# Artificial Intelligence for Business Value

greatlearning
Learning for Life

# What is this talk about? (and what it is not!)

***What is this talk about:***

- Understand how business decisions are made and the relevance of AI / ML
- Understand the basics of Artificial Intelligence and its relevance in business context
- Discuss industry applications of AI / ML

***What this talk is not:***

- Does not deal with cost-benefit analysis of use cases
- Does not cover moral, ethical dimensions of applications
- Does not cover any math behind the techniques

***How delivered:*** I am going to put myself in your shoes, ask & answer key questions that you might have in your mind as you embark on this course!

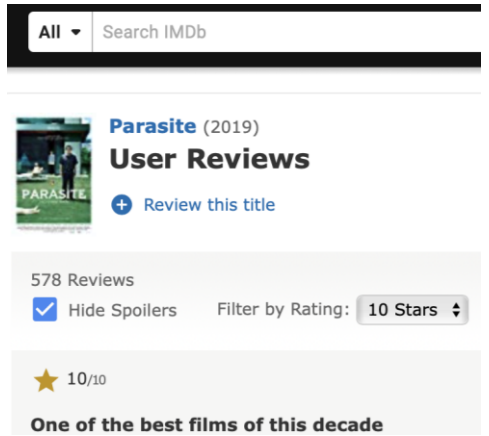
Q1: What is the motivation for us to understand Data Science, AI & ML?

# AI/ML is all around us: Movies at the Theatre (An Example)


Open a movie app to book a ticket


Watch a movie in theatre

Snacks during the break




Write a review about the movie

Recommendation Engine based on Collaborative Filtering

Self driving car

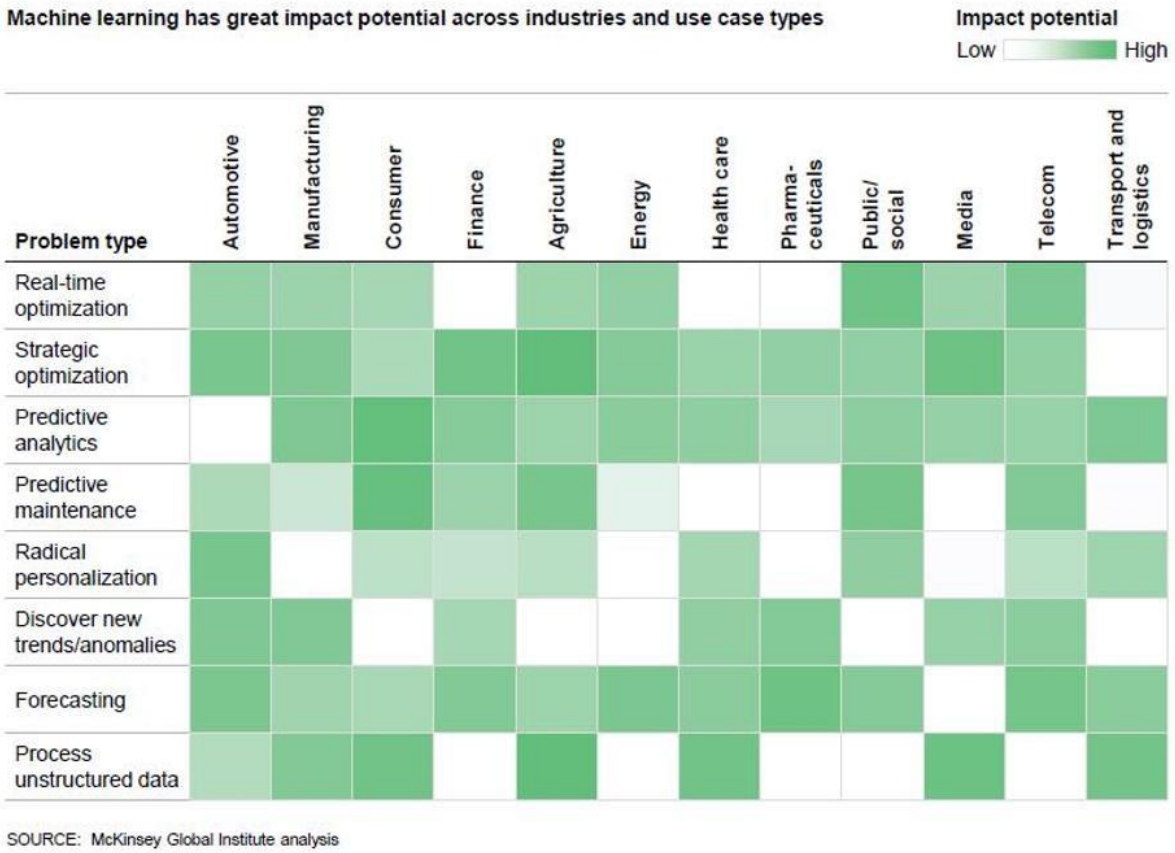
Predicting box office sales based on star value, buzz etc.

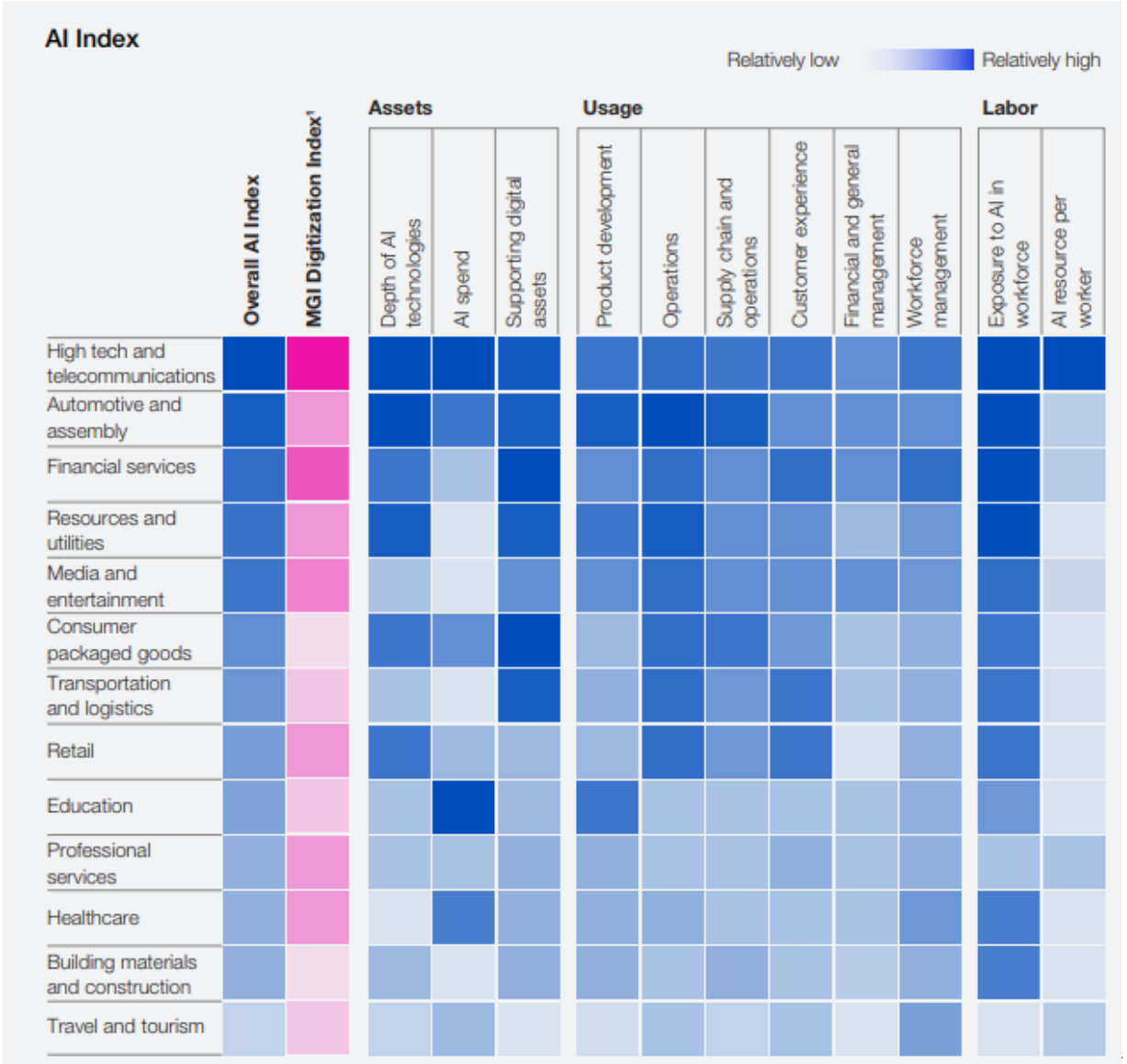
Forecasting product sales based on historical trends

Text Analytics to identify sentiments, emotions, likes & dislikes etc.

