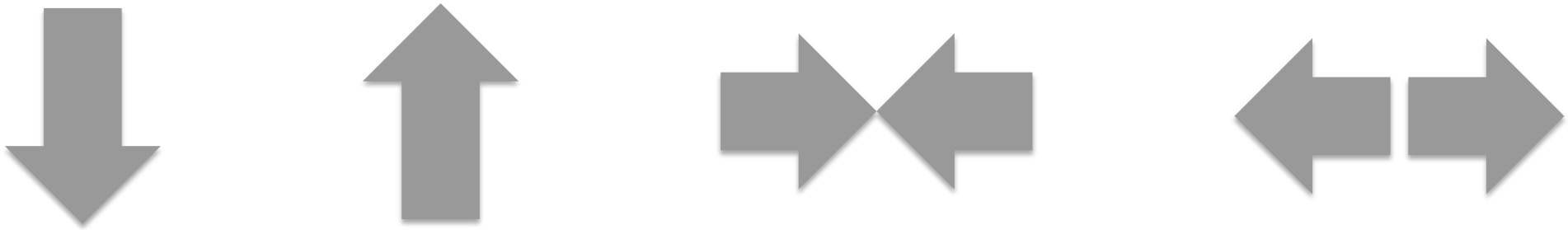
Digital Technologies and Value Creation

Dr. Philippe Blaettchen
Bayes Business School (formerly Cass)

Analytics and organizations

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Analytics and organizations



COST **REVENUE** **RISK** **SCALE**

Context: omni-channel fashion retailer uses analytics for stocking decisions for multiple partially substitutable items in a flexible supply chain with local and outsourced production

Less salvaging and deep markdowns

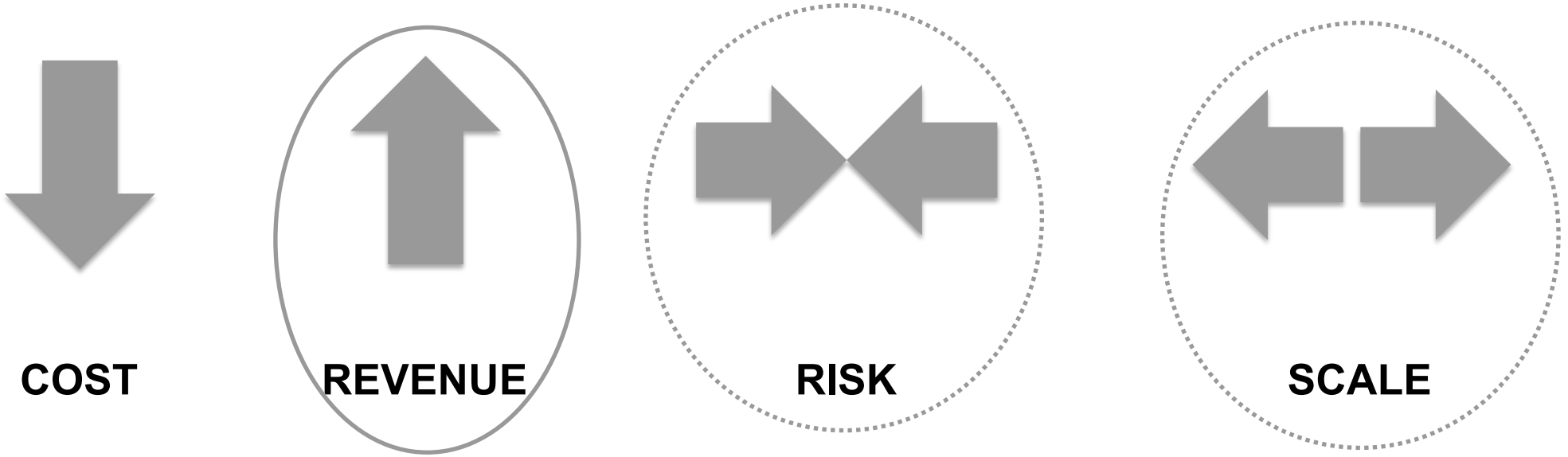
Higher in-stock

Less excess of some items and stock-out of others

Same level of sophistication applied to all items

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

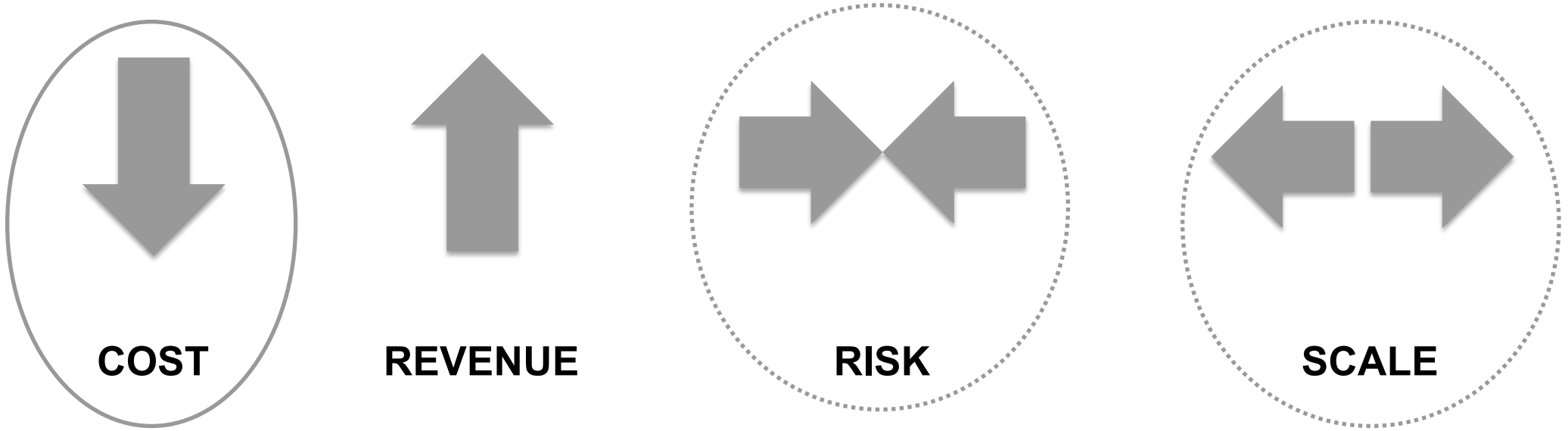
Analytics with an external focus



Key example: Marketing analytics (“MTech”)

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Analytics with an internal focus



Key example: Organizational design using analytics (“People Analytics”)

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Why analytics now?

