



HEKIMA

# FDC - PCBM

Mar | 2019

Thiago Cardoso

Co-founder / CTO **Hekima**

[hekima.com](https://hekima.com)

twitter.com/tncardoso

thiago.cardoso@hekima.com

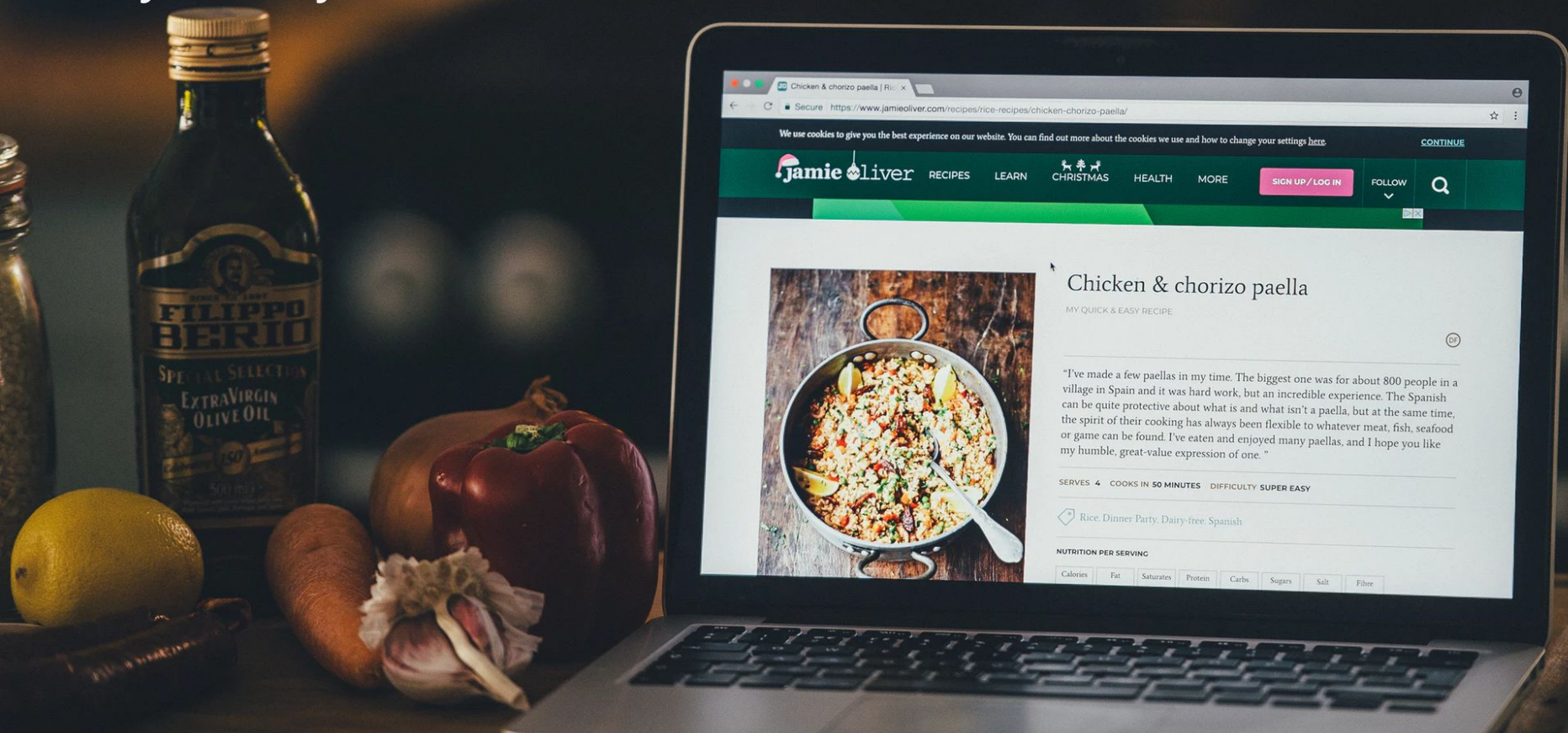
**HEKIMA**

# More than 100 AI projects

Different segments and applications

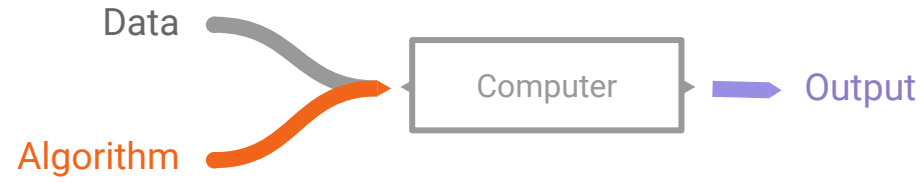


as you may have heard...

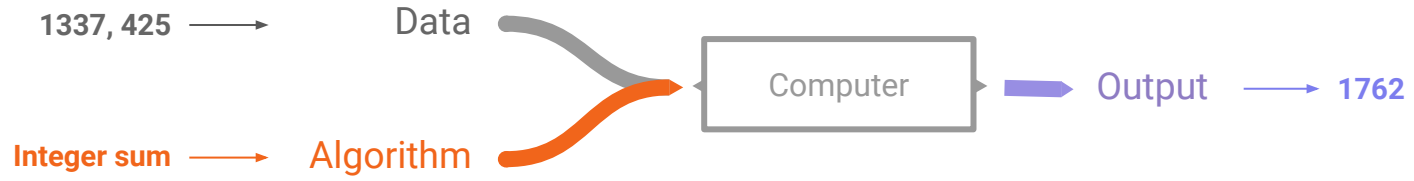




'Traditional programming'



'Traditional programming'



# How to recognize a human being?

# How to recognize a human being?





# How to recognize a human being?



# How to recognize a human being?



# How to recognize a human being?



# How to recognize a human being?



High level abstractions



# It gets harder when working in low-level

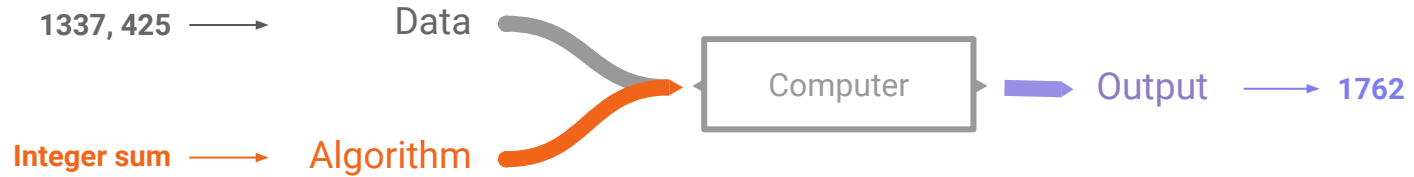


$$A = [a_{ij}] = \begin{bmatrix} a_{11} & a_{12} & a_{13} & \cdots & a_{1n} \\ a_{21} & a_{22} & a_{23} & \cdots & a_{2n} \\ a_{31} & a_{32} & a_{33} & \cdots & a_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & a_{m3} & \cdots & a_{mn} \end{bmatrix}_{m \times n}$$

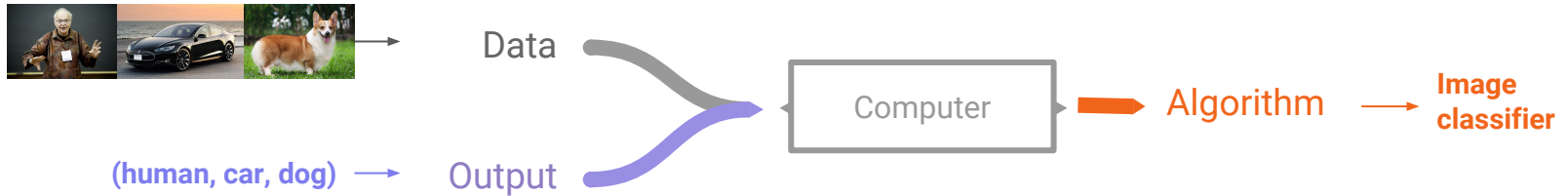
# Fortunately we have a lot of examples!



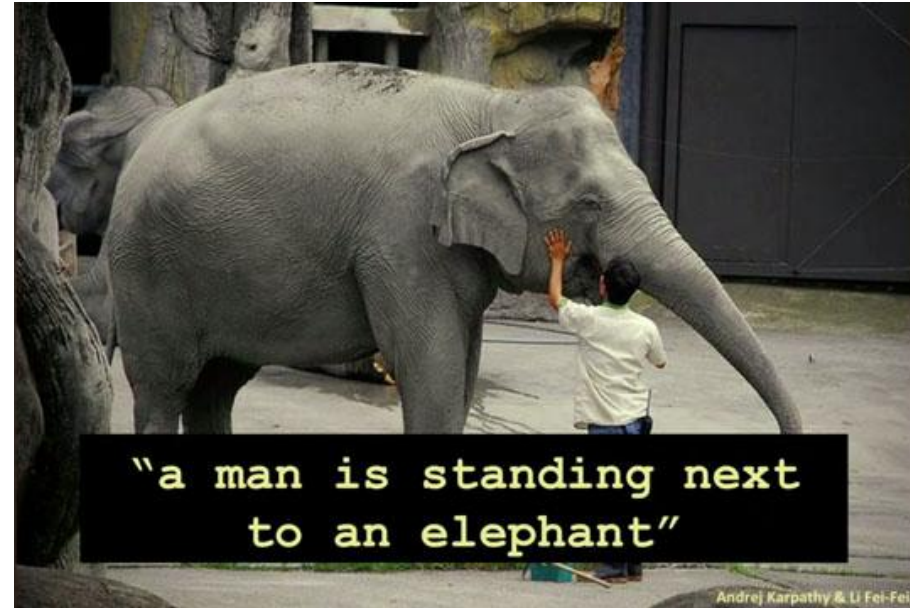
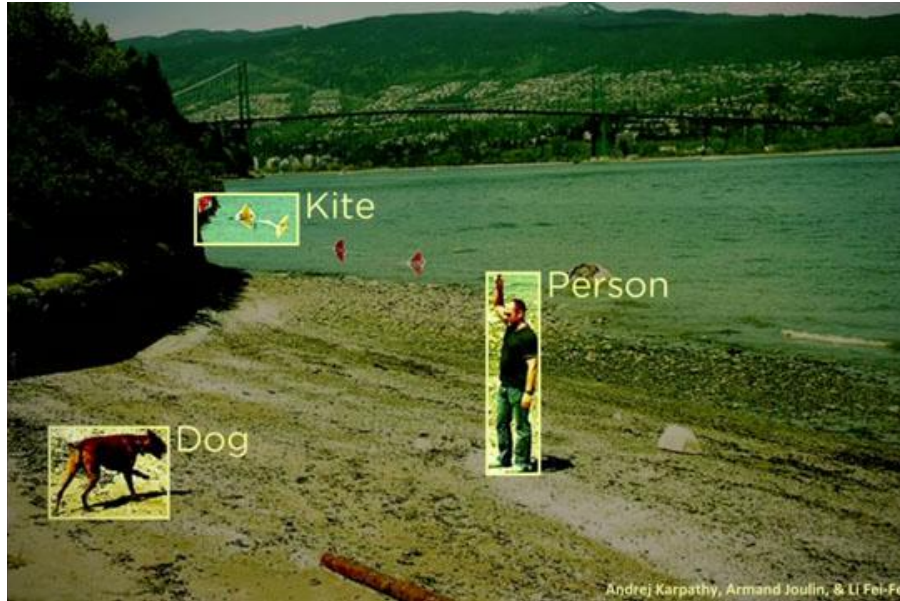
## 'Traditional programming'