**AI / ML Applications**

# There is increasing use of AI/ML across industries = Rewarding Career




https://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/an-executives-guide-to-ai

# But getting true business value needs (lot) more work…

Stacked Ensemble has an accuracy of 97% without overfitting

DL Network with 25 hidden layers beat the existing benchmarks

Business Value?? Not so sure

Do they understand the business complexity, the context?

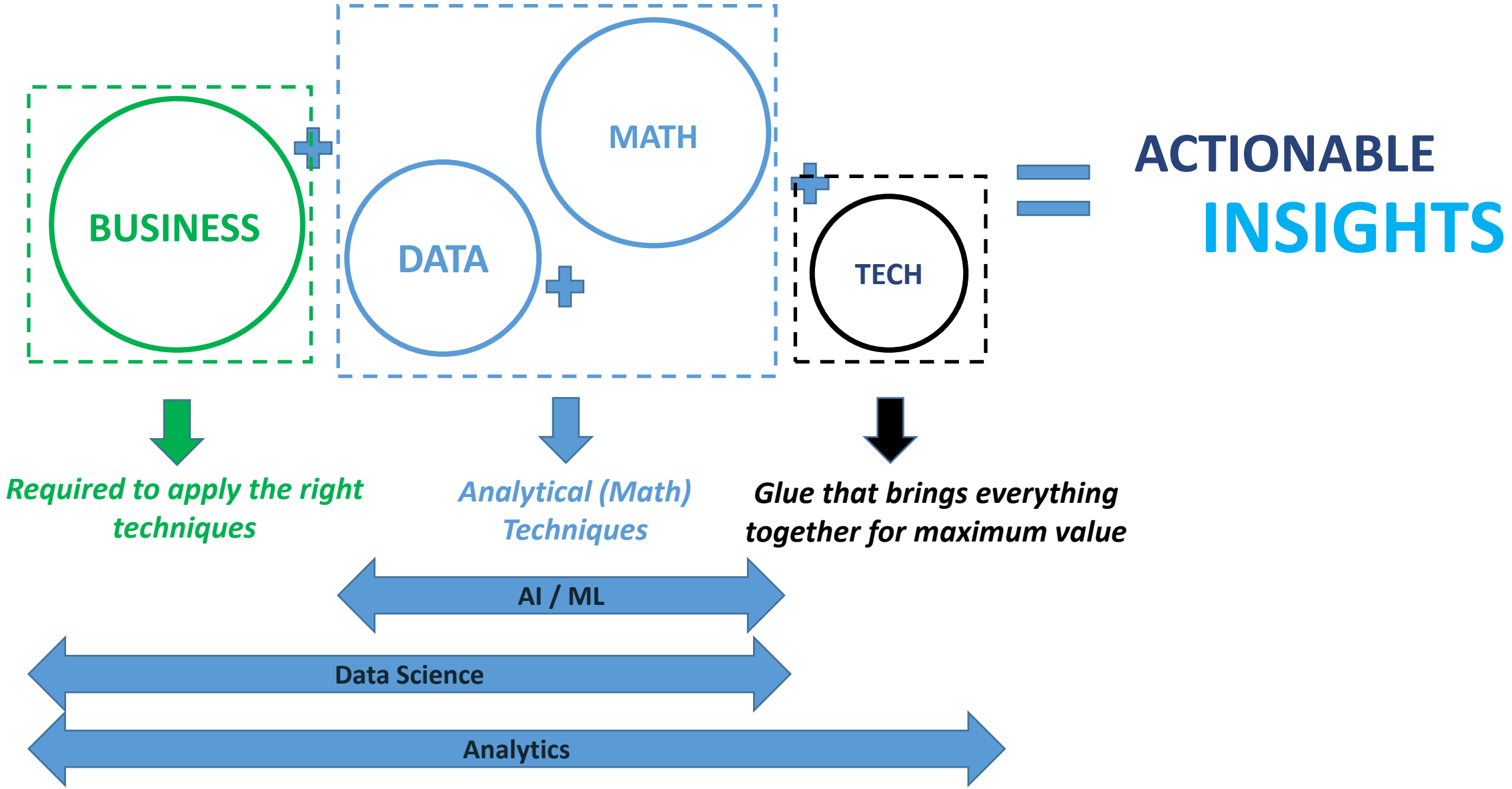
**Data Science (AI/ML) is powerful but there exists a divide**

**Data Scientists**

**Business Decision Maker**

Q2: Before getting into the details, can you show me the simplest possible picture to understand Analytics and its relationship to AI / ML?

# Analytics is a tool to solve business problems…



Q3. To start with, can we understand what is Artificial Intelligence? How are AI & ML related?

# First, let's try to understand categories of Human Intelligence

**Intelligence exhibited by this person**

1. Perceive the world, detect signals and collect data
2. Make sense of the world using data (Inference)
3. Decide on the next course of action
4. Act in the Real World

# What is Artificial Intelligence?

Artificial Intelligence refers to the theory and development of computer systems & machines with the ability to perform tasks normally requiring human intelligence

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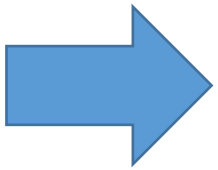
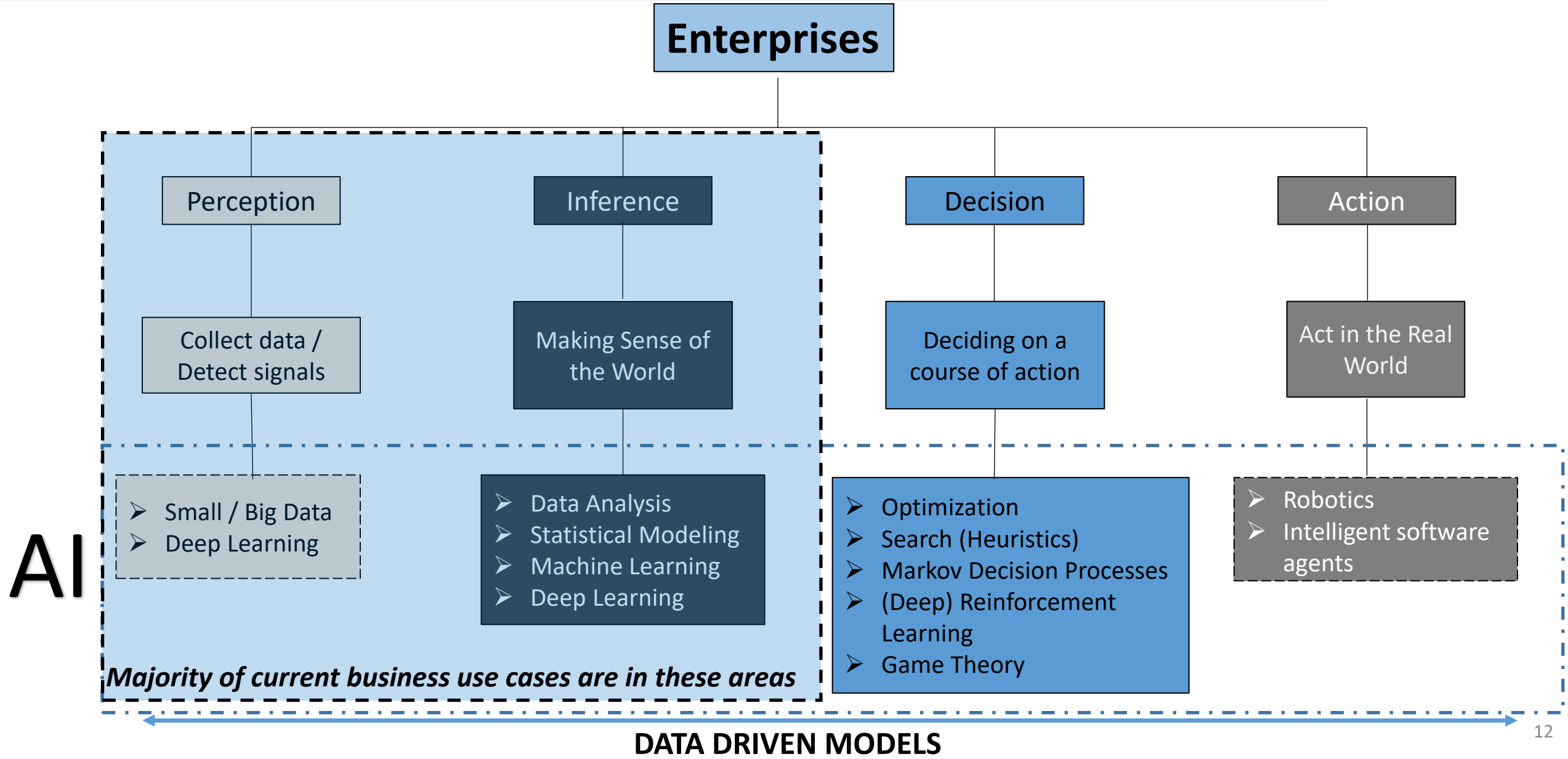
## Main Categories of Human Intelligence