Ongoing research into Algorithms

Page Rank for Google Search, Deep Learning Algorithms (ANNs, CNNs), Reinforcement Learning, ADMM

Increasing access to Data

1991: Internet
1997: Google
2000s: Home PC
2004: Facebook
2005: YouTube
2007: Iphone
Etc.

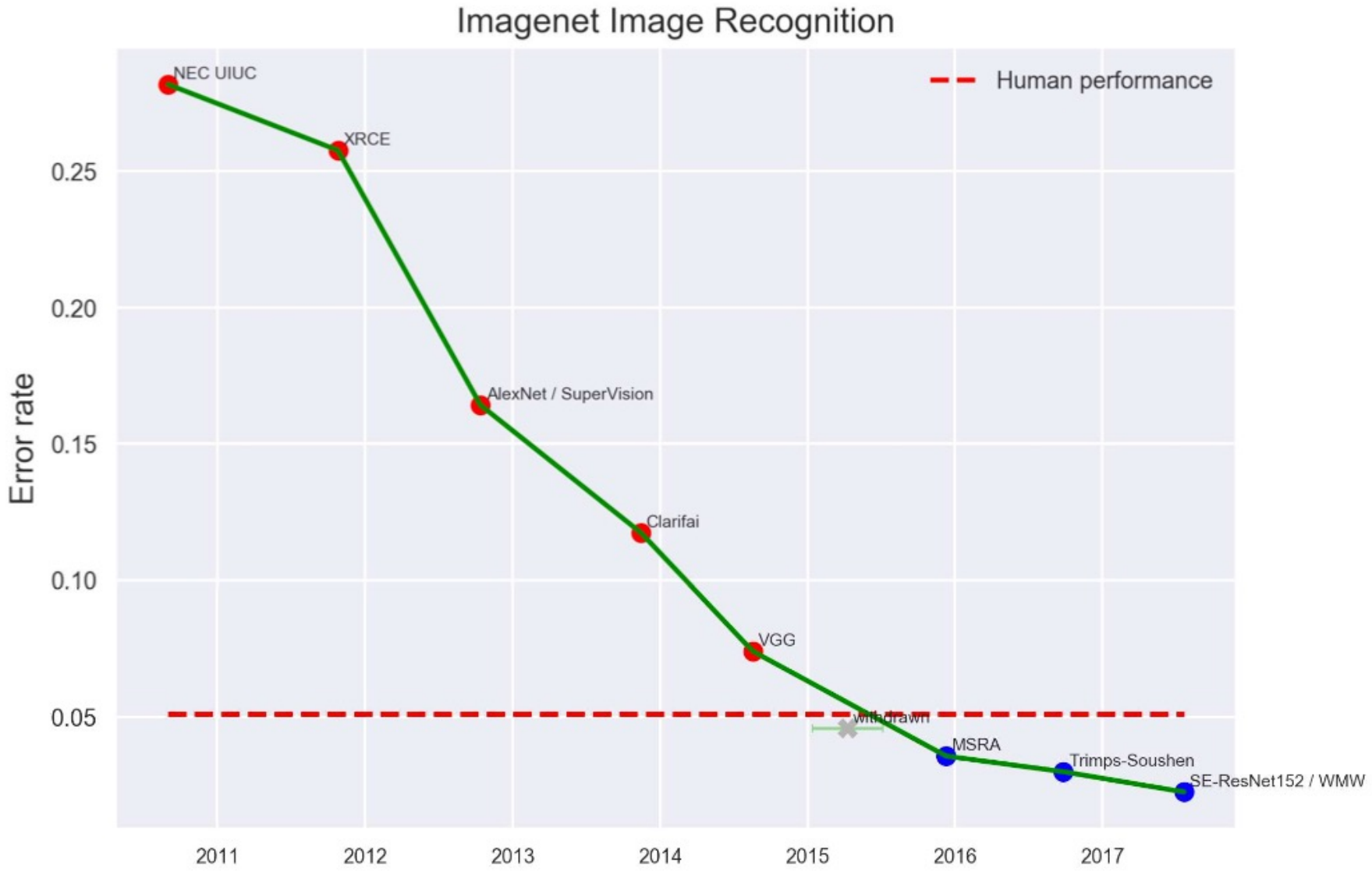
Better computing capabilities

More processors per sq. inch (Moore's law), cloud-based services (storage and computation)

"Perfect storm" for Analytics

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Why analytics now?



BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Why analytics now?

Major opportunities for businesses:

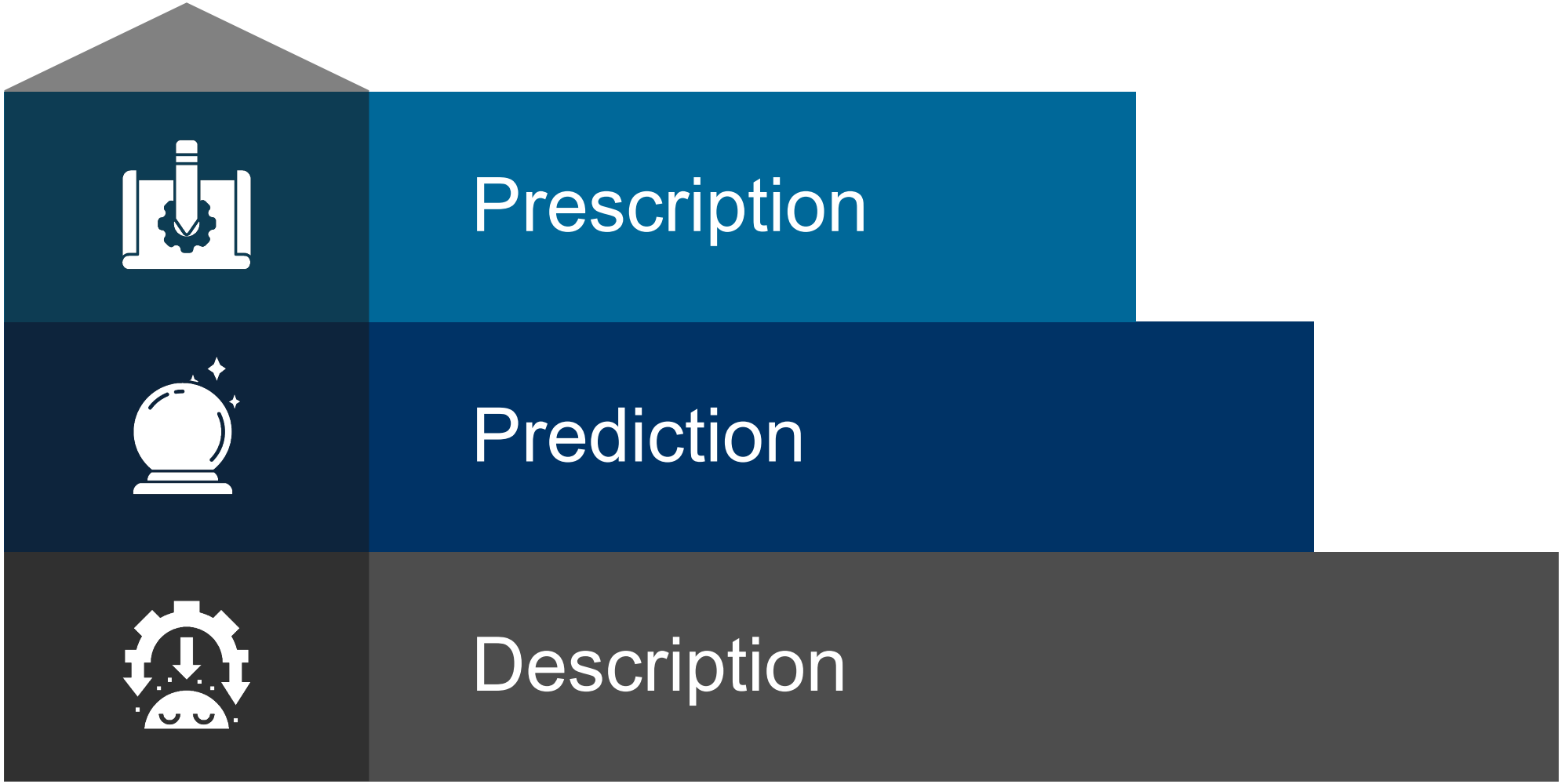
- Personalized services to customers/enhanced customer experience
- Automation of tasks that were previously costly (Forbes, 2018: AI will generate $2.9 trillion in business value and recover 6.2 billion hours of worker productivity by 2021)
- Increased efficiency of processes and tasks

→ **Has led to a lot of hype around the topic**

"*Artificial intelligence is the future, not only for Russia, but for all humankind. It comes with colossal opportunities, but also threats that are difficult to predict. Whoever becomes the leader in this sphere will become the ruler of the world*," Russian President Vladimir Putin said.

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Descriptive, predictive, or prescriptive – where is the value?



BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Learning objectives of the module

https://youtu.be/zs6YbzfMHWA?t=30

Goals: Provide you with the knowledge to

- feel comfortable in any environment where analytics and coding is discussed
- interact with ("speak the same language") as specialists and set you on the path to become one
- be aware of the tools and technologies that allow to extract value from analytics
- identify business opportunities which could use analytics, especially in organizational design and marketing
- know when you're being taken for a ride

How will we do this?

- Hands-on approach to analytics tools and technologies
- Experiencing the whole analytics pipeline
- Coding and practice on various datasets

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Learning objectives of the module

Is this module going to be hard?

- For some of you, it may…
- But, if you work hard, it will also be one of the most rewarding and interesting modules you can take at Bayes:
  Always learn your lectures
  Do the homework regularly
  Practice Python
  Come to office hours if you are still struggling
- I will always find time to help you if you are putting in the effort on your side.

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

General modalities

Lectures:

- Video and exercise material to study **before** class (broken up into digestible bits), mostly to introduce new concepts and tools. I will release videos before the live class on Moodle and update you by email
- Two hours of face-to-face lecture every week during the term. This will be **very interactive**, and you will get plenty of chance to practice your coding and learn-by-doing. This also means that we need to follow a few norms:
  - Please arrive on time – or even a couple of mins ahead of schedule
  - Please only use your computers for the task at hand: no social media (except the one we analyze), no browsing
  - Come prepared to class: lecture learnt, homework done

Tutorials:

- Three tutorials throughout the term, two hours each
- Focused on repeating difficult parts of the previous lecture(s) and going into more depth

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Grading

Group assignments:
- One mid-term project
- One final project

→ Write me an email with your self assigned groups (with everyone in the group in CC)

Homework:
- Individual homework and exercises in most week
- Graded in four weeks

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

About me

- Philippe Blaettchen
  philippe.blaettchen@city.ac.uk

- Lecturer in Management Analytics
- Research and consulting: Sustainability in Supply Chains (food, healthcare in developing countries), traceability and blockchain technology
- German, French
- PhD from INSEAD in Technology and Operations Management
- MS/BS in Industrial Engineering from Karlsruhe Institute of Technology, Germany

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Office hours

- Once a week, two hours (details on Moodle)
- Strictly FCFS
- Feel free to stay around and listen to other students' questions. Also, helping each other out is strongly encouraged
- I expect you to have carefully revised the materials beforehand

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Learning objectives of today

Goals: Understand the general outlay of the course

- What are the tools and technologies used to create value with business analytics?
- Where do we get our data from?
- How is business analytics used by firms in practice?

