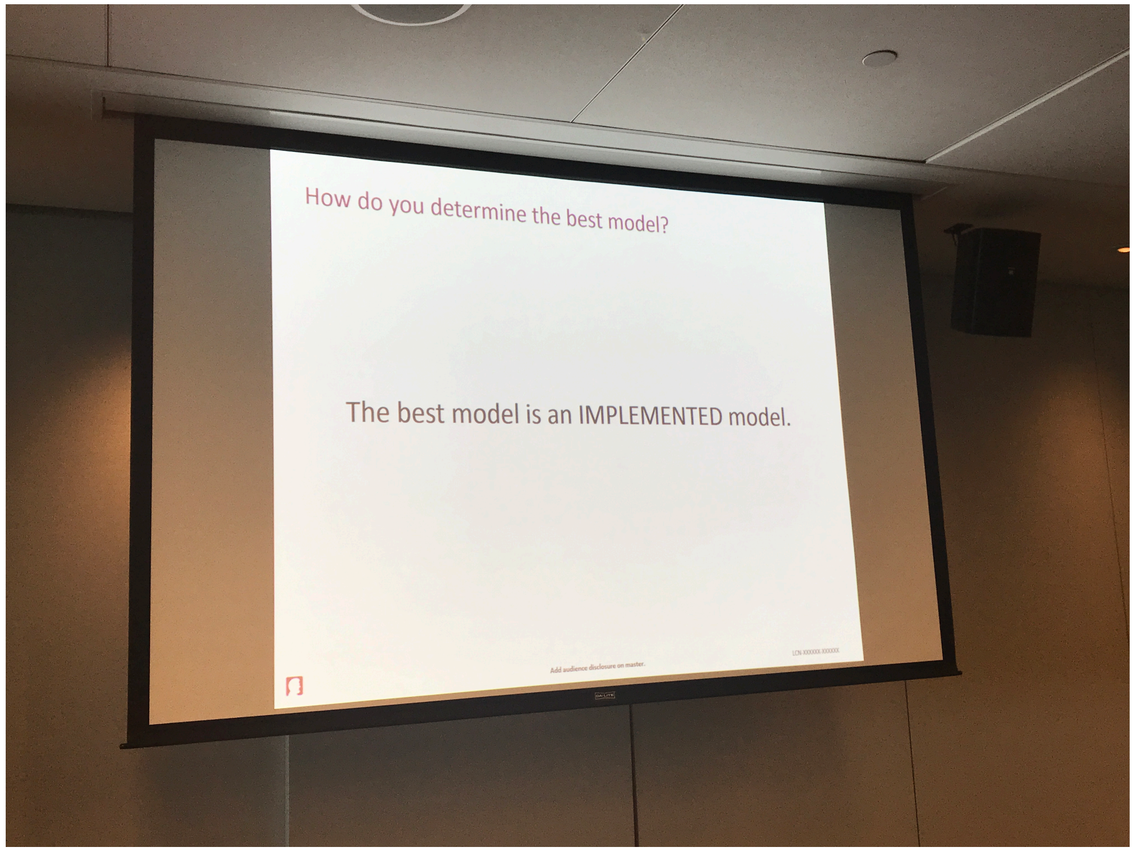


# The best model?

CIDAI Centre of Innovation for Data tech and Artificial Intelligence




[Jamie Warner, Lincoln Financial, PAPIs 2018]