1. PERCEPTION
2. INFERENCE
3. DECISION
4. ACTION



We get our computers to do any or some or all of these tasks by embedding AI into our software programs

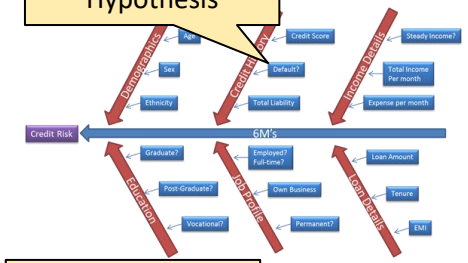
# Why is AI relevant for business enterprises?



# Machine Learning Pipeline – Subset of AI

1 Hypothesis Generation

Formulate Hypothesis

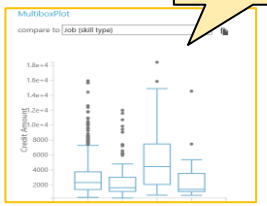



2 Gather Data

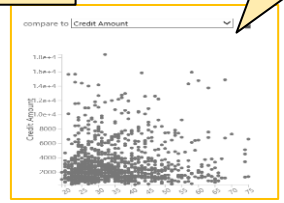
Input Data


3 Exploratory Analysis

Uni-variate Analysis

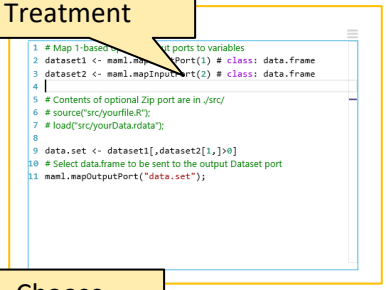



Bi-variate Analysis

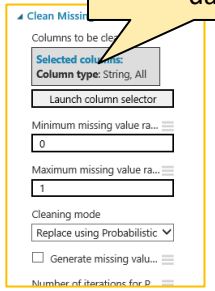



4 Pre-Processing

Outlier Analysis & Treatment

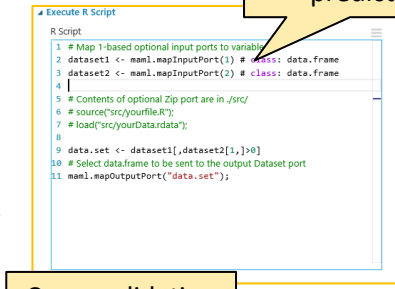



Clean Missing data



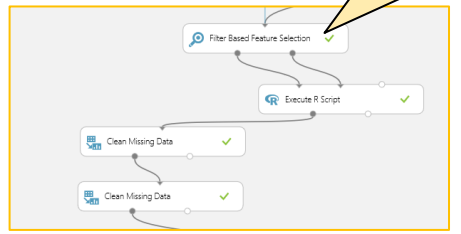

5 Feature Engineering

Generate new predictors



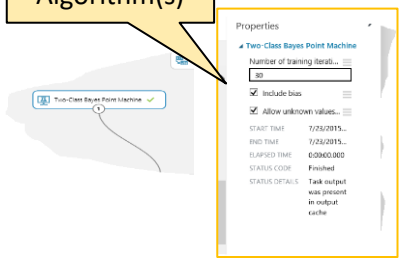

6 Feature Selection

Select final set of predictors



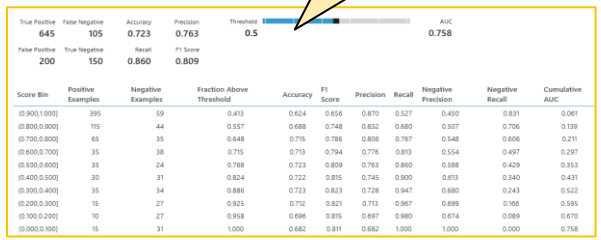

7 Algorithm & Ensembles

Choose Algorithm(s)



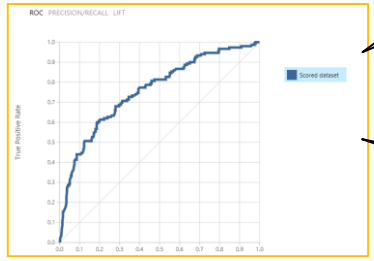

8 Tune Hyper-model Parameters

Cross-validation




9 Output Evaluation

AUC: 0.758




Reduce Bias & Variance

***MANY USE CASES IN THE INDUSTRY ARE BASED ON THIS PIPELINE…***

Q4: What are the broad categories of decisions taken in organizations and how are these decisions made?

# On a daily basis organizations take hundreds of decisions…

Should I acquire Company A?

What revenue guidance should I give my investors?

What price should I set for my product?

How do I increase checkouts on my ecommerce website?

What campaigns should I run? How much should I spend on those campaigns?

How do I increase manufacturing throughput?

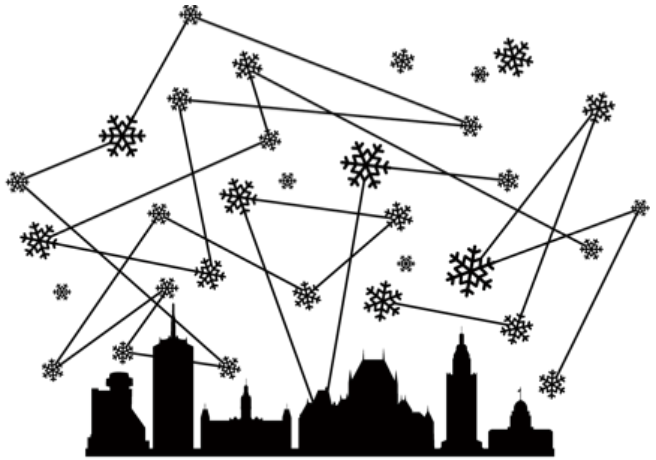
Should I hire this person or not?

What offers should I give my customers?

How do I comply with regulatory requirements?

# Business Decisions – Type 1 - Strategic

**Real World (Business)**



*Strategic*

**DECISIONS**

**EXPERTISE**


What is the company's next blockbuster product?

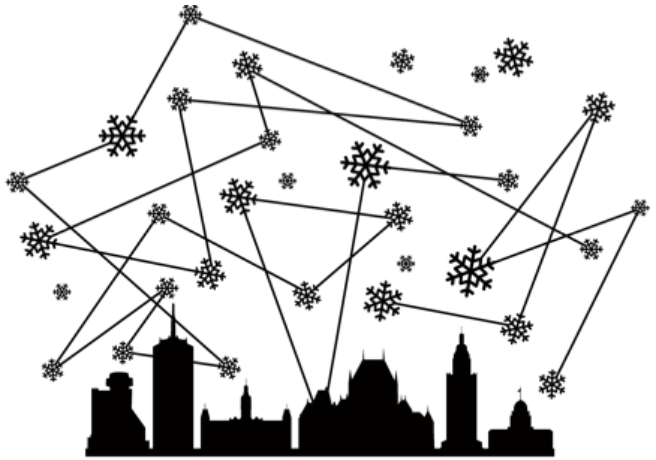
Should I acquire company X?