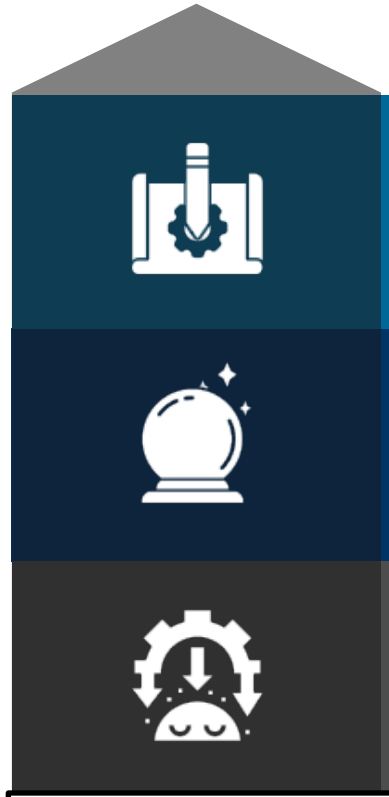
How will we do this?

- We start by characterizing business analytics activities and linking activities to technologies
- We then discuss the increasing availability of data and how we can harness it
- Finally, we introduce Organizational Analytics, MarTech, and Social Media Analytics as our playground for the rest of the class

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Digital technologies for analytics

The tools for analytics in practice



Prescription

Experimentation, optimization

Prediction

Machine learning: supervised, unsupervised

Description

Statistics, Hypothesis testing, Regression, Field-specific measurements, Visualization

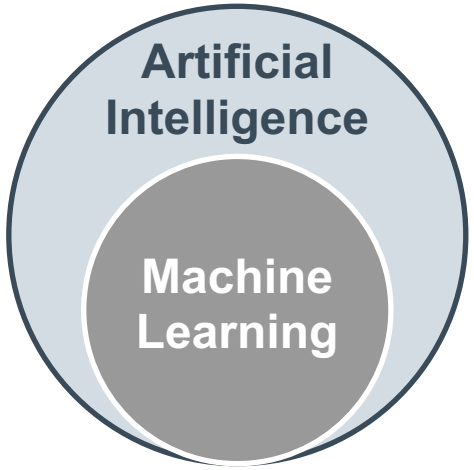
Building a solid foundation: Gathering data (internally, externally), cleaning, pre-processing

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

ML vs. AI

Machine Learning (ML):
Well-defined concept. Set of algorithms (i.e., procedures) that take data as an input and learn patterns or predictions from this data without being told explicitly how to build these patterns or predictions.

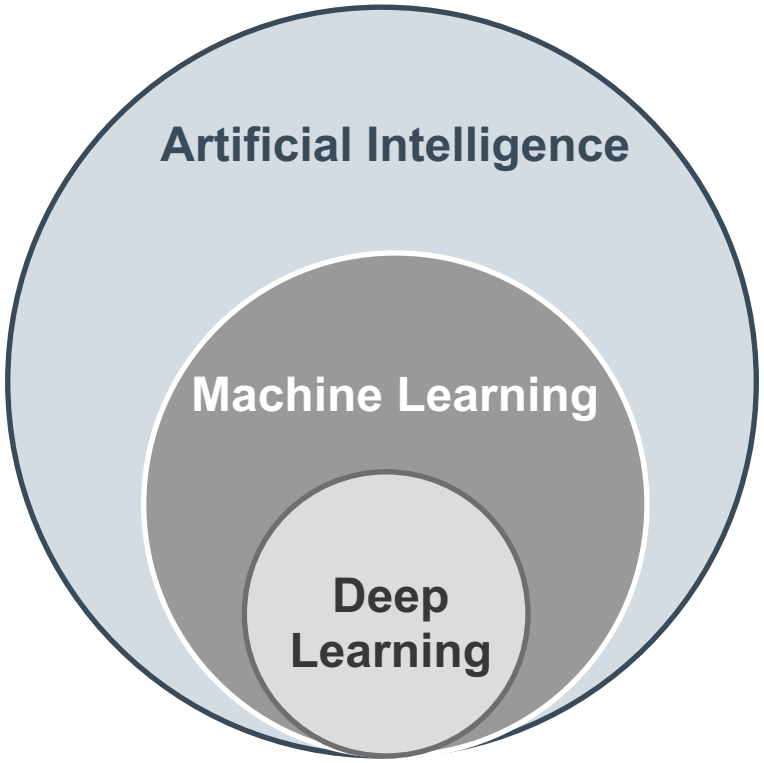
Artificial Intelligence (AI):
Not as clear. Typically set of tasks performed by a computer that are commonly associated with intelligent beings (includes interaction with environment and making decisions to maximize goals)



BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

And what about Deep Learning?