# Don't Become a Data Scientist

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

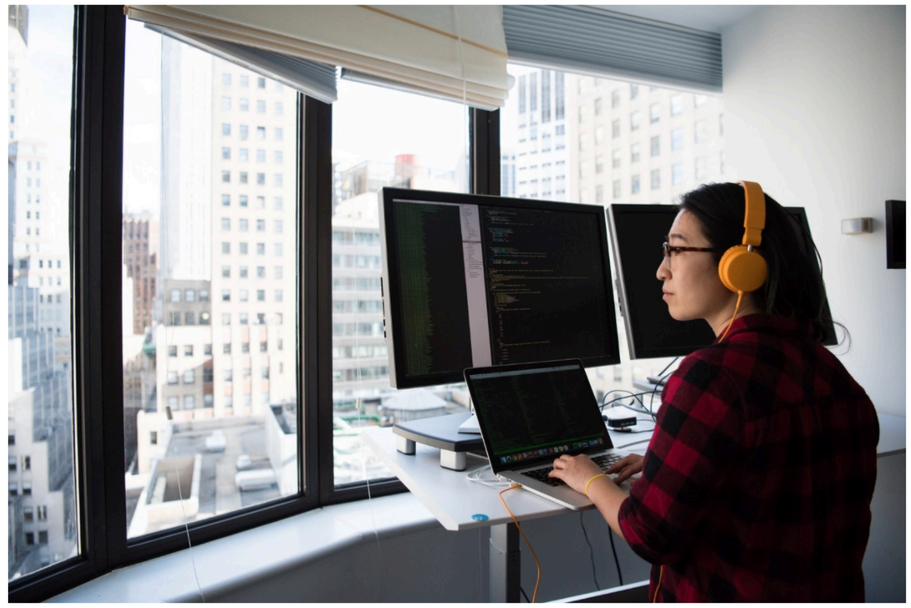
## Don’t Become a Data Scientist

The advice I give when someone asks me how to get into data science. Become a software engineer instead.