## Machine Learning



# New tasks, new opportunities, new businesses





## HEALTH

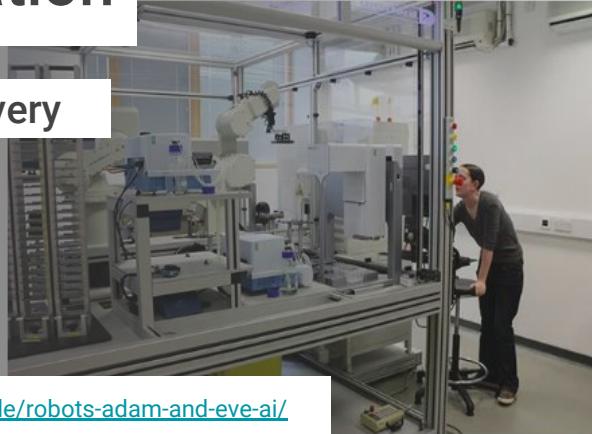
# Robot Scientist Discovers Potential Malaria Drug

The machine called Eve is packed with innovations for finding drugs faster

By Andy Extnance on February 5, 2015

Not only automation

but also knowledge discovery



ADVERTISEMENT

## LATEST NEWS



The EPA's Climate Rollbacks Could Mean Thousands of Premature Deaths

Birds of a Feather Fight Germs Together

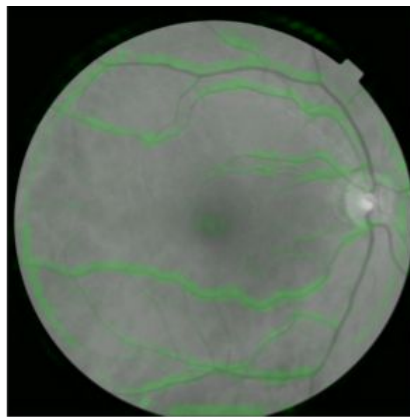
CONFIDENTIAL |

# Not only automation

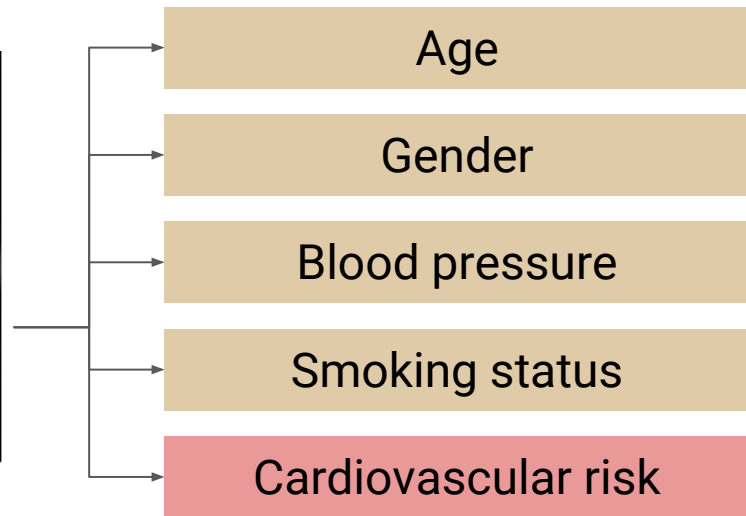
but also knowledge discovery



Image of retina



Blood pressure predictions  
focus on blood vessels



# Not only automation

but also knowledge discovery

less invasive and  
cheaper

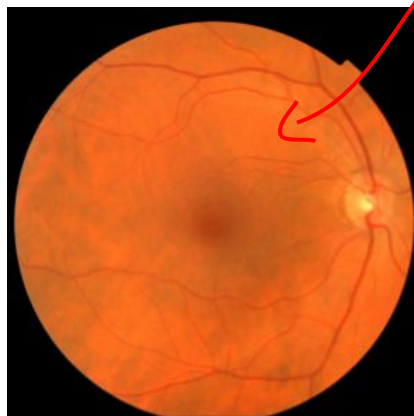
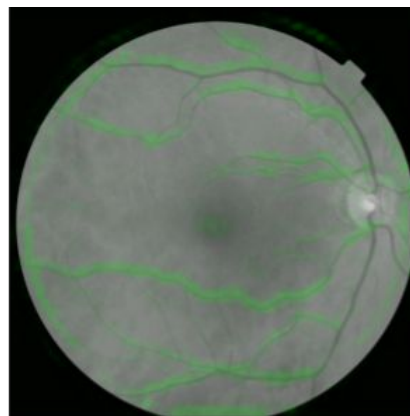
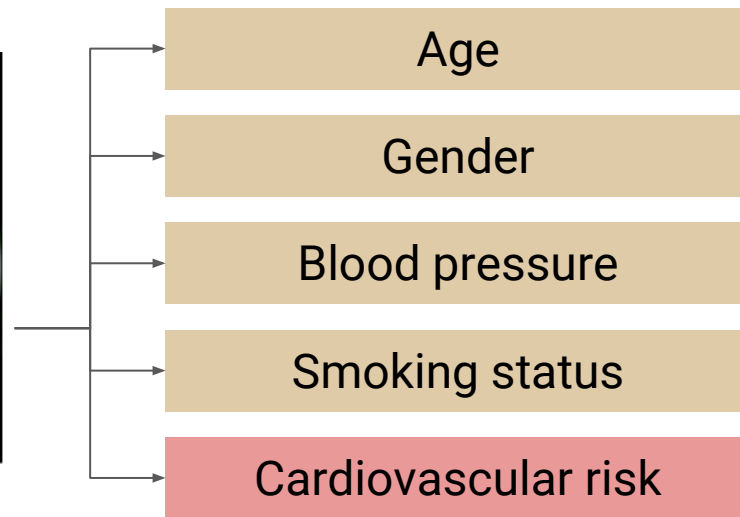


Image of retina

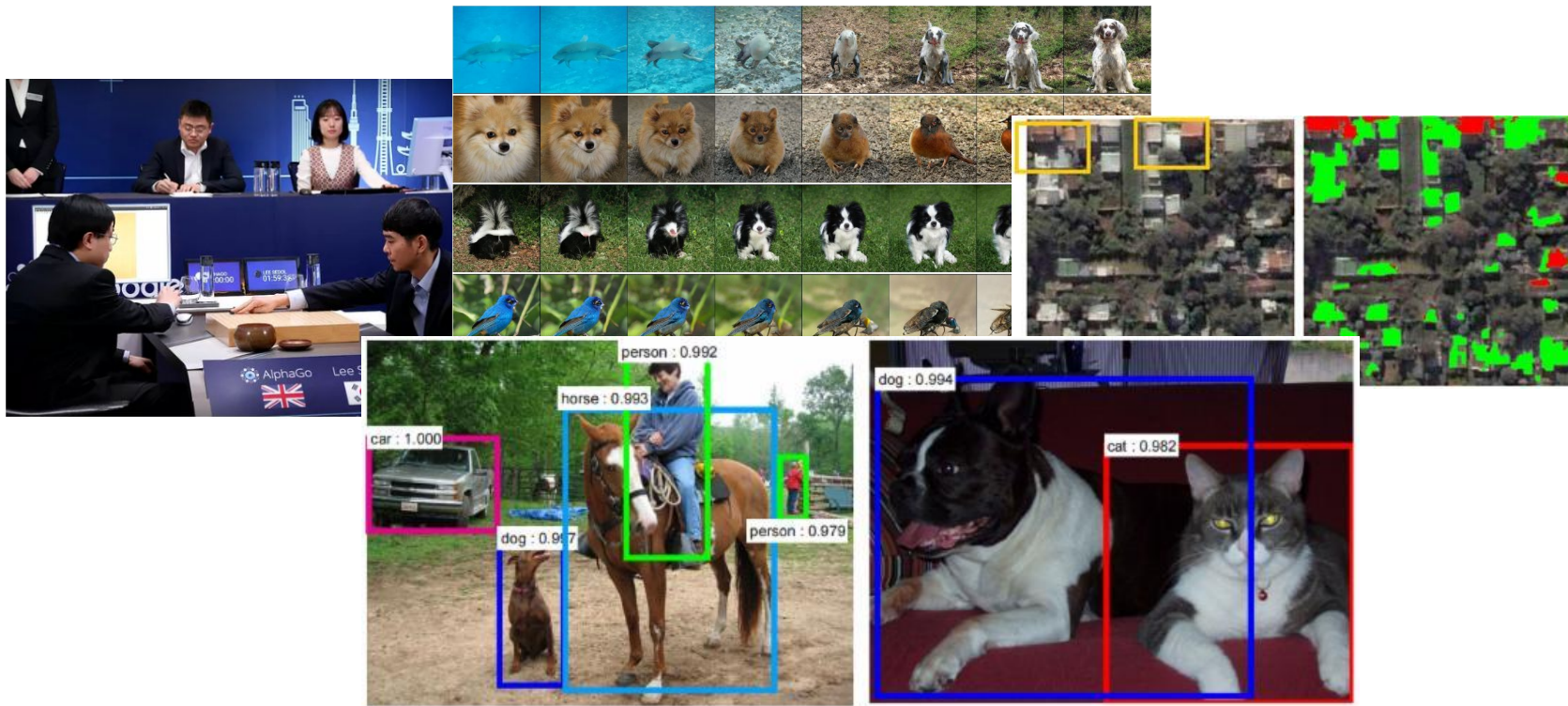


Blood pressure predictions  
focus on blood vessels



accuracy similar to  
blood test

# I already know where to apply ML!



If you had a ML model  
with 100% accuracy,  
what would you do next?