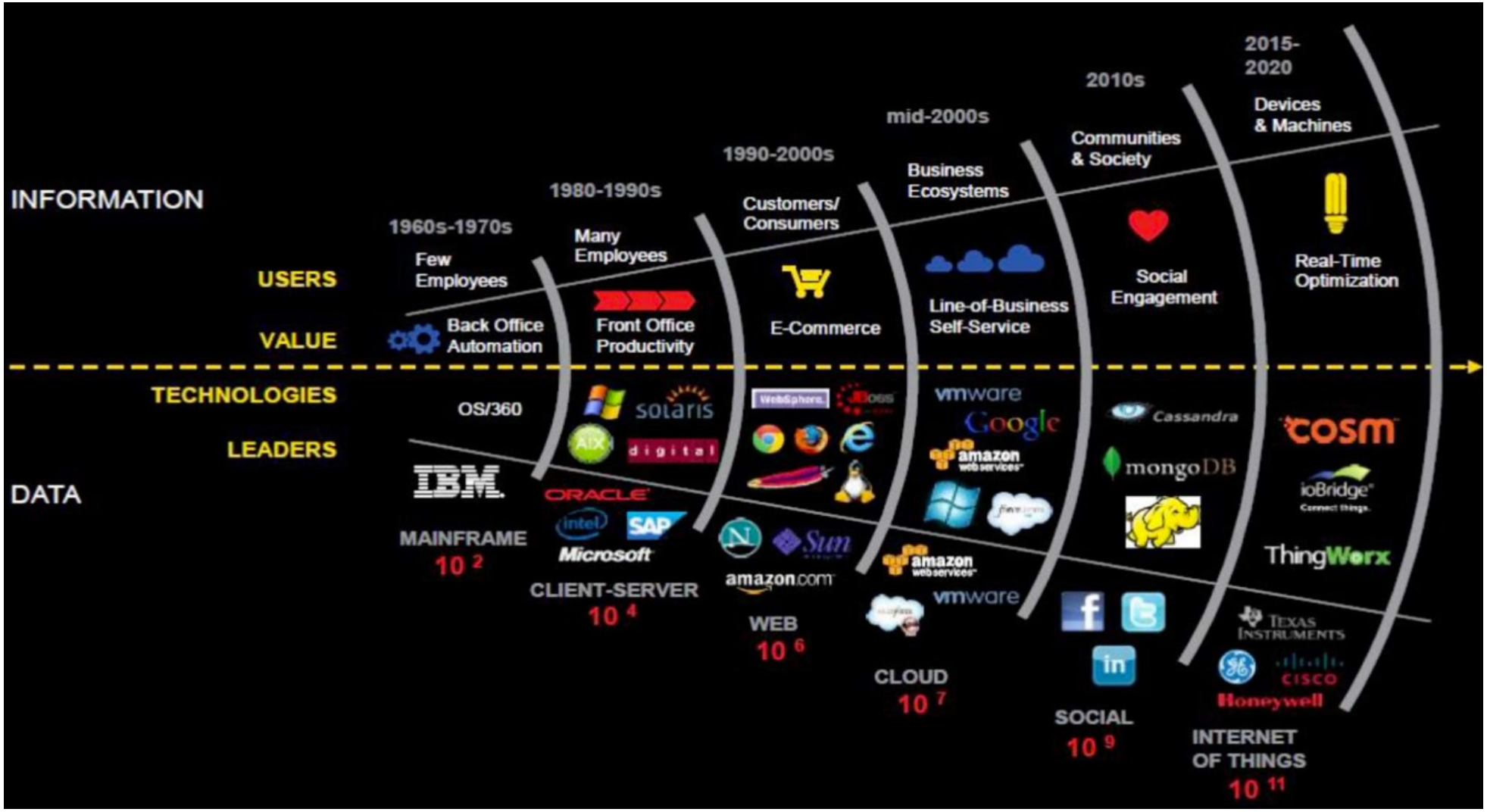
Deep Learning:
Set of techniques for supervised machine learning. Involves fitting neural networks to input data to predict an output variable.
[See Term 2]



BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Data, data, data

What makes data “Big”? 3Vs: Volume, Variety, Velocity



BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Big Data vs. Smart Data

Smart data is:

- Data that is right for the decision → **data engineering**
- Supports (and is supported by) analytics, expertise, and machines → **data analytics**
- Hits your key business drivers: customer acquisition, loyalty, growth, risk optimization, etc. → **business expertise**

Potential data sources are endless…

From within the organization
- Sensors in factories and offices
- Bookkeeping and accounting
- Slack, Emails
- Website traffic
- Customer data
- …

From outside the organization
- Competitive intelligence: reports, statements
- Social media: Google, Twitter, Instagram, Facebook, Glassdoor, LinkedIn, …
- Consumer studies
- …

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

And once we collected the data?

“Data scientists spend 80% of their time cleaning a dataset and only 20% of their time analyzing it.”

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

People Analytics and Org 2.0

The universal problem of organizing

Source: Puranam & Clement (2020)

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Organization Design & Development Issues

Individual Level

- ✓ Executive assessment
- ✓ Executive Search
- ✓ Executive Pay
- ✓ Employer Branding
- ✓ Onboarding
- ✓ Talent Acquisition
- ✓ Employee engagement
- ✓ Talent Management
- ✓ Leadership Development
- ✓ Compensation Design
- ✓ Communication Management

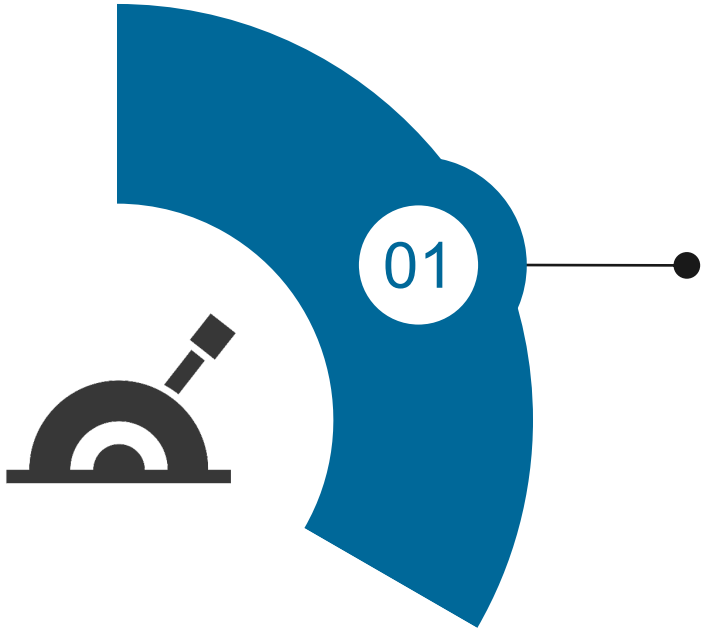
Group Level

- ✓ Organization Design
- ✓ Measures and Incentive systems
- ✓ Design Effectiveness
- ✓ Organization Diagnostics
- ✓ Performance Improvement
- ✓ Change management
- ✓ Strategy Execution
- ✓ Culture Management
- ✓ Post-Merger and Acquisition

Source: Puranam & Clement (2020)