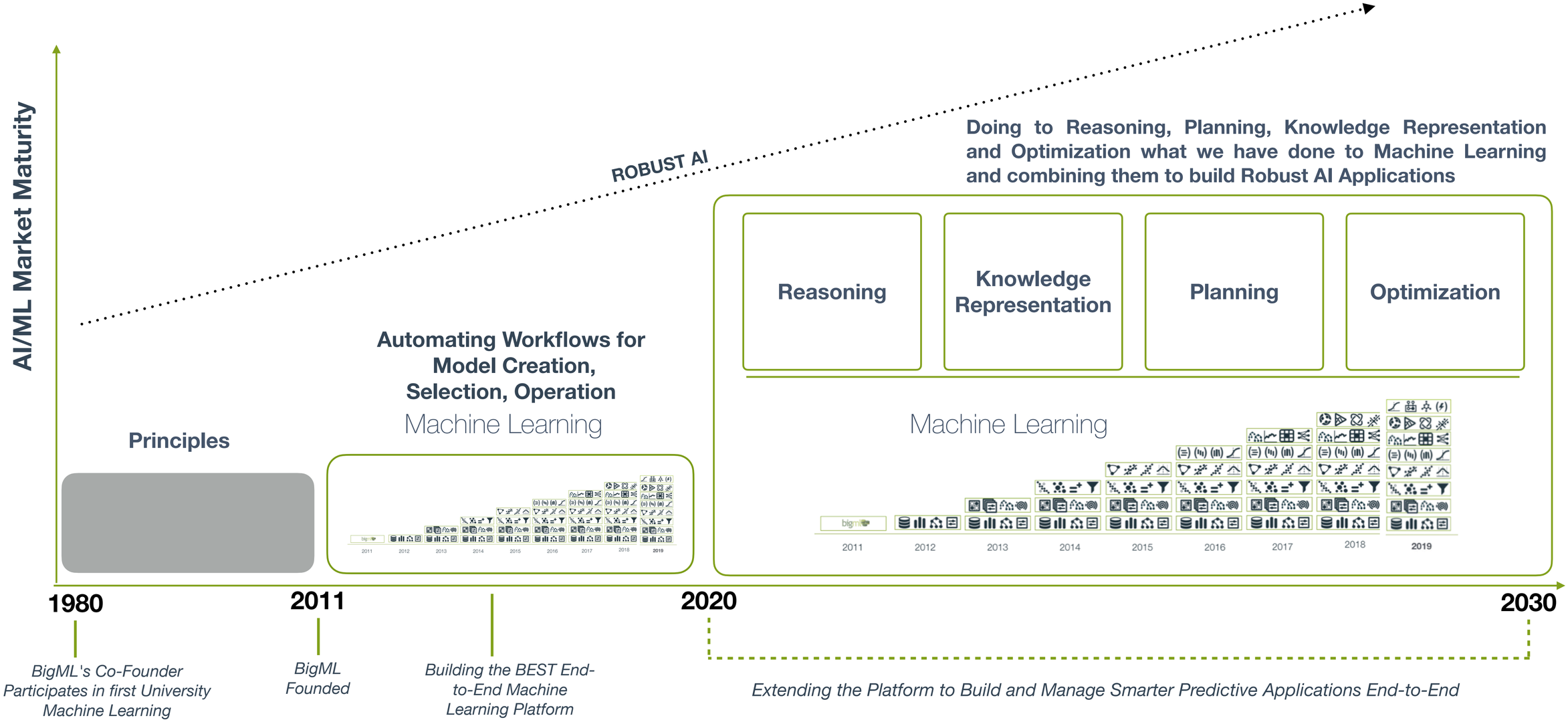
Chris Follow

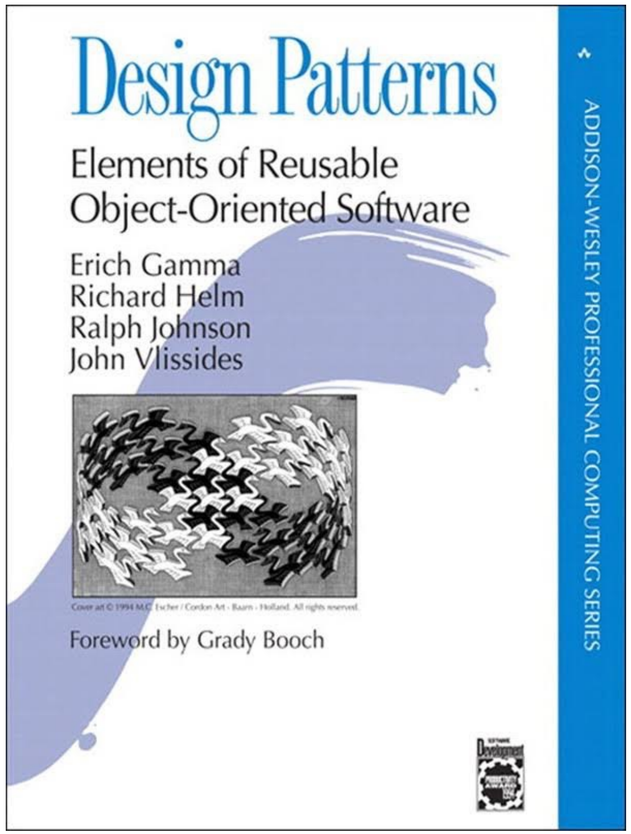
May 4 · 6 min read ★

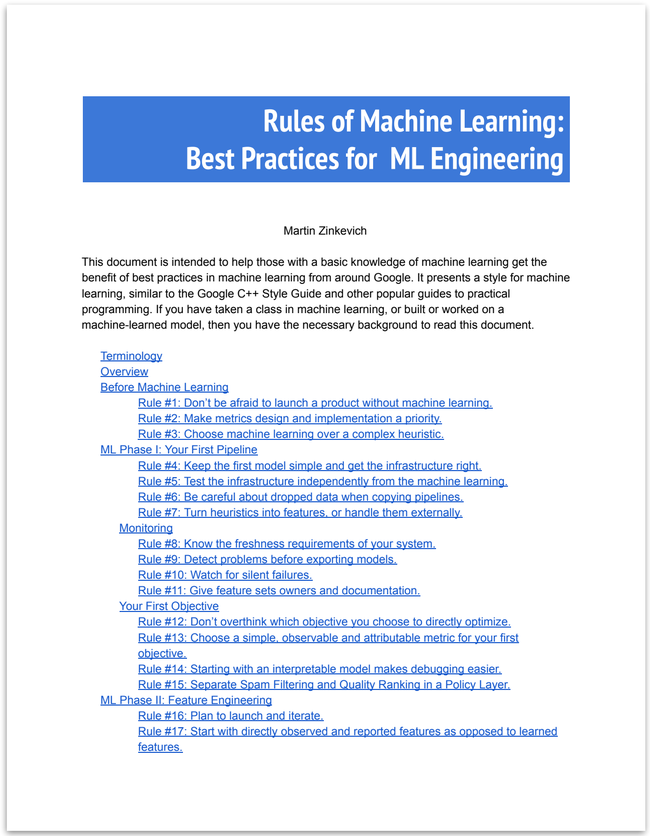


# BigML **Future**

CIDAI Centre of Innovation for Data tech and Artificial Intelligence





**Rules of Machine Learning: Best Practices for ML Engineering**

Martin Zinkevich

This document is intended to help those with a basic knowledge of machine learning get the benefit of best practices in machine learning from around Google. It presents a style for machine learning, similar to the Google C++ Style Guide and other popular guides to practical programming. If you have taken a class in machine learning, or built or worked on a machine-learned model, then you have the necessary background to read this document.