## Creating a Data-Driven Organization - Carl Anderson



**DATA**



**REPORT**



**ANALYSIS**



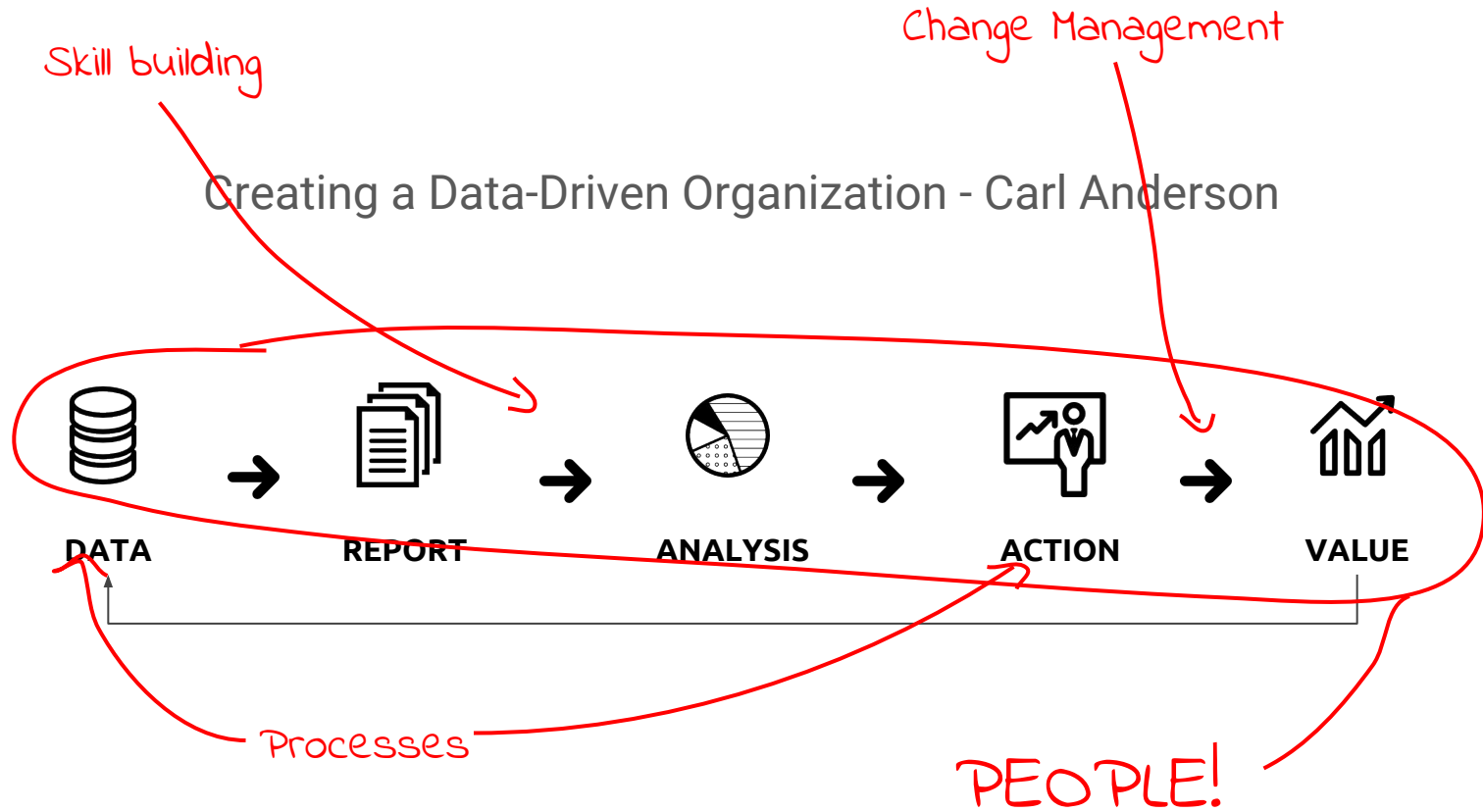
**ACTION**



**VALUE**

## Creating a Data-Driven Organization - Carl Anderson







ML without accounting for processes  
and people is the 'but it works on my  
computer' of Data Science.

# Brazilian market is moving fast

## 4 TRANSFORMATION

Data and AI as an essential part of the core business.  
Data-driven companies.

- Deep transformation. AI is part of strategic planning
- Cultural change

## 3 EXECUTION

Improvements in the operational performance.  
Use of predictive analysis in production.

- End to end projects

## 2 EXPLORATION

Growing consensus about the potential of Big Data applications is conducive to initial experiments and exploratory analysis.

- Opportunities lab
- Exploratory data analysis

## 1 DISCOVERY

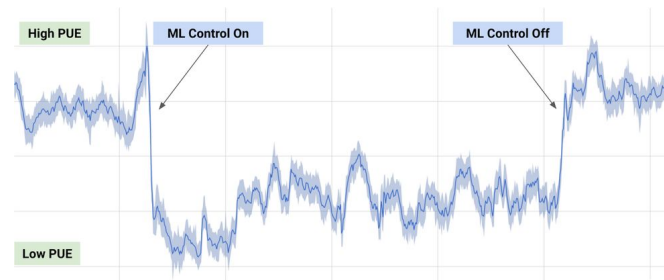
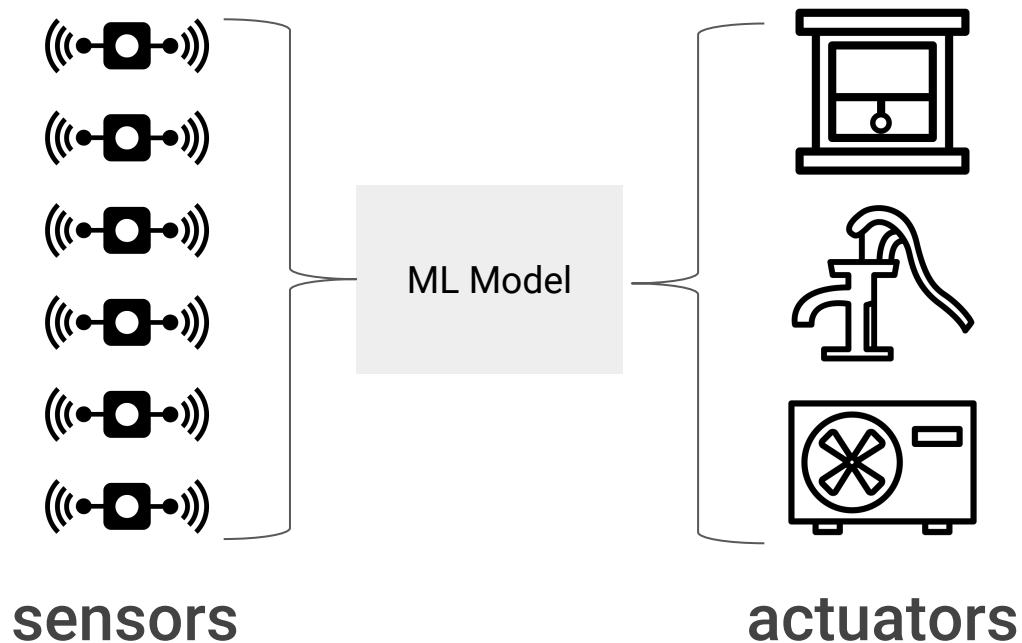
Data / AI is discussed but don't reflect on business strategy or internal processes.

- Prioritization of business opportunities
- Projects that show potential and ROI

# Smart Datacenter

# Smart Datacenter

Save 40% of cooling costs by managing the Datacenter

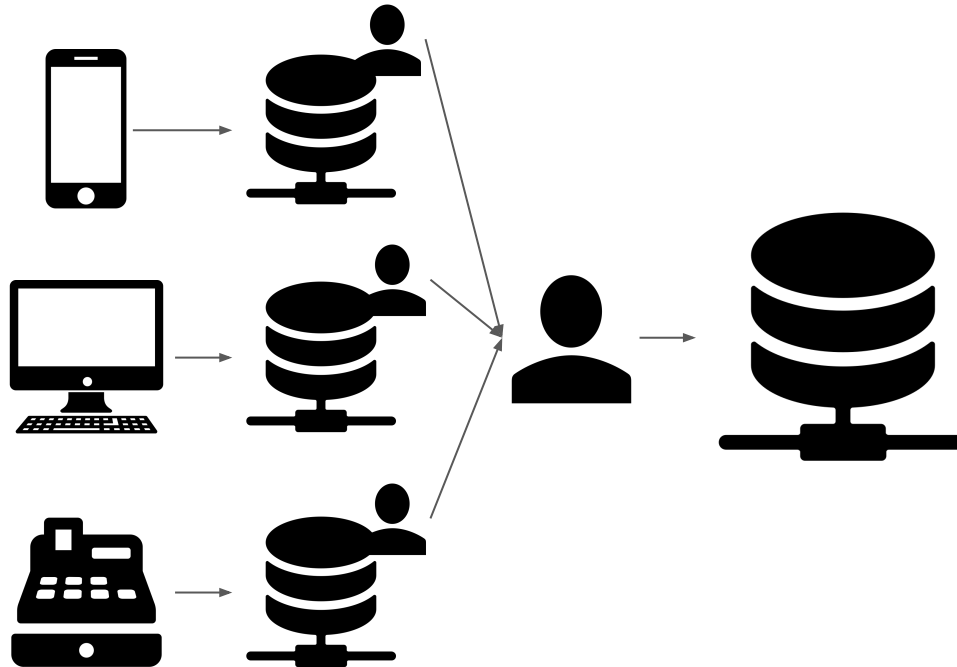




# Master Data Management

# Master Data Management

Multiple data sources, one entity





HEKIMA

# Natural language processing

CONFIDENTIAL

# Customer feedback analysis



The **car** is really **comfortable**

car

comfortable

I think the **trunk** is **small**

trunk

small

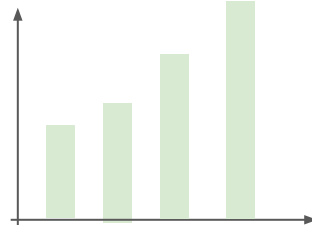
The **customer service** is **awesome!**