Should I expand into country A or B?

1. Experience
2. Education
3. Training

# Business Decisions – Type 2 - Tactical

**Real World (Business)**



*Tactical*

**DECISIONS**

**EXPERTISE**

1. Education
2. Experience
3. Training

***Head of Sales & Marketing***

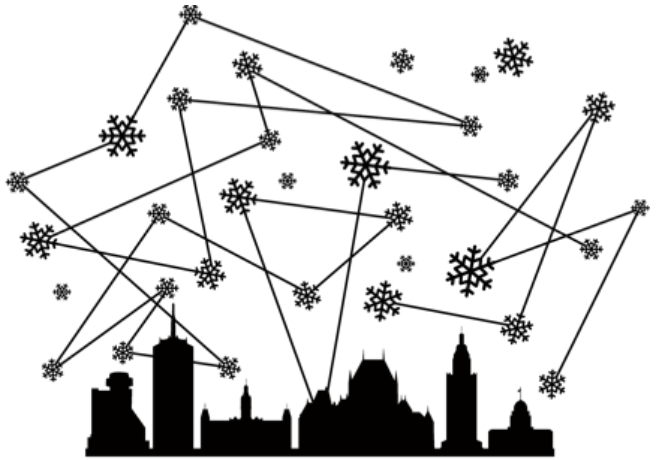
What price should I set for Product X, SKU Y?

What should the next week marketing campaign focus on?

How do I handle the negative brand perception on social media?

# Business Decisions – Type 3 - Operational

**Real World (Business)**



*Operational*

**DECISIONS**

**EXPERTISE**

How many shifts should I run today?

How do I improve safety on the shop floor?

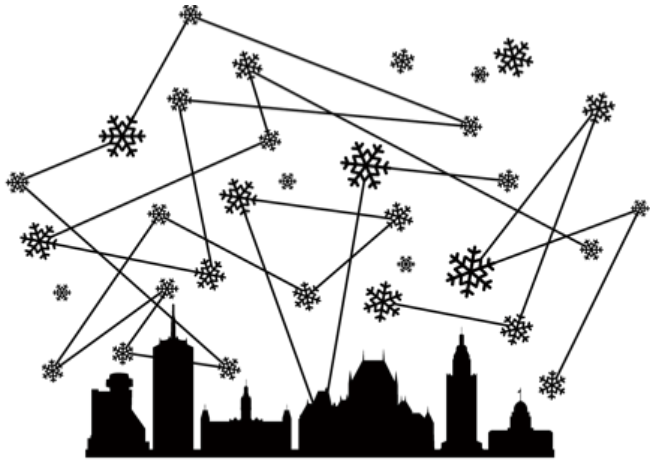
What is the bottleneck in the process?

***Shop floor Manager***

1. Training
2. Experience
3. Education

# So how are business decisions made?

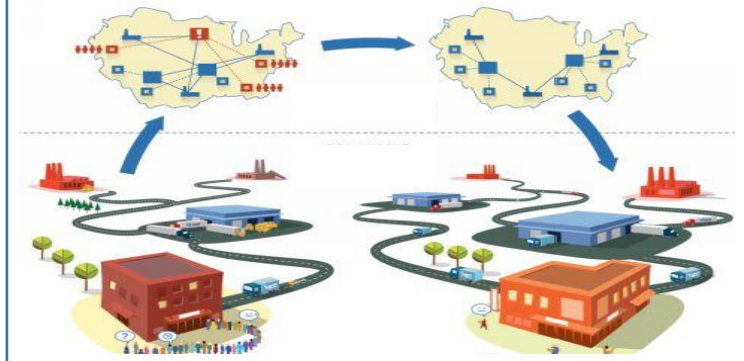
**Real World (Business)**



**DECISIONS**

**EXPERTISE**

1. Experience
2. Education
3. Training



**MENTAL MODELS**

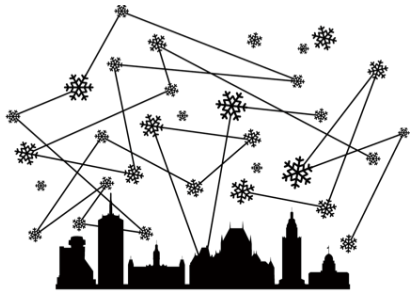
**Approximation of the Real World**


***Business Decision Makers***

# Mental Models backed by Human Expertise (Gut Feel)

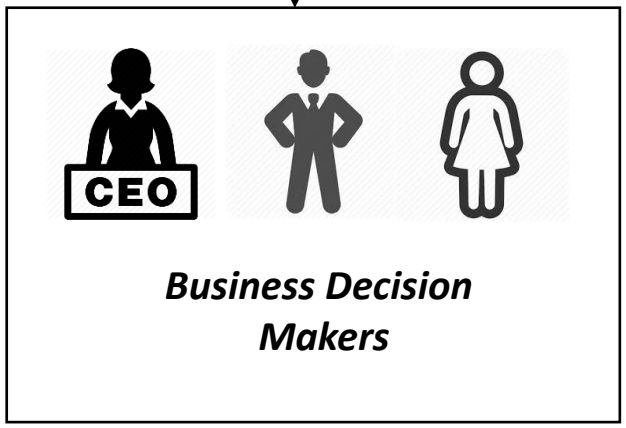
**Mental Models**

*No Technology, Just Expertise*



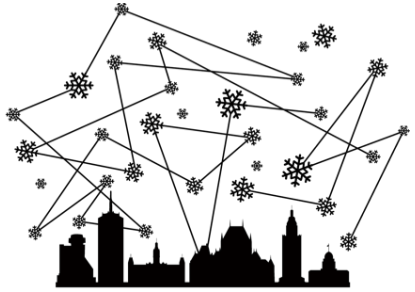
**Real World (Business)**

**Develop an Approximation**




***Business Decision Makers***

**Use for decision making**

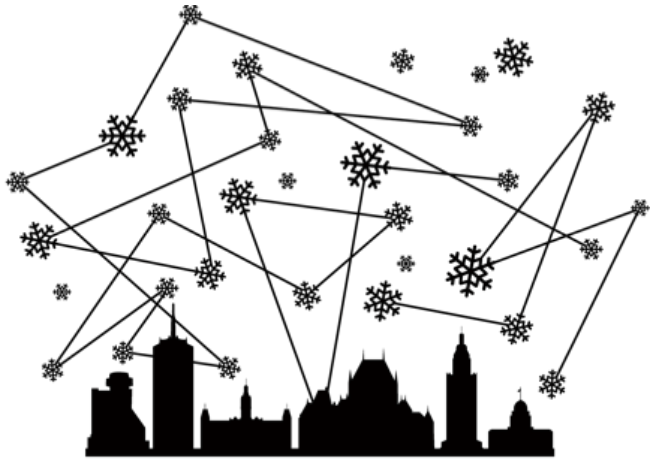


**Real World (Business)**

Q5: Decision making in a business context has been done for decades. Where does Analytics (AI/ML) play a role and why is there such a big interest now?