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

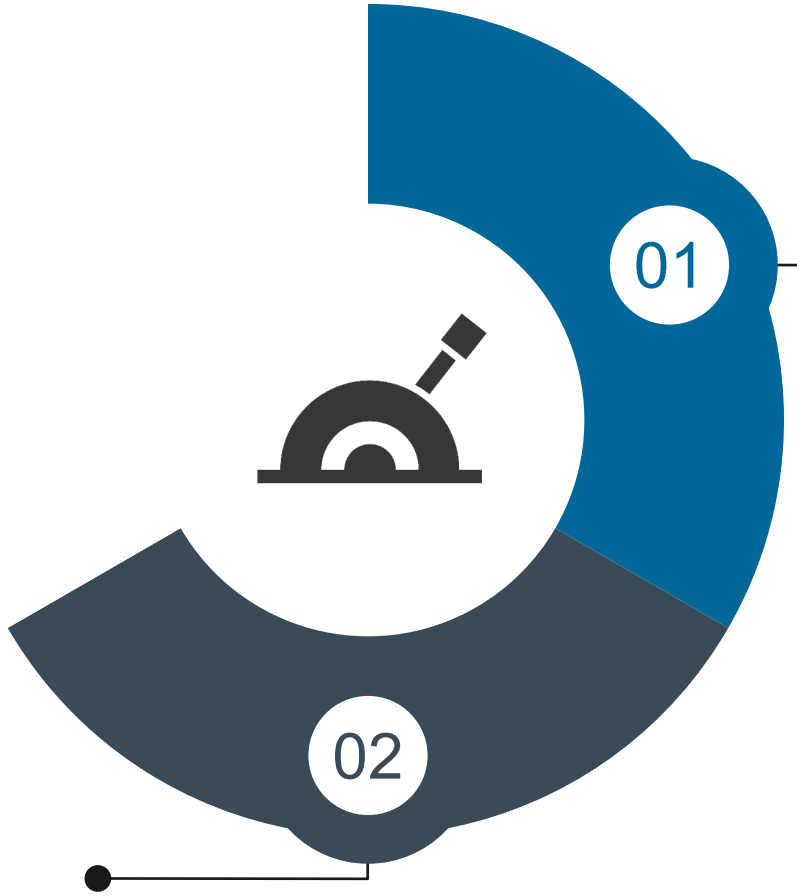
Three levers of organization design



Structuring
(e.g. authority, incentives)

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Three levers of organization design



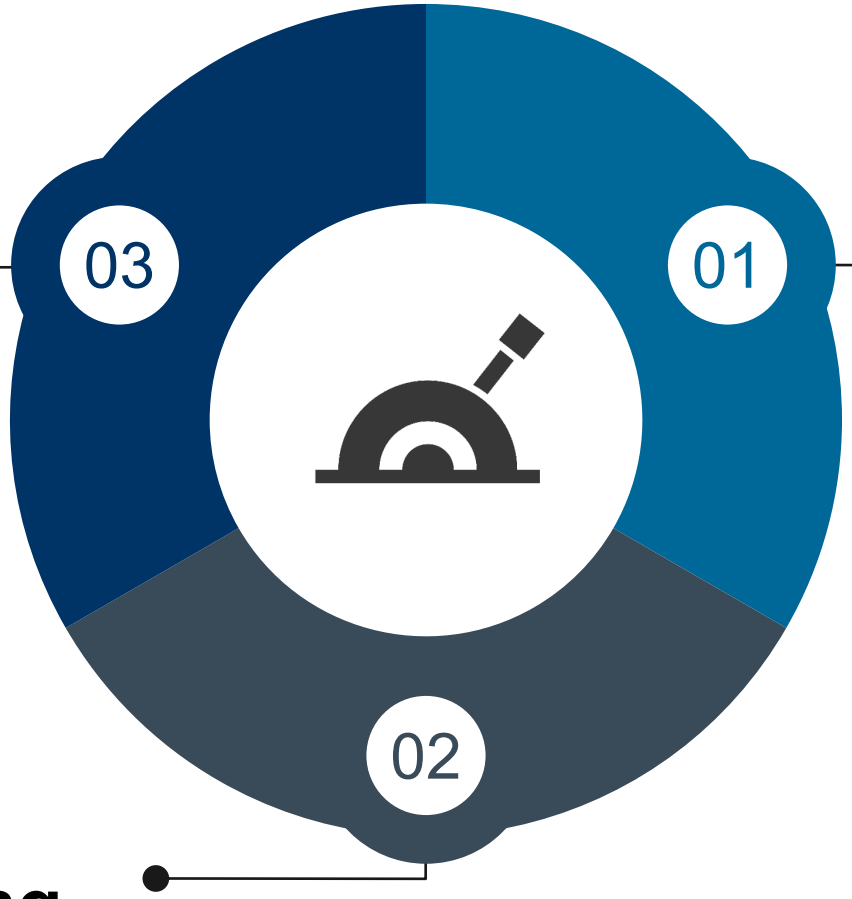
Structuring
(e.g. authority, incentives)

Sorting
(e.g. selection, retention)

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Three levers of organization design

Sensemaking
(e.g. vision, leadership, culture)



Structuring
(e.g. authority, incentives, grouping)

Sorting
(e.g. selection, retention)

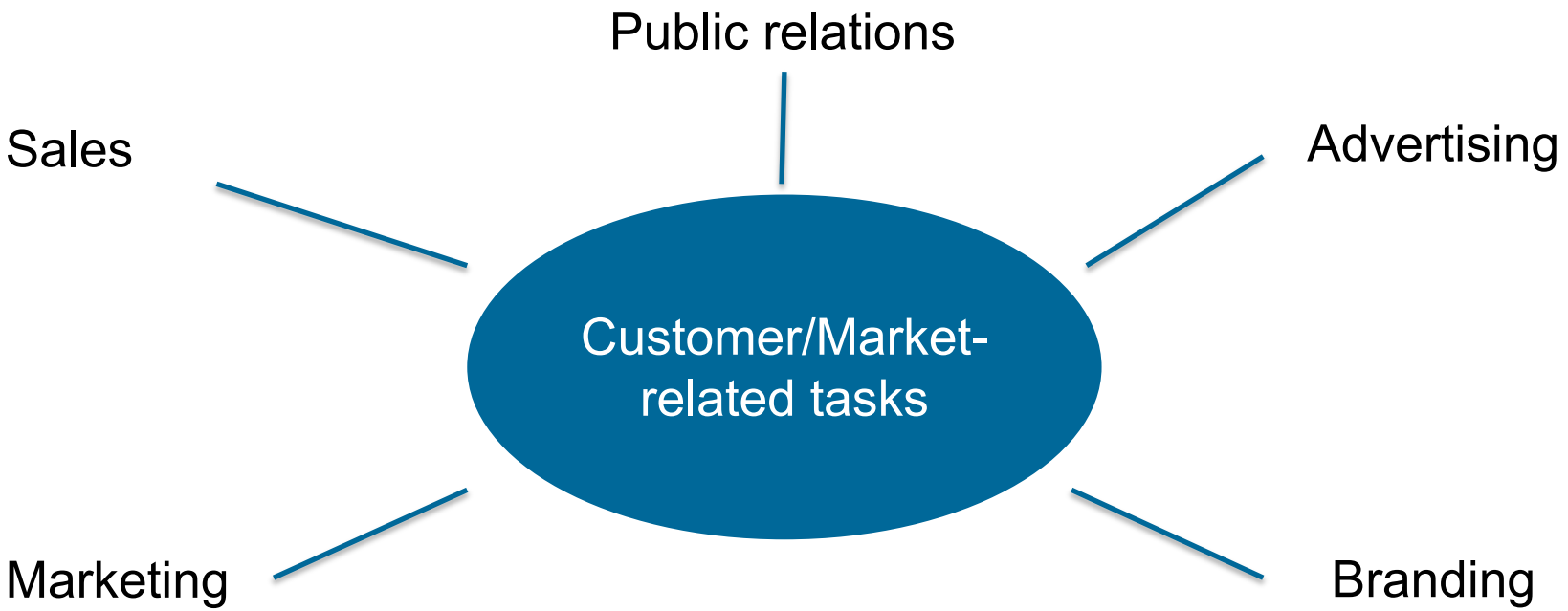
BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Analytics in Marketing / MarTech