customer service

awesome

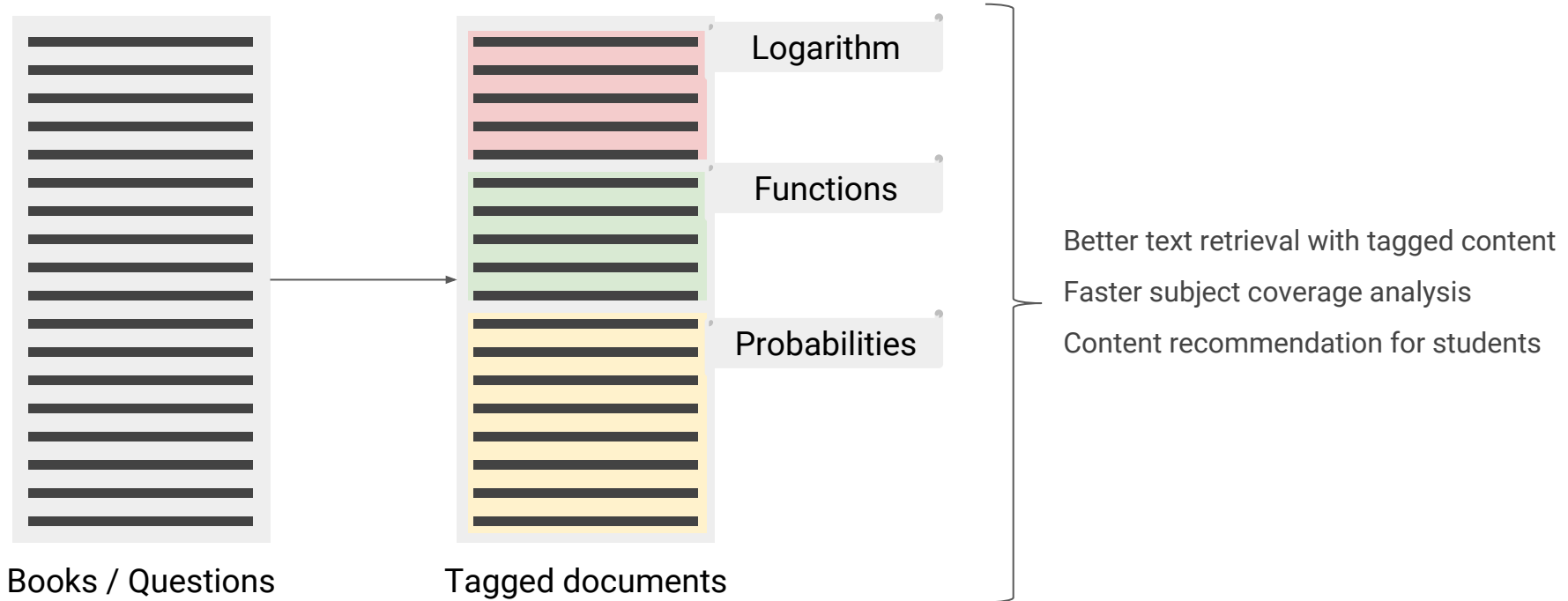
I was not able to **test-drive!**

test-drive



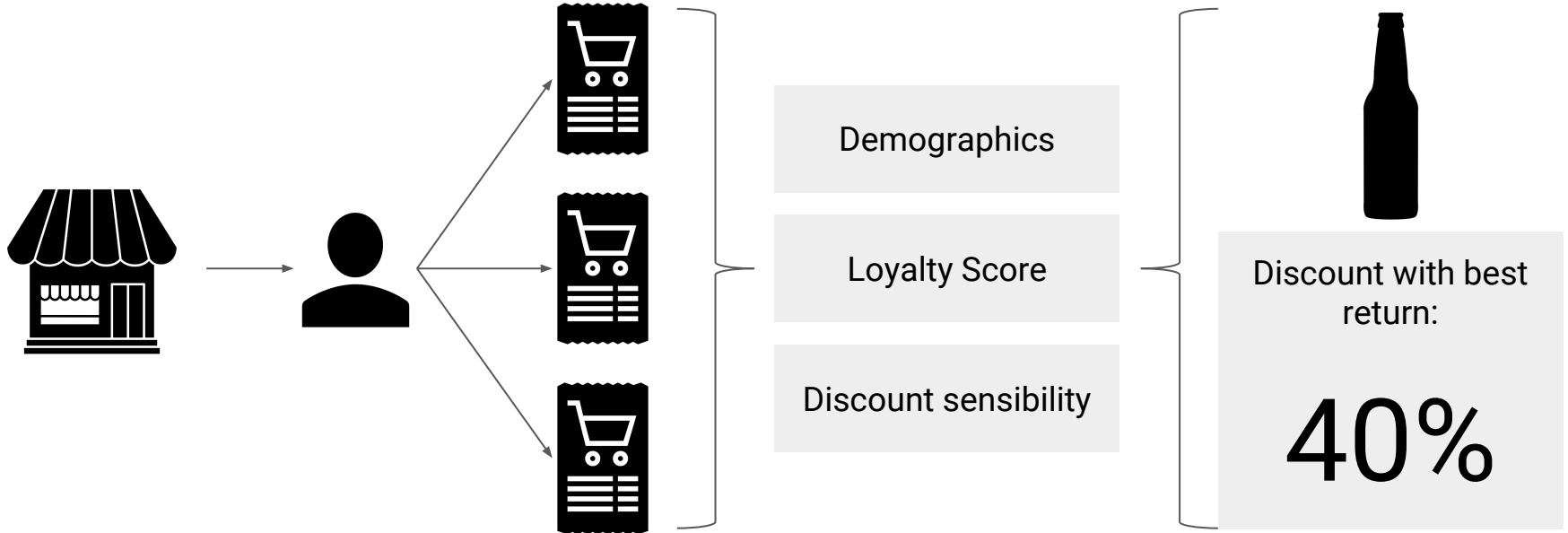



# Content classification



# Customer profiling

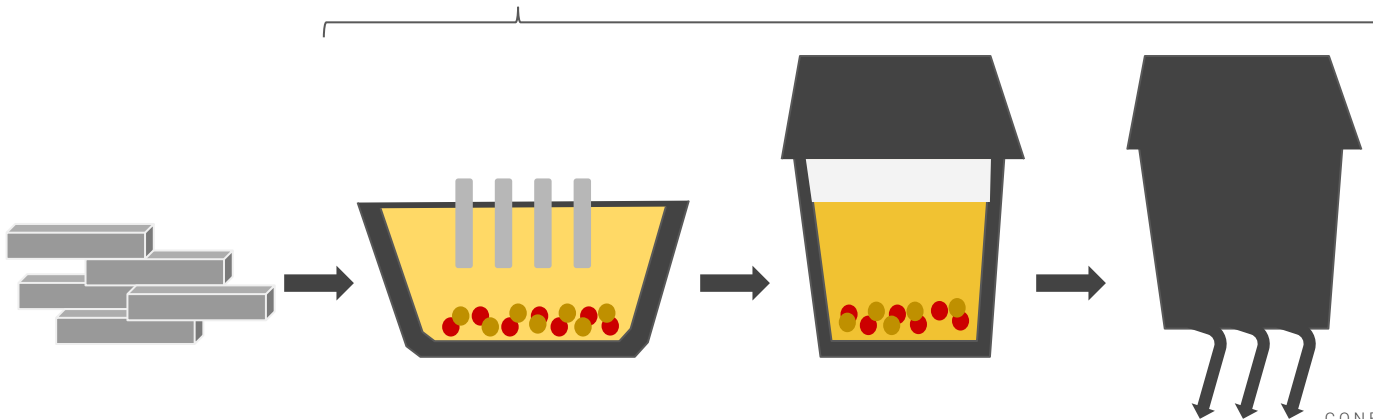
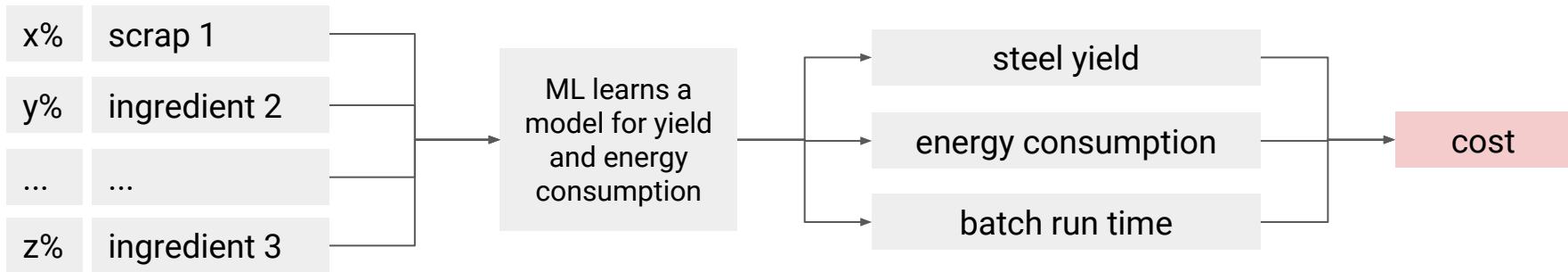
# Customer profiling