# Business Decision Making is becoming increasingly ‘Complex’

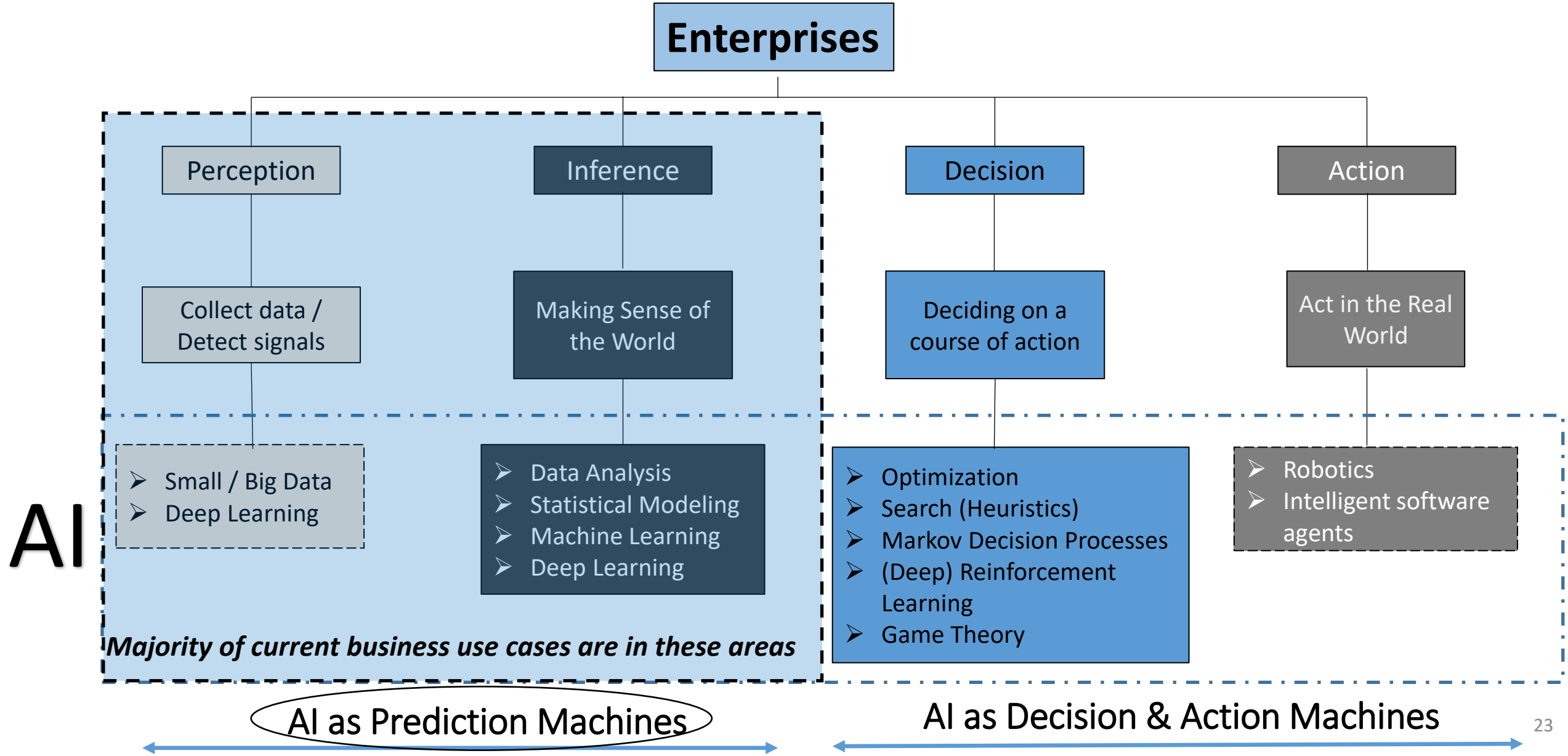
**Real World (Business)**



- Multiple Entities with their own goals
- Complex Non-Linear Relationships
- Delayed Feedback
- ‘Black Swan’ Events (Unpredictable events)
- Uncertainty & Long Term Consequences

***Business decision makers are expected to take right decisions in this complex world***

# AI as Prediction Machines



# AI as Prediction Machines - Examples

***Prediction Machines***



Take Information that you have (Data)

Customer Attributes
Product Details
Transaction History

Product Sales across time
Location of Stores

Utterance by a customer on his / her mobile phone

Create Information that you don't have (Predictions)

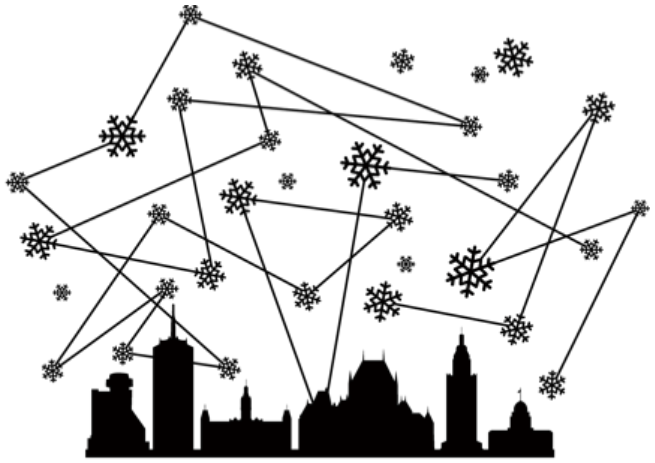
Whether a particular customer will churn (leave the bank) or not?