Marketing: sometimes difficult to define

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Marketing: sometimes difficult to define



But: as the focus is more and more on data and quantitative analysis, these distinctions are becoming less important!

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Marketing: a more global definition

"The art and science of capturing the value created by our products and services"

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

So, what is marketing analytics?

"Building models of seller and buyer preferences to make predictions about future marketplace behaviors, and to use these predictions to optimize a firm's offering"

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

So, what is marketing analytics?

"Building models of **seller and buyer preferences** to make predictions about future marketplace behaviors, and to use these predictions to optimize a firm's offering"

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

So, what is marketing analytics?

Source: Dilbert (2000)

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

So, what is marketing analytics?

"Building models of seller and buyer preferences to make predictions about future marketplace behaviors, and to use these predictions to **optimize a firm's offering**"

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

A fundamental measurement issue

"Building models of seller and **buyer preferences** to make predictions about future marketplace behaviors, and to use these predictions to optimize a firm's offering"

→ How do we measure preferences?

The old world

- Customer surveys (live, phone, mail, online, etc.)
- Choice experiments

The new world

- Revealed preferences observed in (big) data
- Low-cost field experiments on websites
- Social media information

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Finally, marketing technology (MarTech)

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

What is MarTech (sometimes also MTech)?

Technology (esp. software) solutions that focus on

- **Marketing analytics**
- Customer experience
- Marketing attribution
- Content and content management
- Email marketing
- Marketing management

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Social Media Analytics

What is Social Media Analytics?

"The art and science of extracting **valuable hidden insights**
from vast amounts of semistructured and unstructured **social media data**
to enable **informed and insightful decision making**"

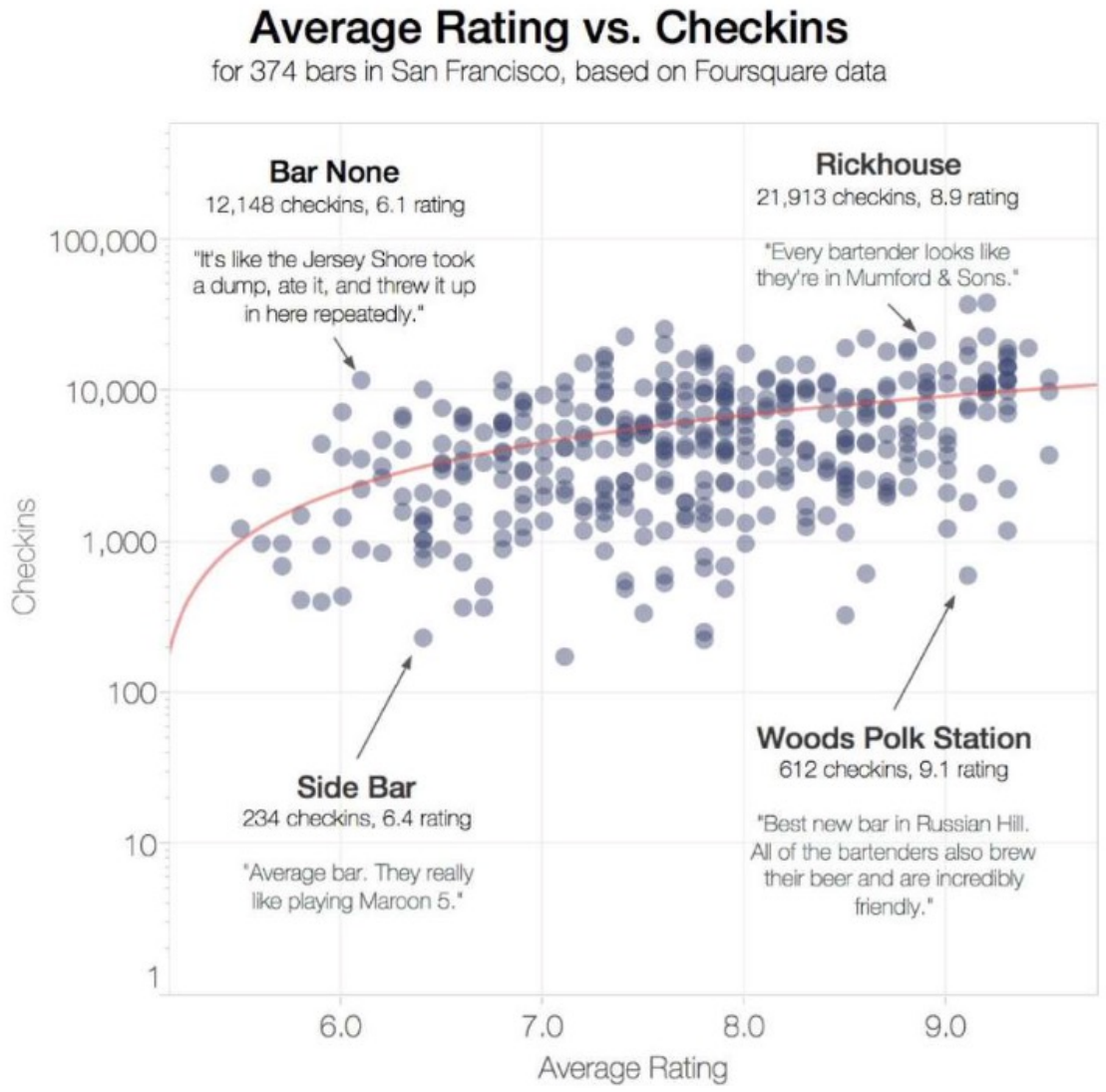
BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

CUTTING OUT THE MIDDLEMAN

Source: Nguyen (nd)

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

How to find the perfect Happy Hour spot with data?