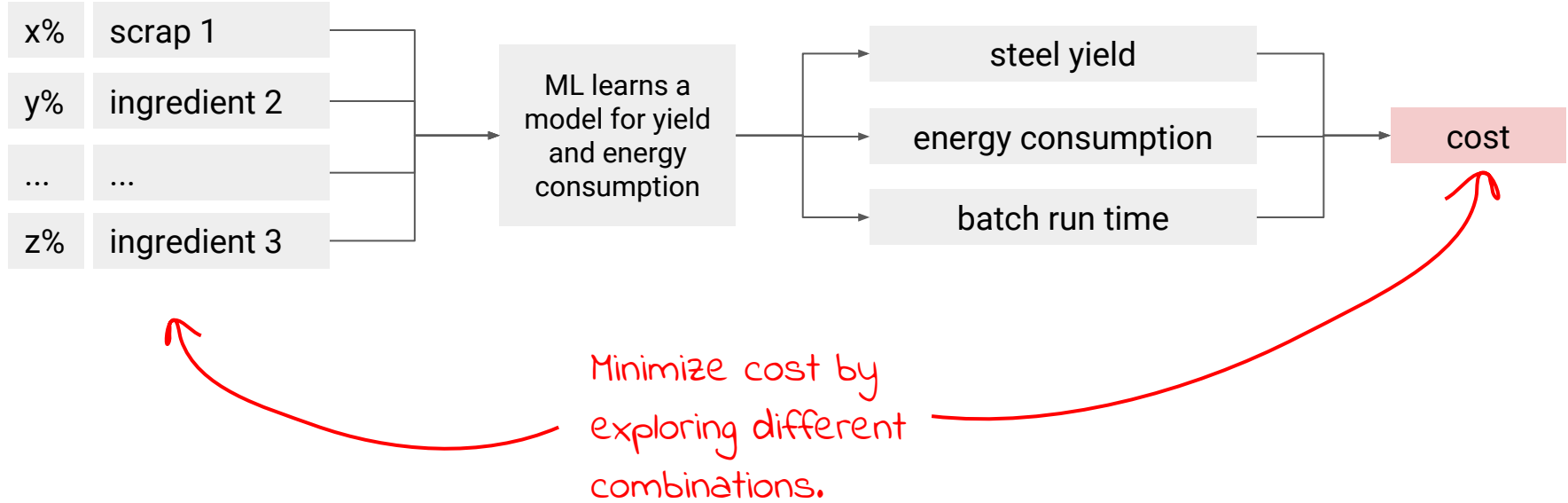


# Optimizing scrap mixture for steel production

# Optimizing scrap mix



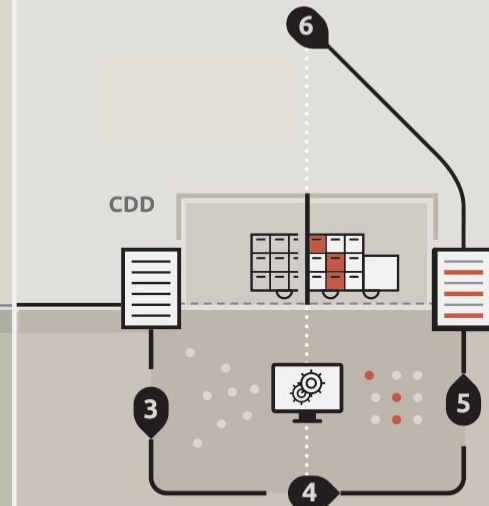
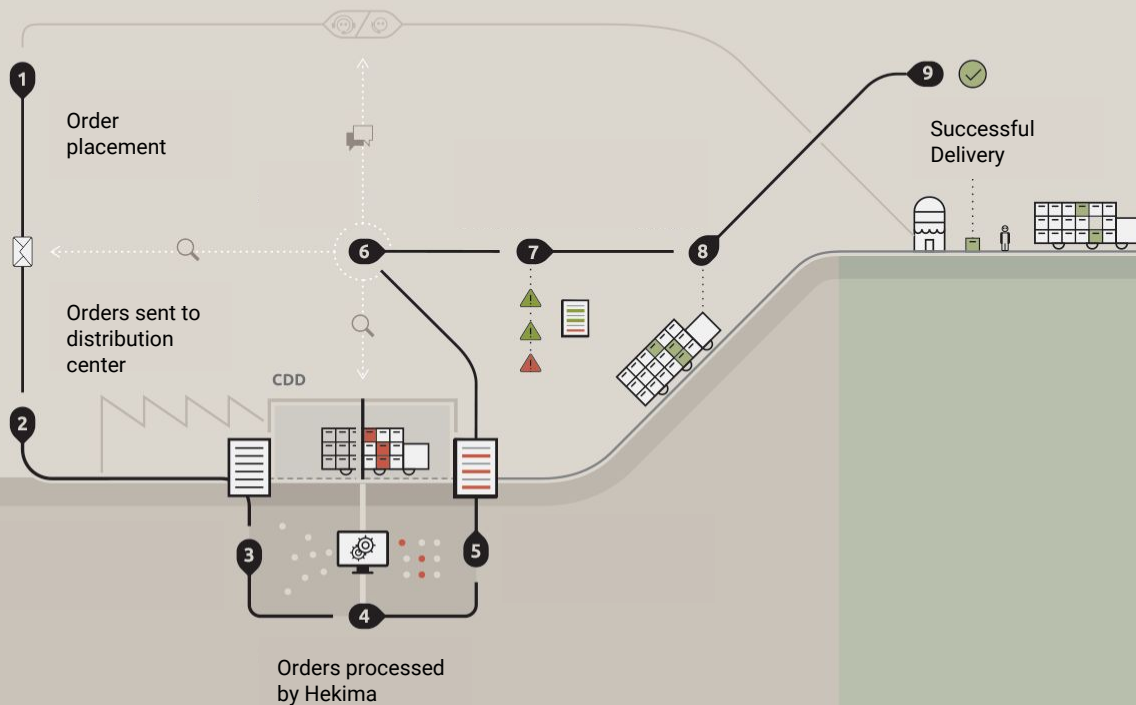
# Optimizing scrap mix





# Shipment failure prediction

## SPECIFIC POINTS OF INTERVENTION BY HEKIMA

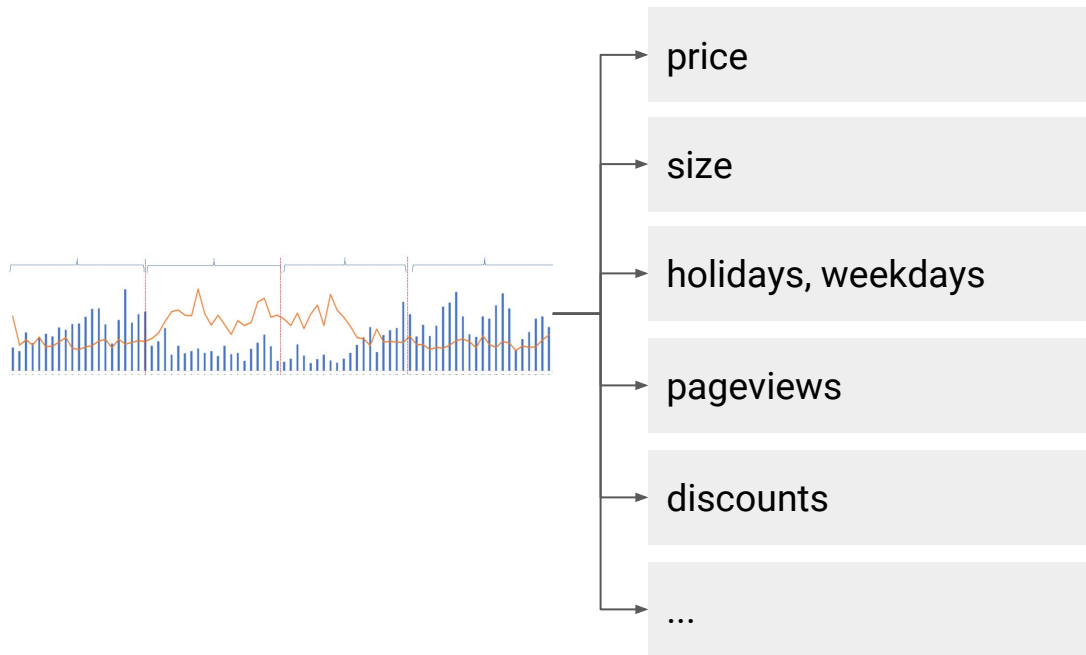




# Dynamic Pricing

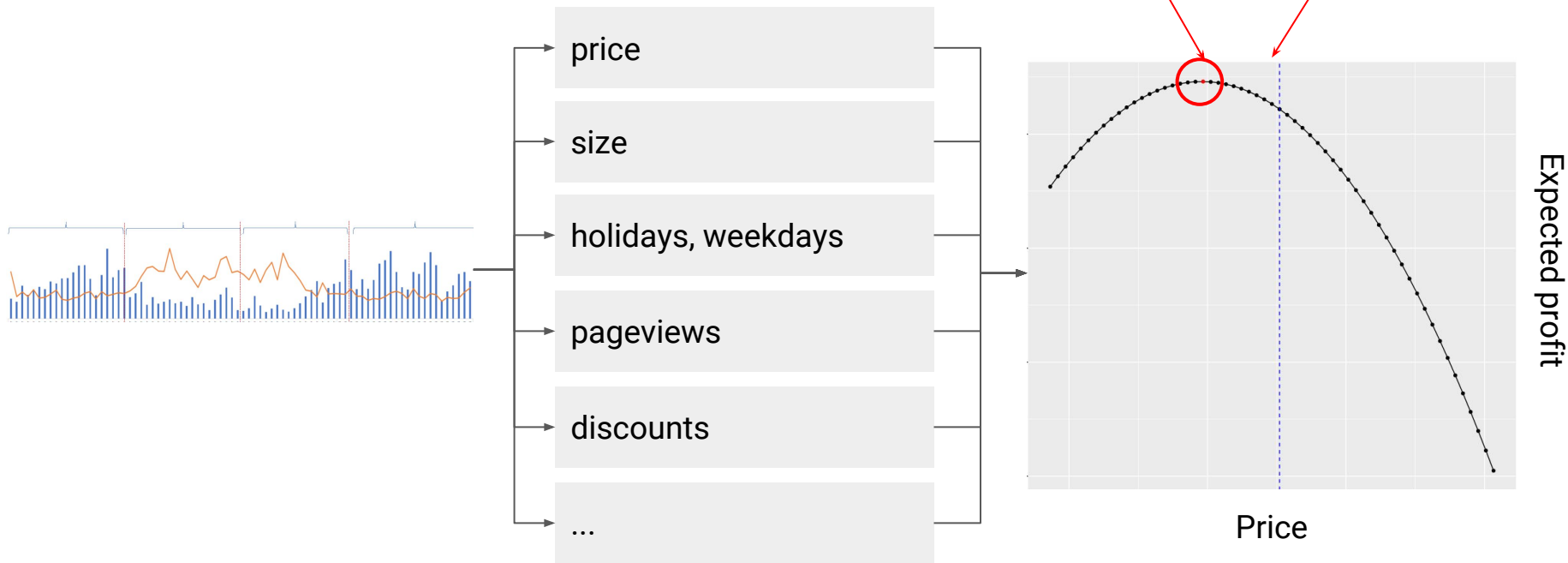
# Dynamic Pricing

learning how different features impact sales and profits



# Dynamic Pricing

learning how different features impact sales and profits





# Many other possibilities

Text classification,

churn prediction, recommendation,

customer analysis, data sanitization,

supply chain automation, demand forecasting...