Terminology
Overview
Before Machine Learning
- Rule #1: Don't be afraid to launch a product without machine learning.
- Rule #2: Make metrics design and implementation a priority.
- Rule #3: Choose machine learning over a complex heuristic.

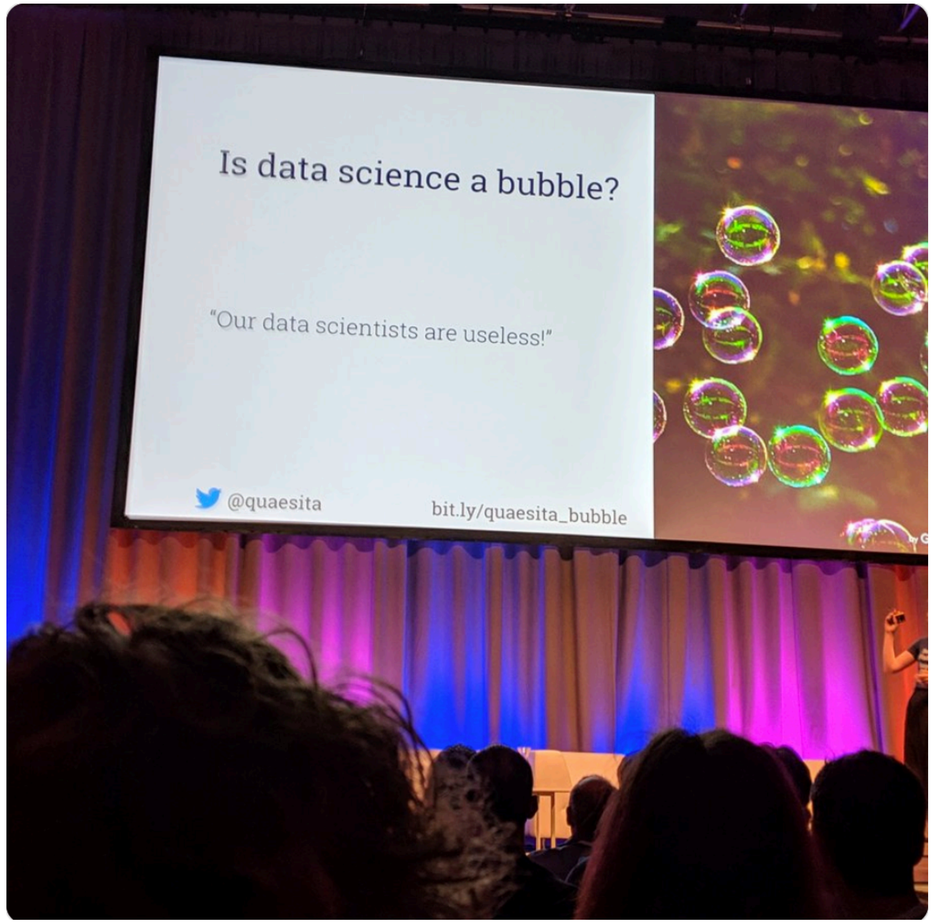
ML Phase I: Your First Pipeline
- Rule #4: Keep the first model simple and get the infrastructure right.
- Rule #5: Test the infrastructure independently from the machine learning.
- Rule #6: Be careful about dropped data when copying pipelines.
- Rule #7: Turn heuristics into features, or handle them externally.

Monitoring
- Rule #8: Know the freshness requirements of your system.
- Rule #9: Detect problems before exporting models.
- Rule #10: Watch for silent failures.
- Rule #11: Give feature sets owners and documentation.

Your First Objective
- Rule #12: Don't overthink which objective you choose to directly optimize.
- Rule #13: Choose a simple, observable and attributable metric for your first objective.
- Rule #14: Starting with an interpretable model makes debugging easier.
- Rule #15: Separate Spam Filtering and Quality Ranking in a Policy Layer.

ML Phase II: Feature Engineering
- Rule #16: Plan to launch and iterate.
- Rule #17: Start with directly observed and reported features as opposed to learned features.