Source: https://www.linkedin.com/pulse/how-find-perfect-happy-hour-spot-data-sohan-murthy

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

How would you predict the success of a new movie with data?

Features	Adjusted R^2	p-Value
Average weekly tweet-rate	0.80	3.65e-09
Average daily tweet-rate	0.93	5.27e-09
Average daily tweet-rate + theaters count	0.97	9.14e-12

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

What is Social Media Analytics?

"The art and science of extracting valuable hidden insights
from vast amounts of semistructured and **unstructured** social media data
to enable informed and insightful decision making"

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

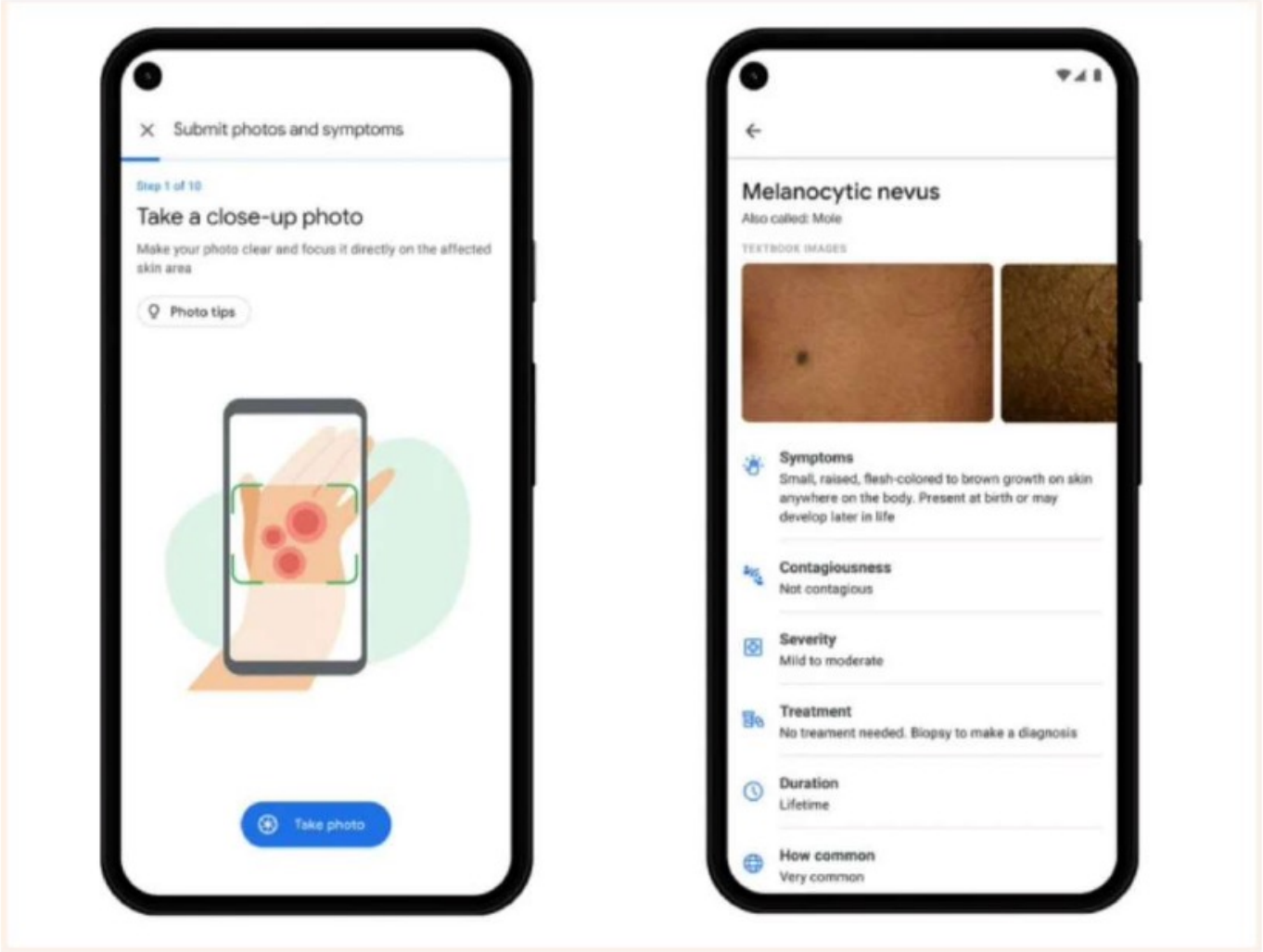
Healthcare meets Analytics

X-Ray

Coughing sound

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Google – Derm Assist



Source: https://www.ft.com/content/6d4cd446-2243-43f4-befd-565b4e880811

BAYES BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Harnessing unstructured data – a supporting function

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON

Module overview

Overview – subject to change

Overarching theme	Week	
Introduction	1	Introduction to analytics applications and coding basics
Gathering data	2	Scraping web data
Gathering data / descriptive analytics	3	Data pre-processing and descriptive analytics
Gathering data / descriptive analytics	4	Descriptives in marketing analytics, and using social media APIs
Descriptive analytics	5	Descriptives in people analytics
NO LECTURE	6	NO LECTURE
Predictive analytics	7	Retaining employees and customers
Predictive analytics	8	Valuing a (social media) customer base
Predictive analytics	9	Segmenting customers and positioning products
Prescriptive analytics	10	Optimizing products and organizations
Prescriptive analytics	11	A/B-testing in practice

BAYES
BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON


See you in class!