Forecast demand for products in the next 3 months in each store

Precisely identify what the customer said so that action can be performed

# We saw earlier how business decisions are made?

**Real World (Business)**



**HUMAN JUDGMENT REQUIRED FOR MAKING THE DECISION**

**DECISION**

**EXPERTISE**

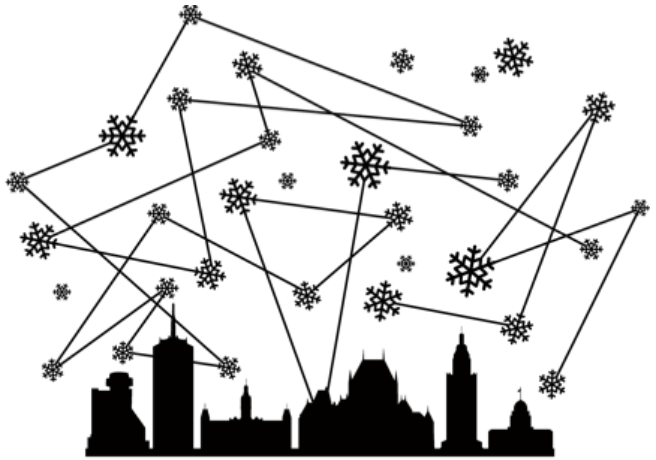
1. Experience
2. Education
3. Training


**Approximation of the Real World**


***Business Decision Makers***

# Goal & Purpose of Analytics – (with AI as Prediction Machines)

**Real World (Business)**



**HUMAN JUDGMENT STILL REQUIRED FOR MAKING THE DECISION**

Better **DECISIONS**

**EXPERTISE**

Better **MENTAL MODELS**

Better **Approximation of the Real World**

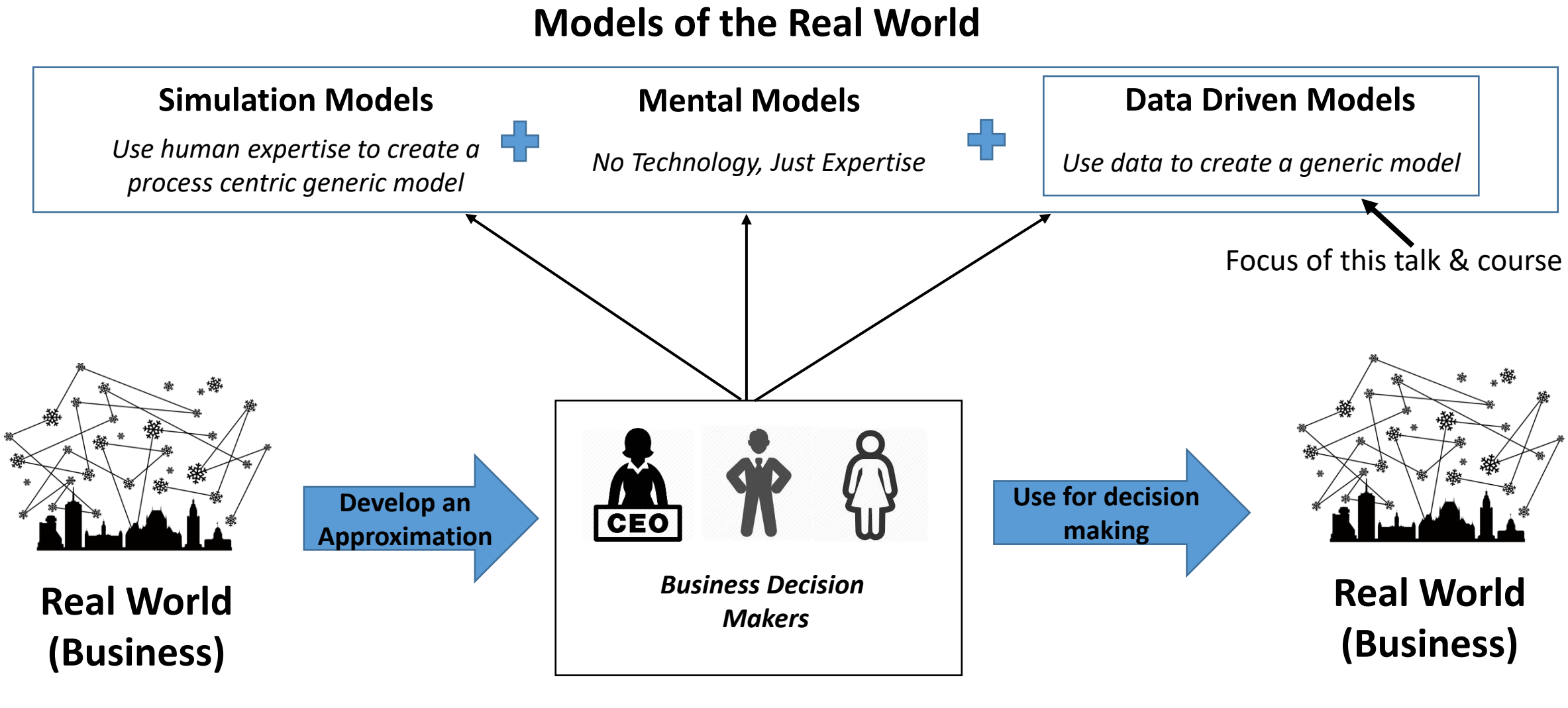

***Business Decision Makers***

***AI as Prediction Machines***

***AI / ML Pipeline***

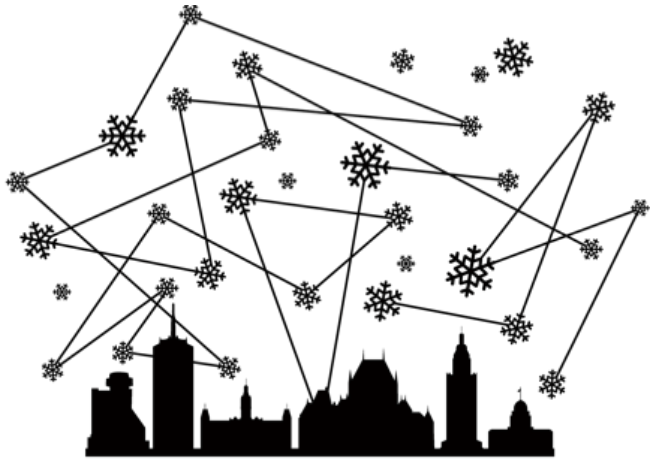
DATA → ML / DL Algorithms → Predictions *(Past, Present & Future)*

# ‘Models of the Real World’ is at the centre of business decisions



# Artificial Intelligence (End to End / Autonomous)

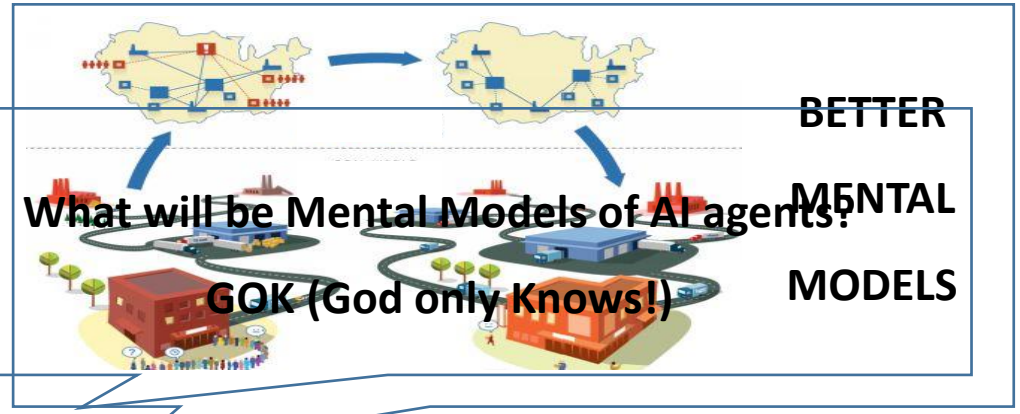
**Real World (Business)**



**EVEN BETTER DECISIONS**

**EXPERTISE**

***Decision Maker***




**'Even' Better Approximation of the Real World**

***AI / ML Pipeline***

DATA → ML / DL Algorithms → Predictions

Q6: Can you bring these concepts to life with some examples from your personal experience?

# Example 1: Automobiles – Utilizing Sensor data to predict defects

**BUSINESS**

For this automobile company, the warranty costs were rising year on year at an alarming rate

**DATA**

Semi-structured data from sensors from cars across 100+ countries (Ex: Pedal position, Oil temperature, Engine temperature…60+ parameters)

**MATH**

Clustering done on data to identify driving styles which is then correlated with warranty claims to predict defect probability

**TECH**

- Spark on the Cloud platform called Databricks for Machine Learning
- User Interface using React for self-service

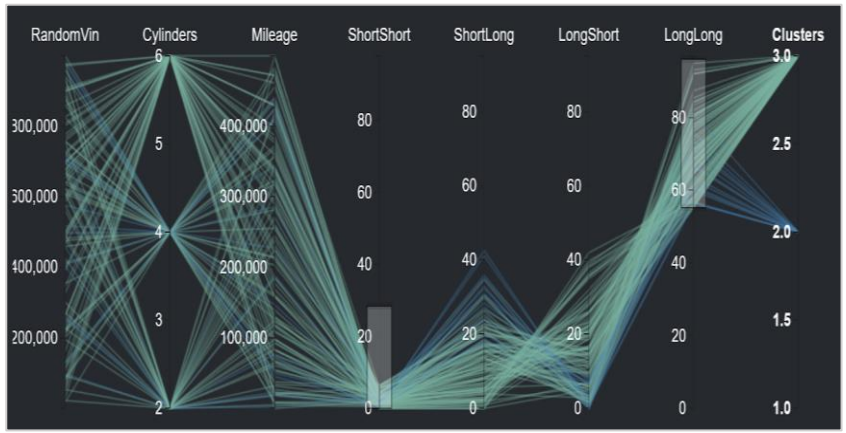
# Example 1: Utilizing sensor data to predict defects

**Business Problem**

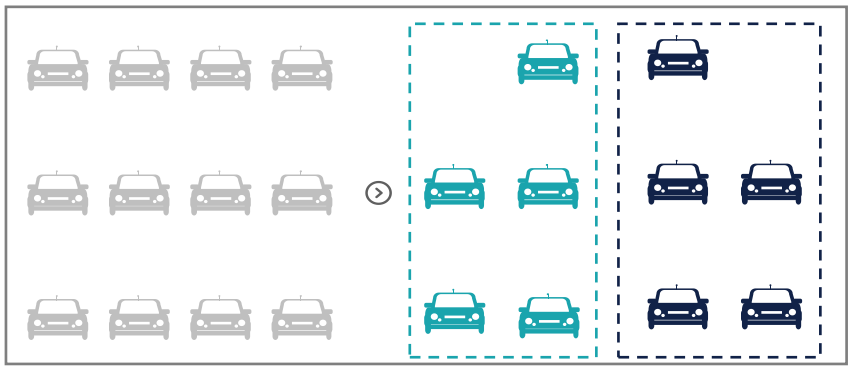
For this automobile company, the warranty costs were rising year on year at an alarming rate

**AI as Prediction Machine**

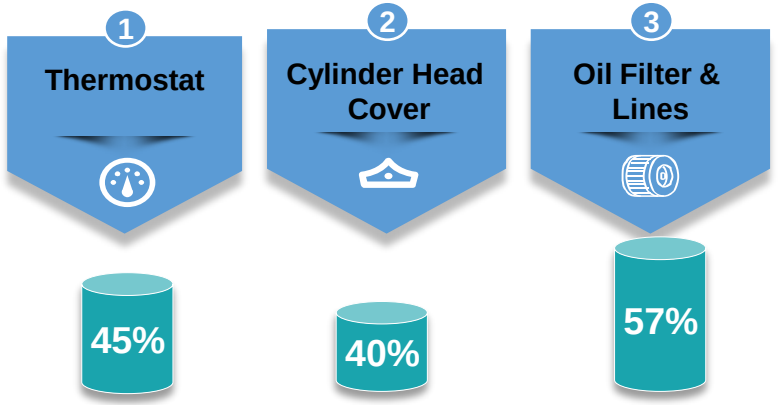
Sensor data from cars in 100+ different countries




Visualization to understand the data



Clustering to identify driving styles




Defects were correlated with driving styles

**Decisions**

- Marketing
- Finance
- Engineering

# Example 2: Leveraging external data to drive innovation

**BUSINESS**

Consumer durables company wants to obtain product feedback as soon as its products are released in the market and not wait for 6-8 months which was the current state scenario?