It's all about **best software engineering practices**



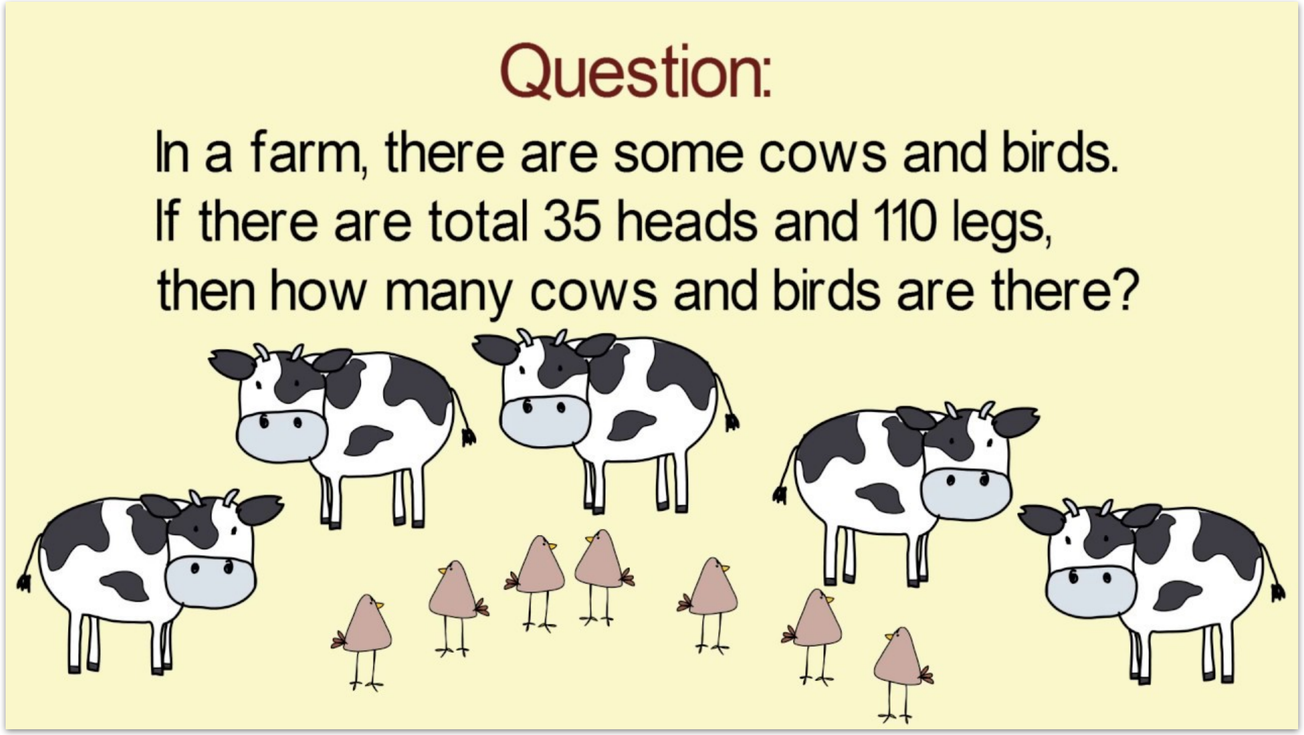

@quaesita

# The AI and Data Science bubbles **BURST!**

*It's all about robust*
*Machine Learning and best software engineering practices*

# Focus turns to **Reasoning!**

*Most problems cannot be solved just inductively with data*




Reasoning




Sciencing

First **basic reasoning** frameworks in place

The media starts exaggerating the **first preliminary results** of **integrated learning** and **reasoning systems**

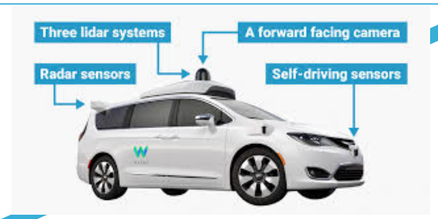
*Mixing inductive, deductive, and adductive systems becomes popular*




@samirkawas

CIDAI Centre of Innovation for Data tech and Artificial Intelligence

| 2039 | 2040 | 2041 | 2042 | 2043 | 2044 |
|---|---|---|---|---|---|

| Scenario \ Objective | Well-defined | Undefined |
|---|---|---|
| Adversarial | | **First prototypes!!!** |
| Imprecise | | |
| Dynamic |   | |
| Static |   | |

# Conclusion

CIDAI Centre of Innovation for Data tech and Artificial Intelligence




**The opportunities are endless!!!**

## The good:

We are only at the very beginning.