What about the challenges?

**F**airness

**A**ccountability

**T**ransparency



W

KIMA



What about the challenges?

**F**airness

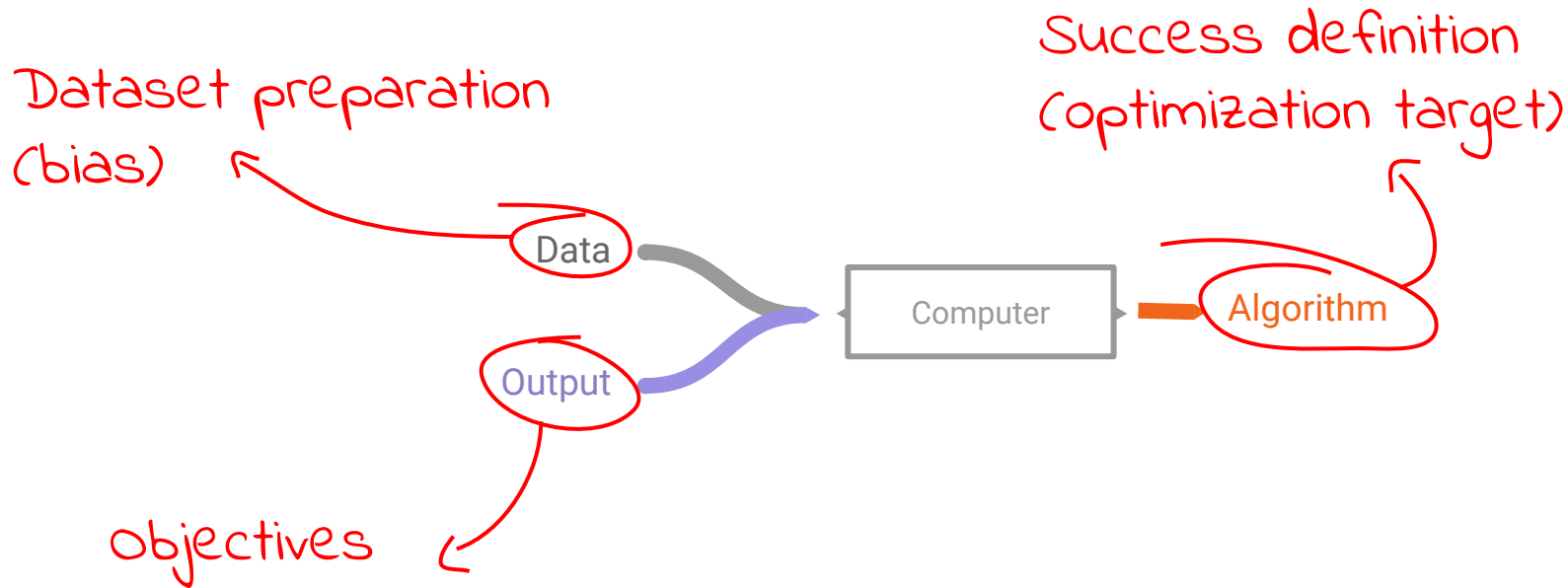
**A**ccountability

**T**ransparency



# ML is influenced by people

even learning our mistakes!



## Success definition

Amazon

# Is Amazon's algorithm cashing in on the Camp Fire by raising the cost of safety equipment?

Sudden and repeated price increases on fire extinguishers, axes and escape ladders sold on Amazon are seemingly linked to increased demand driven by California's Camp Fire



By **MATTHEW CHAPMAN**

Friday 23 November 2018



Credit **Justin Sullivan/Getty Images**

# Bias in ML

## Gender bias

Portuguese English Turkish Detect language ▼

↔

English Portuguese Turkish ▼

Translate

He is a babysitter  
She is a doctor

✕

O bir bebek bakıcısı  
O bir doktor

☆ 📄 🔊 🔗

✍ Suggest an edit

34/5000

English Spanish Turkish Detect language ▼

↔

English Spanish Portuguese ▼

Translate

O bir bebek bakıcısı  
O bir doktor

✕

She's a babysitter  
He is a doctor

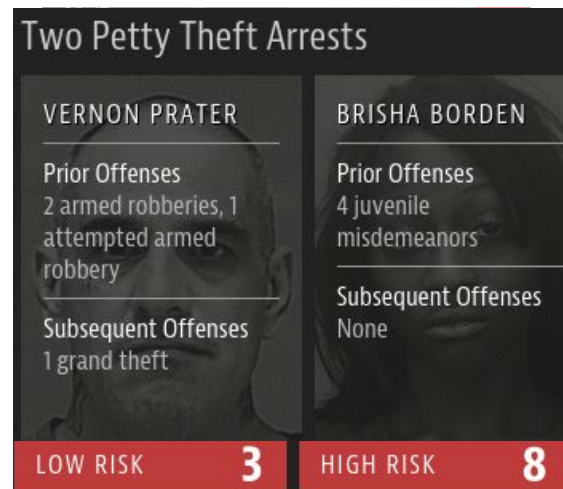
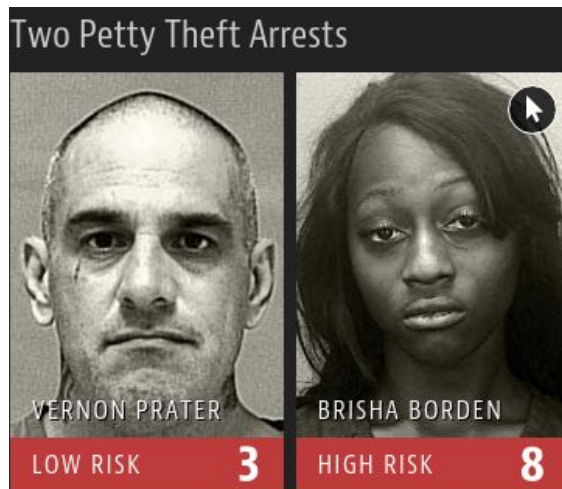
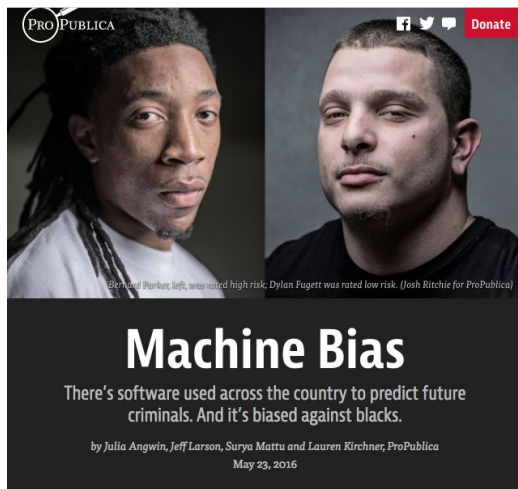
☆ 📄 🔊 🔗

✍ Suggest an edit

33/5000

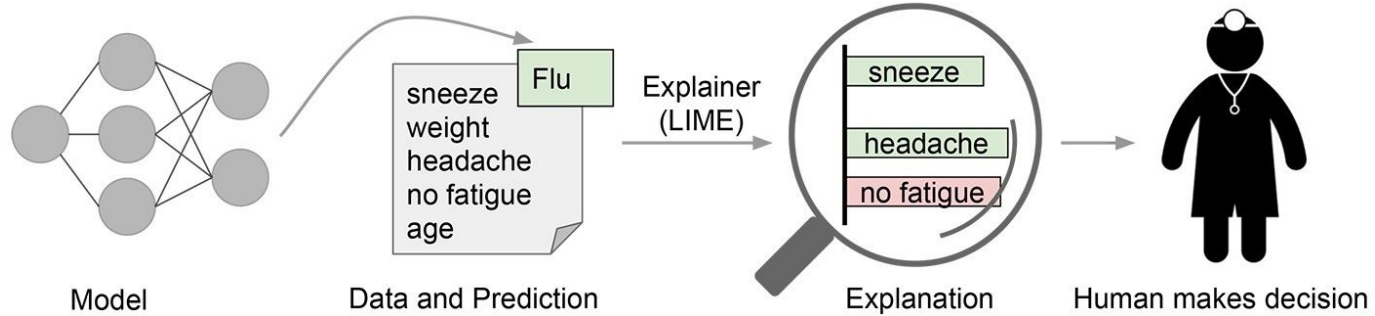
# Bias in ML

## Racial bias

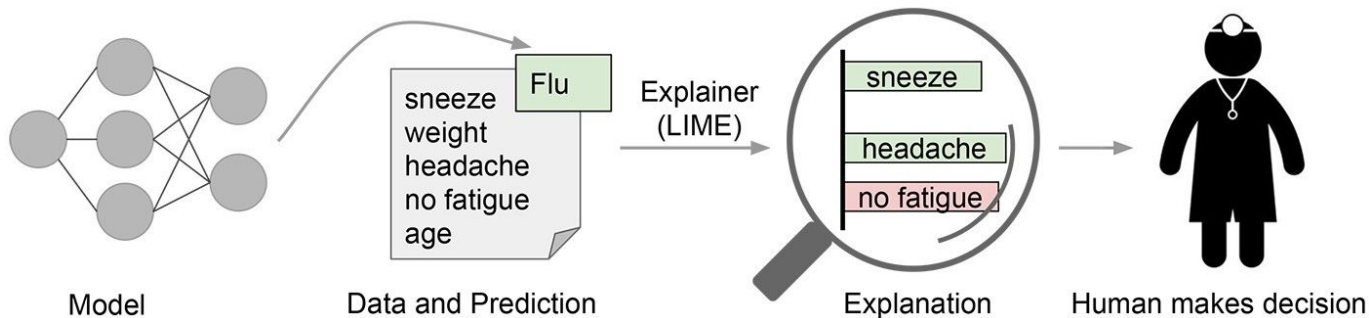


It is not enough to remove the feature! Bias can be indirect.