**DATA**

Unstructured data from reviews in marketplaces, brand websites, Industry forums, blogs

**MATH**

Natural Language Processing Techniques to detect spam, emotion, entities, sentiments, contextual meaning etc.

**TECH**

Self-service visualization built using Tableau that provides the summary view and different levels of drill-down into specific consumer characteristics

# Example 2: Using External Data to Drive Innovation

**Business Problem**

Consumer durables company gets product feedback 6-8 months after the product is launched which is not useful

**AI as Prediction Machine**

Industry Forums — Consumer Reports

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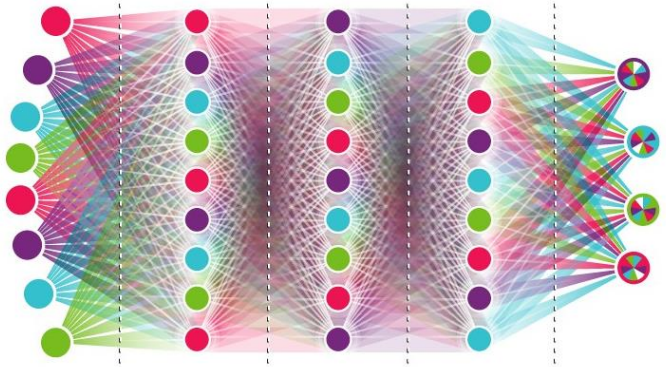
Market Places — Home Depot, a

+

Brand Websites — LG, Whirlpool

**External data from ecommerce sites, brand websites etc.**



**Deep Learning for Text Understanding**

Dependency Parsing

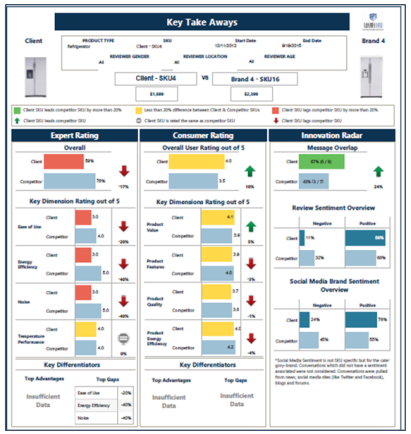
Entity Detection

Word Vectors

Language Models

- Sentiment Analysis
- Drivers of Purchase
- Triggers of Purchase
- Expert Opinion
- ★★★☆ Consumer Rating
- Popular Features

Text Analytics




**Understand key factors that influence customer perception & behavior**

**Decisions**

- Innovation
- Marketing
- Distribution

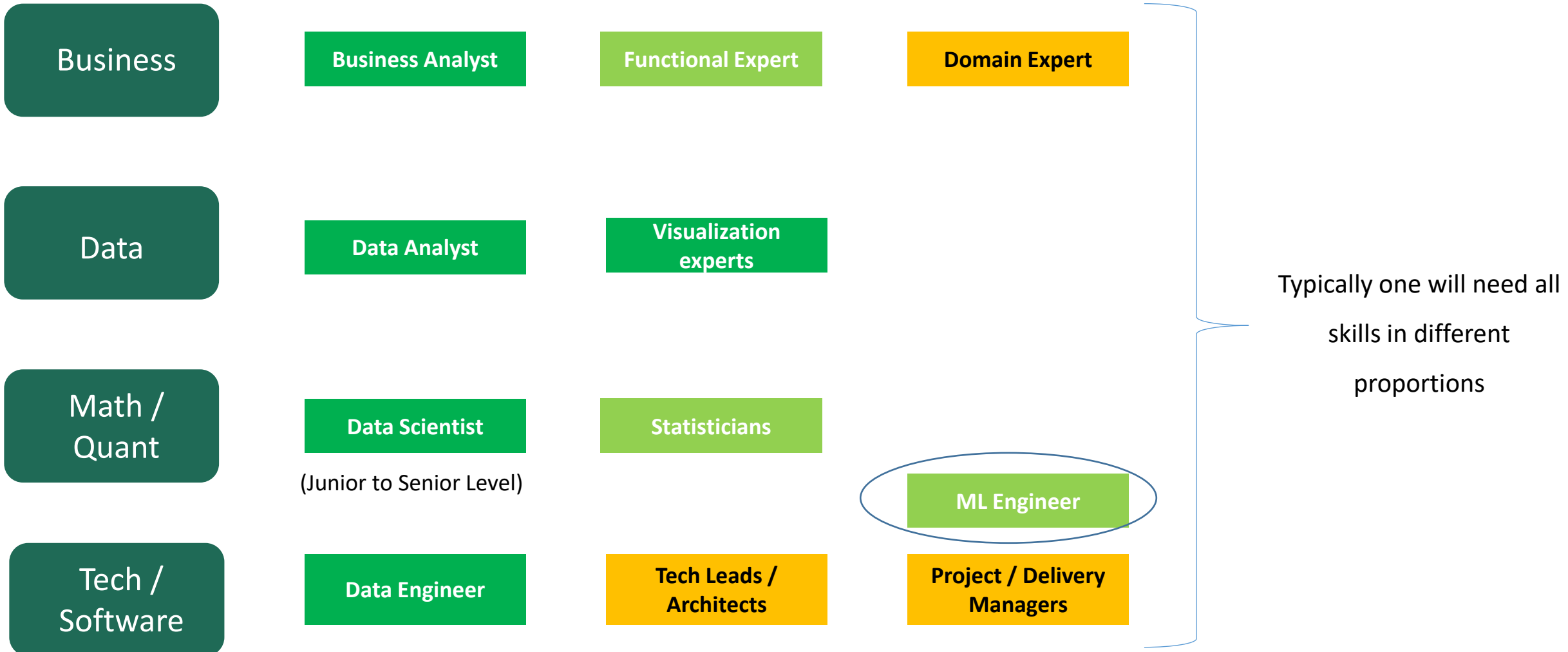
Q7. What competencies are required to create data driven models?

# Competencies to create Data Driven Models

| | | | |
|---|---|---|---|
| Business | Use Case Formulation | Interpret Analytics Output | Domain Expertise |
| Data | Data Types – (Un / Semi) Structured | Data Visualization & Story Telling | Signals from data (subtract noise) |
| Math / Quant | Select the right techniques | Appropriate coding language / platform | Evaluating the output of algos |
| Tech / Software | Data Engineering / Model Deployment | Front-end Applications | Software Engineering / SDLC |

Q8: What are the typical roles in the analytics space and what specific skills are required to break into it?