## The bad:

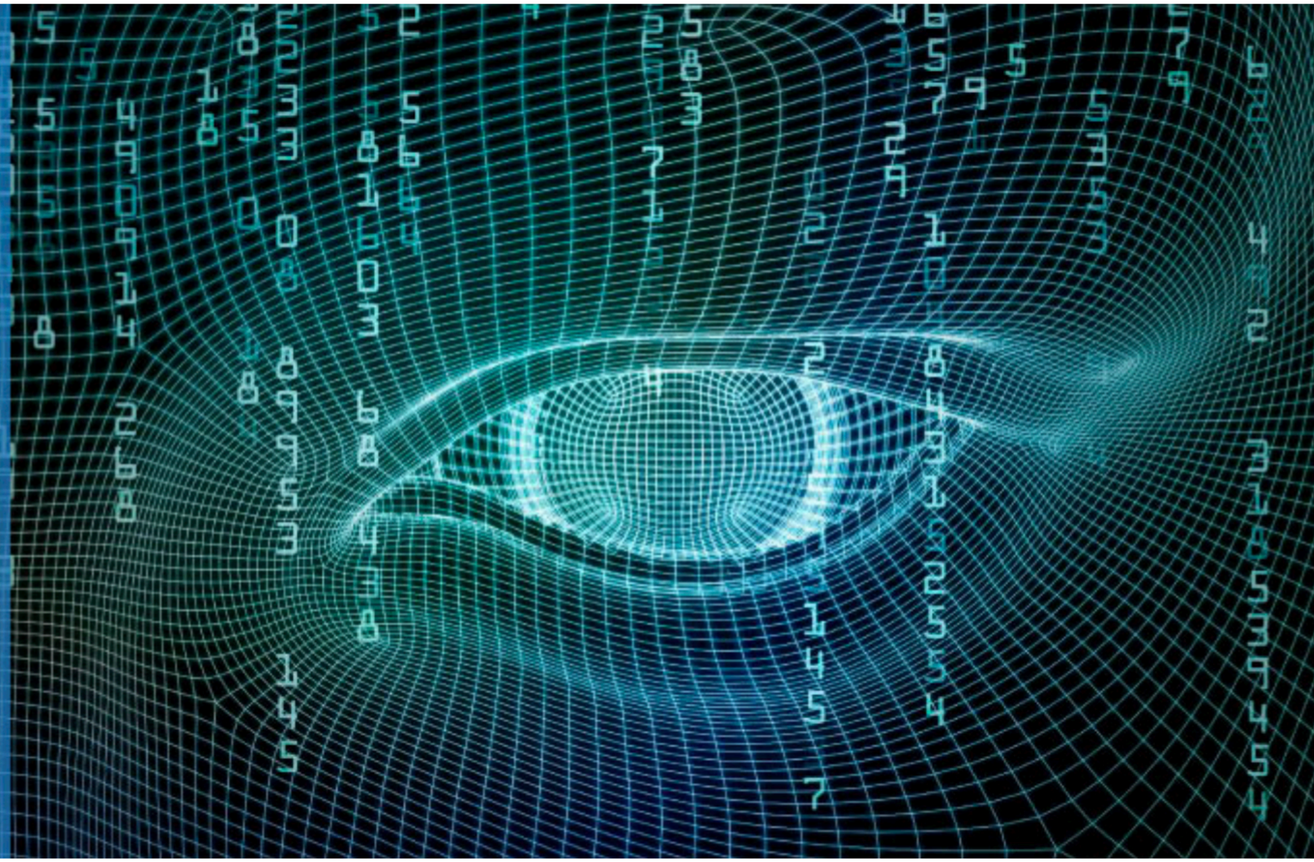
We need more and better education to solve real-world problems sooner and faster.

## The ugly:

Robust applications aren't easy to build and operate.

ACTO DE PRESENTACIÓN

CIDAI Centre of Innovation for Data tech and Artificial Intelligence



# *The good, the bad, and the ugly of Artificial Intelligence*

Dr. Francisco Martin
**BigML, Inc**

September 15, 2020

CIDAI Centre of Innovation for Data tech and Artificial Intelligence