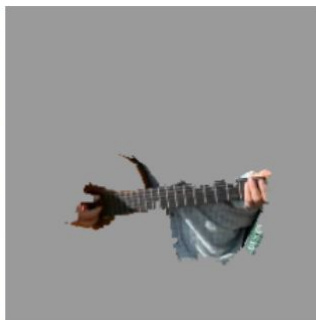
# Transparency



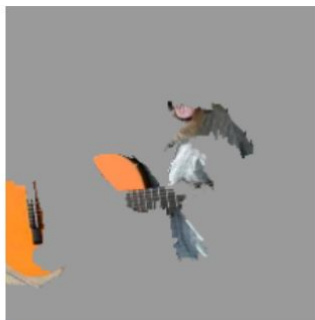
# Transparency



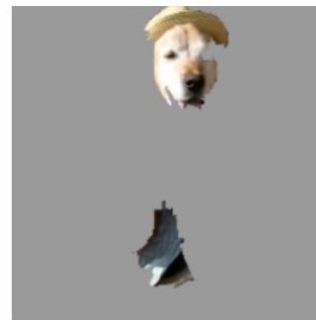
(a) Original Image



(b) Explaining *Electric guitar*



(c) Explaining *Acoustic guitar*



(d) Explaining *Labrador*

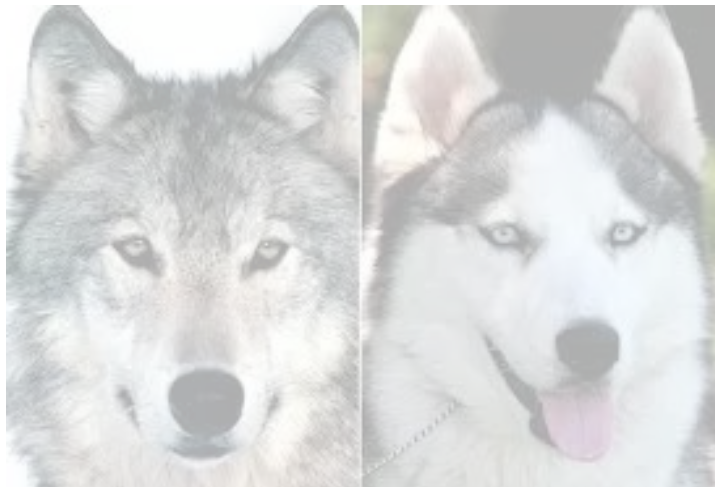
# Transparency



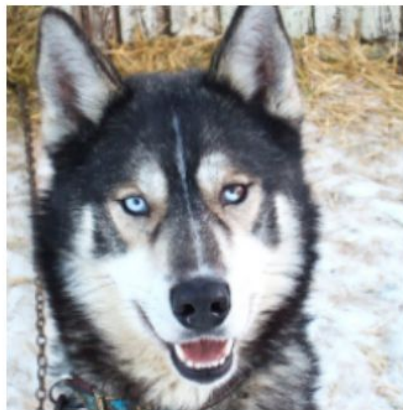
Wolf or Husky?



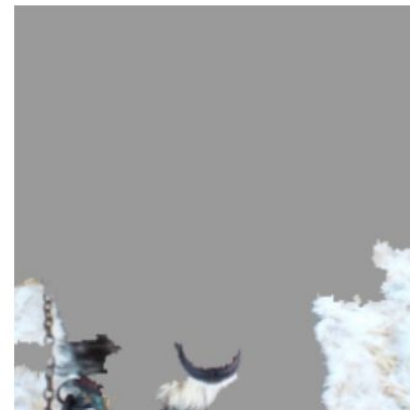
# Transparency



Wolf or Husky?



(a) Husky classified as wolf



(b) Explanation

Grass or Snow?!?!?!?

# What about the challenges?

## Skill shortage

- AI skills gap is the largest barrier to AI adoption (O'Reilly 2018).
- Need for stronger integration between companies and universities.

## Data protection laws

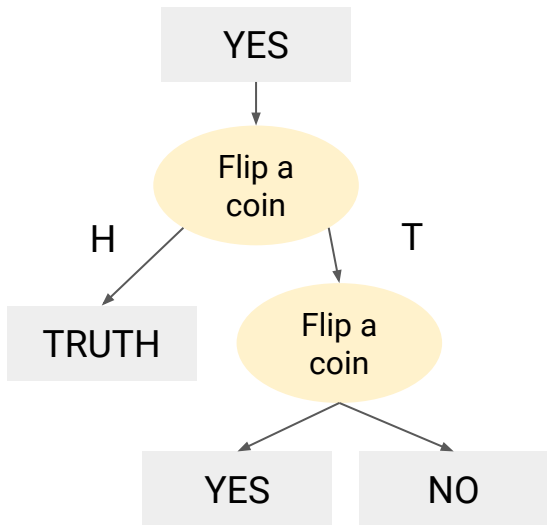
- Until 2020 all companies must be prepared.
- Changes in the way data is stored, processed and used to train Machine Learning models.



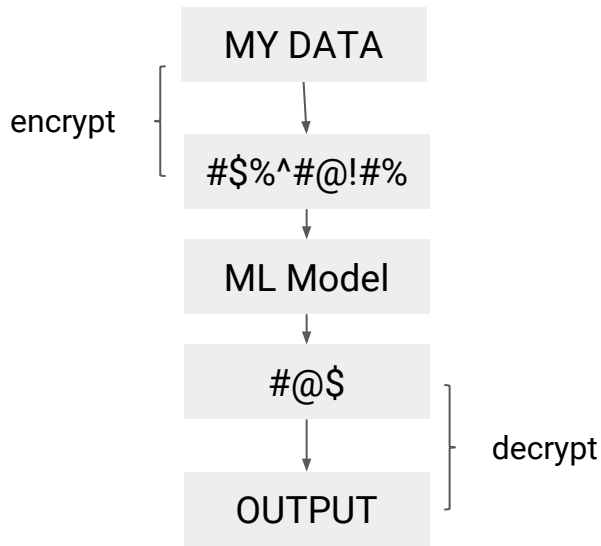
Where is AI headed?

# Privacy

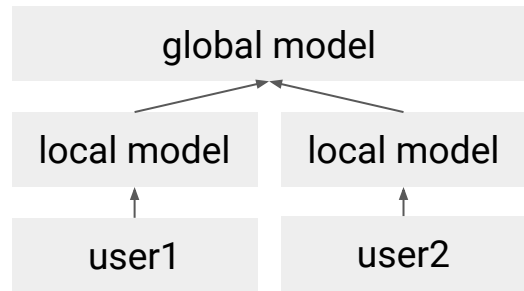
## Differential Privacy



## Homomorphic Encryption



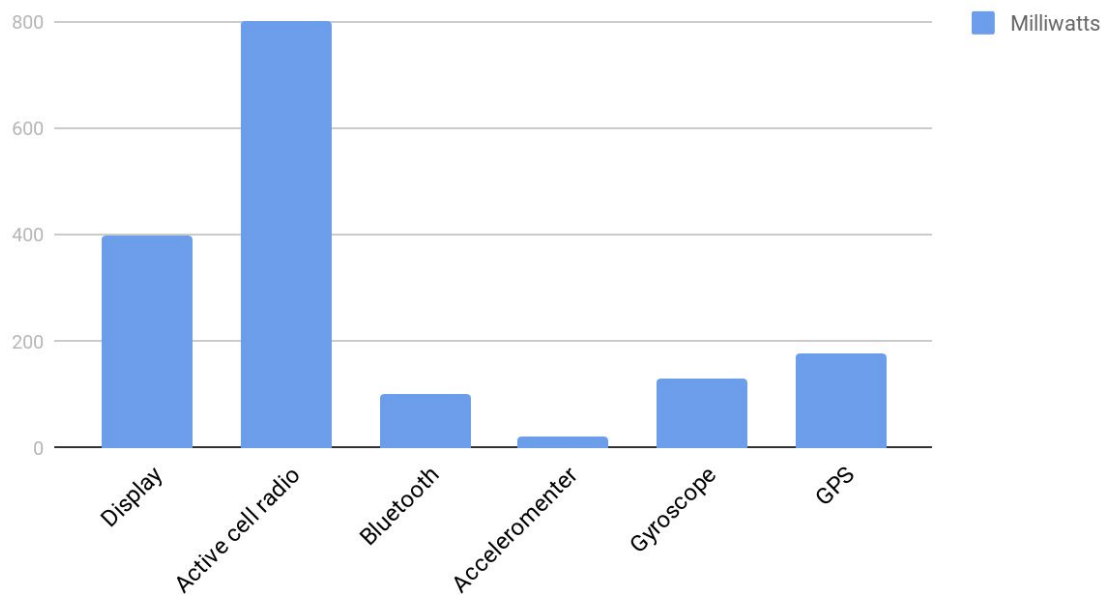
## Federated Learning & Multi-party computation



# The future of ML is 'tiny'

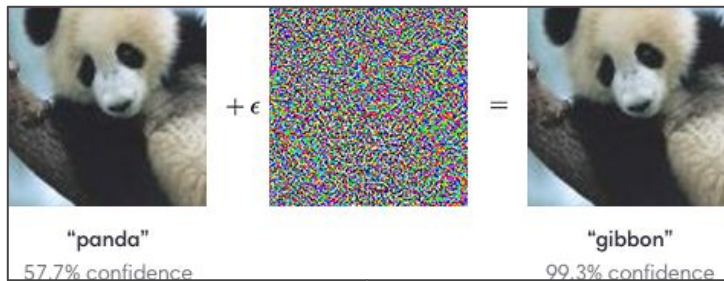
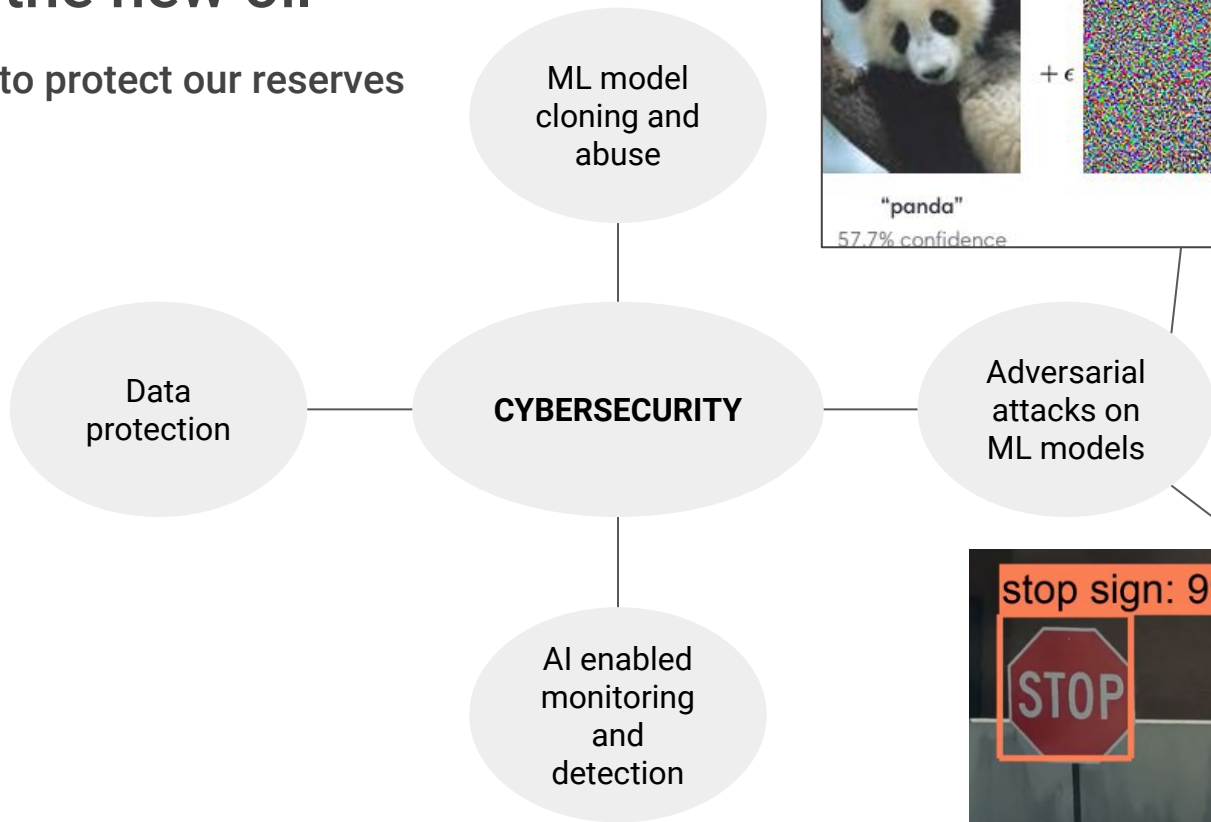
Pete Warden

Smartphone energy consumption



# If data is the new oil

It is important to protect our reserves





”

**Analytics is about impact. In our company [Zynga], if you have brilliant insight and you did great research and no one changes, you get zero credit.**



**Ken Rudin**, Head of Analytics on Facebook



HEKIMA

# FDC - PCBM

Mar | 2019

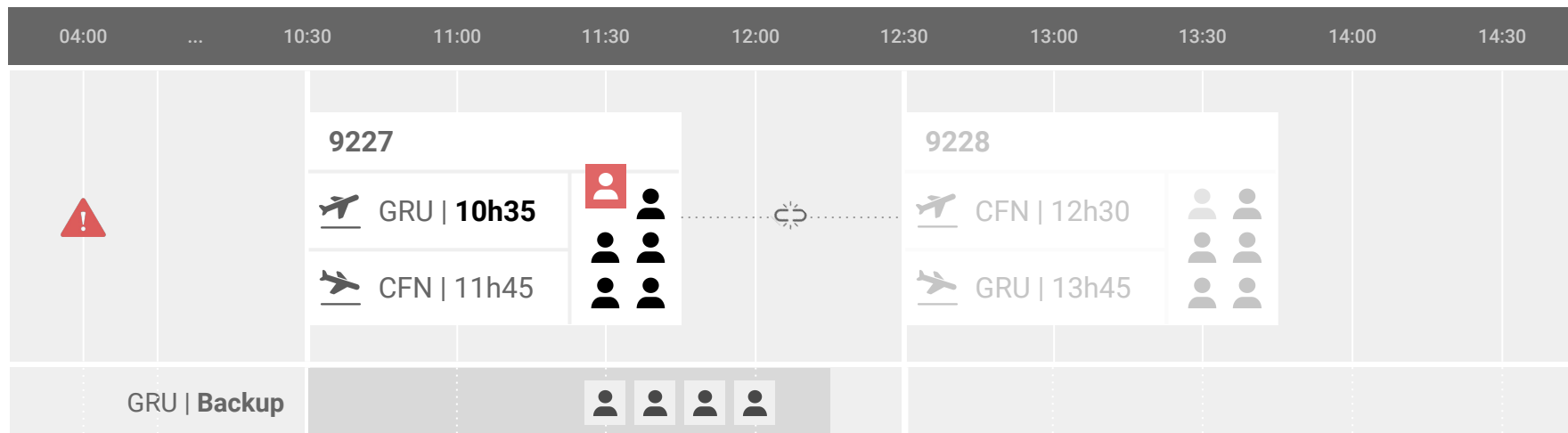
# Flight crew scheduling

## Optimizing scrap mix

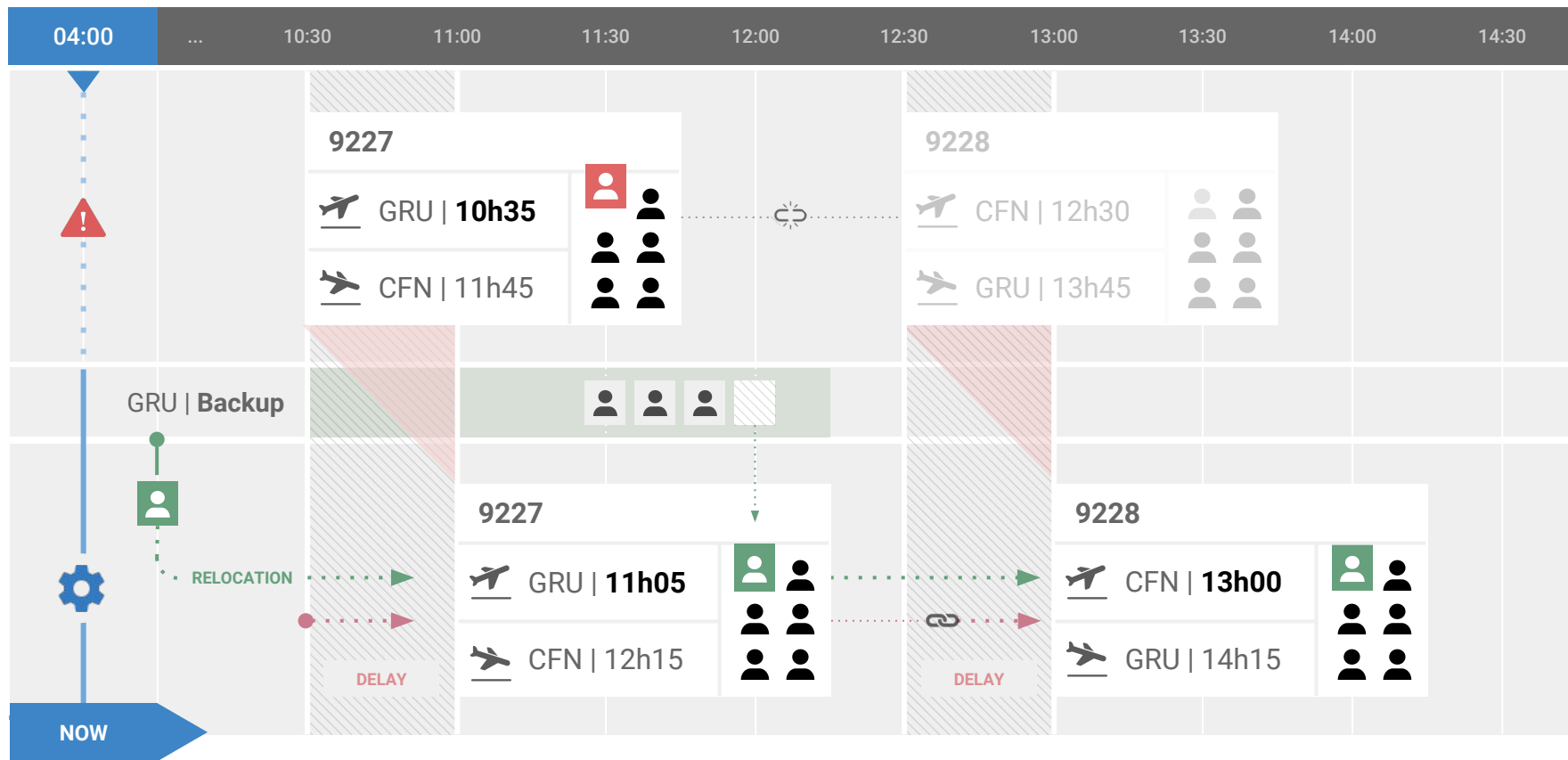
**U\$219<sub>MM</sub>**

expected cost savings in yearly  
brazilian production (2.8% of  
revenue)









”

**I often tell my students not to be misled by the name 'artificial intelligence' - there is nothing artificial about it. AI is made by humans, intended to behave by humans, and, ultimately, to impact humans' lives and human society.**



**Fei Fei Li**, Professor at Stanford University

# Dynamic Pricing

learning how different features impact sales and profits

**42%**

margin increase expected