# Typical Roles in Analytics / Data Science



# Entry Points for different experience levels

| Fresher / Junior Developer | Lead / Architect | Program Manager / Business Head |
|---|---|---|
| **Business Analyst** | **Functional / Domain Lead** | **Functional / Domain Expert** |
| **Data Analyst** | **Senior Data Analyst** | **Mid-Level Data Scientist** |
| **Big Data / Cloud programmer** | **Mid-Level Data Scientist** | **Analytics Delivery Manager** |
| | **Data Engineer / Big Data / Cloud Specialist** | **Consultant** |

# Skills required for an Analytics Professional

1. **Business Orientation** – Basic understanding of business concepts

2. **Structured Thinking** – Ability to break down a problem into parts

3. **Analytical Techniques** – Articulate as to how data & analytics can help

# 1. Business Orientation - Basic understanding of business concepts

**Value Creation** – Reason for existence of a business

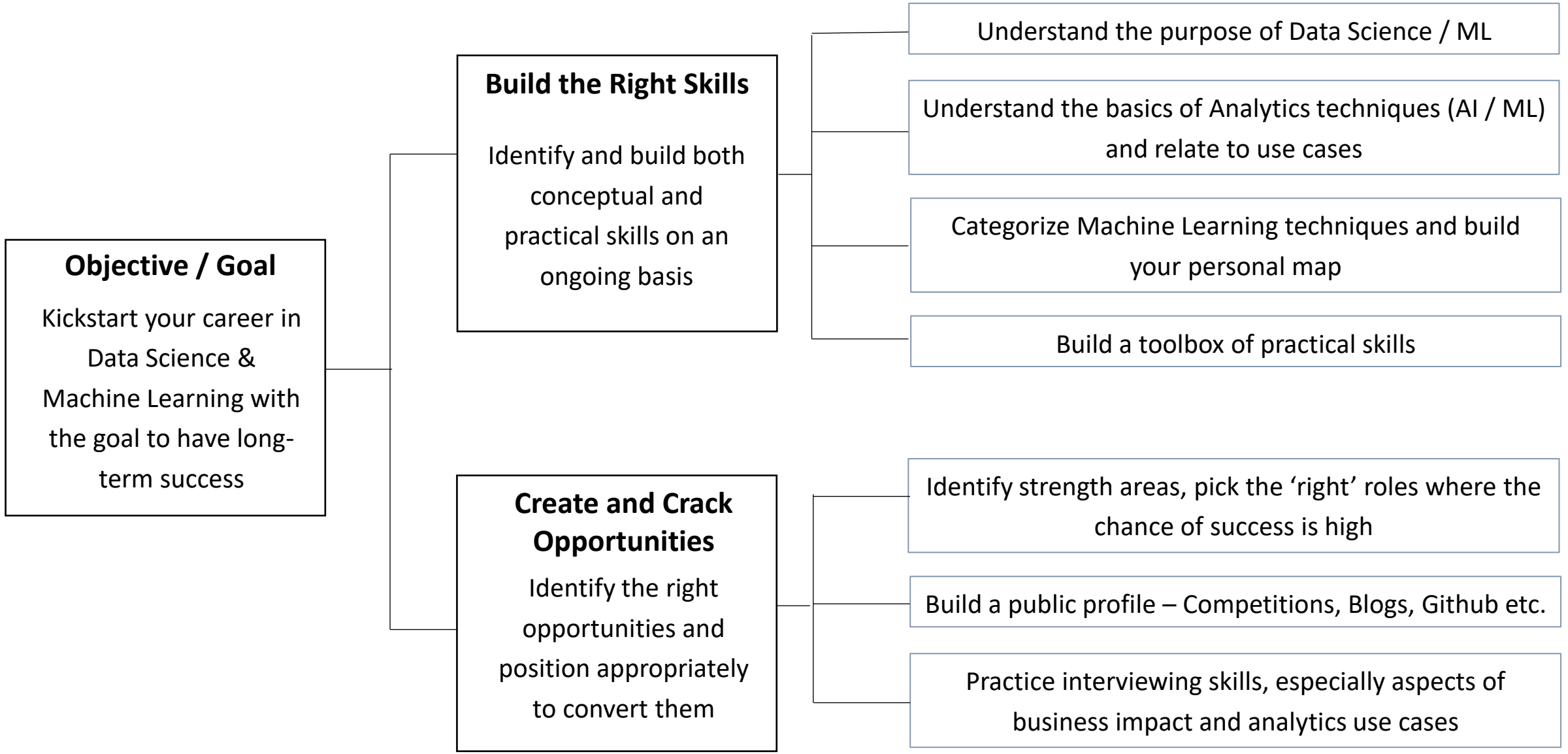
**Business Model** – Core actors & activities that generate value

Raw material / Ideas → Making a Product / Offering a Service | Marketing & Selling a Product / Service → Customers

Supporting Functions

- **Finance** – What numbers matter & why?
- **Strategy** – To deal with competition
- **R & D** – Innovation
- **HR** – Managing People

# 2. Structured Thinking – Ability to break down a problem



# Structured Thinking - Many Resources are available…

## Frameworks

- Cynefin (by Dave Snowden)
- Issue Tree & Hypothesis Formulation
- MECE Principle
- Porter's Five Forces
- 3C Framework (Company, Customer & Competitor)
- 4P Framework (Product, Price, Place, Promotion)
- SWOT
- 2x2 Matrices
- BCG Matrix
- McKinsey 7S Framework

## Where Available

- Case Interview preparation websites like:
  - www.craftingcases.com
  - www.preplounge.com
  - Victor Cheng's CaseInterview prep
- Consulting company websites

(Ex: http://caseinterviewprep.deloitte.com/)

- YouTube (Case Interview Preparation videos)
- Forums like Quora

# 3. Analytics Techniques – Components of the toolbox

- Basic knowledge of Math concepts – Distributions, Probability, Matrices
- Good knowledge of Statistical Techniques & Machine Learning algorithms
- Atleast 1 programming language for ML – Python (Jupyter notebooks), R
- Data Visualization skills – Python or Tools like Tableau, Qlikview
- Atleast 1 GUI based ML platform – H2o, Azure ML, BigML

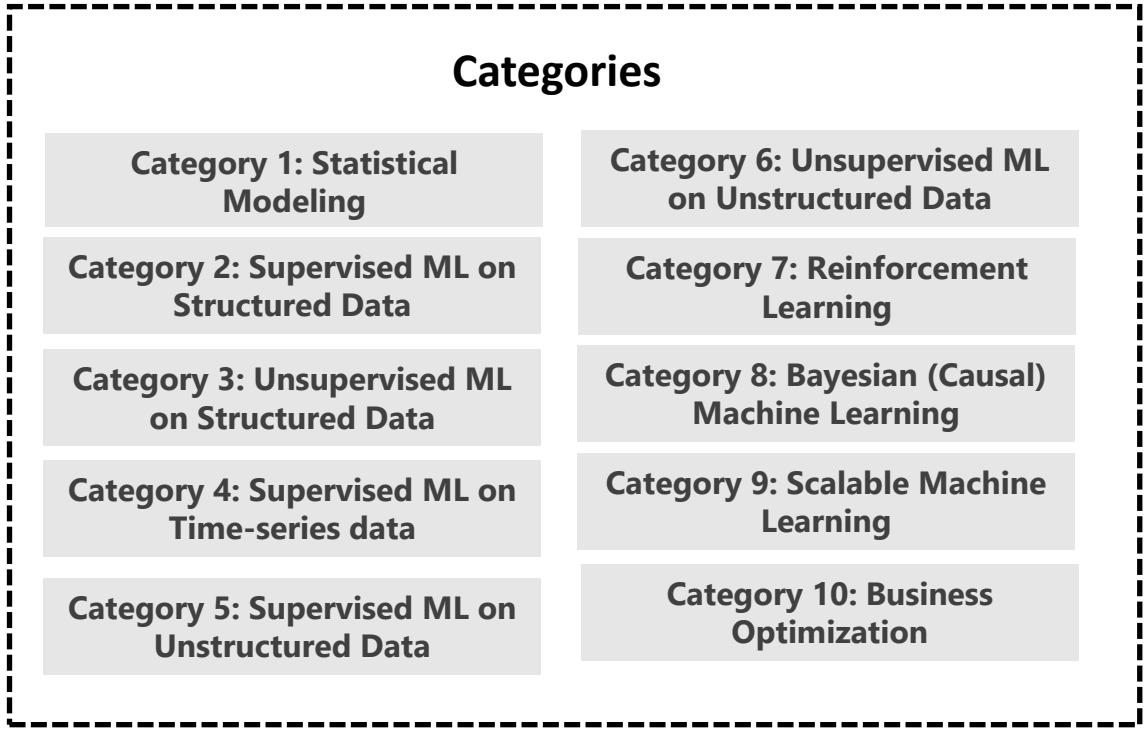
→ *Structured course will help you get this knowledge faster*

- 1 Cloud based platform (Nice to have) – AWS, Databricks, Paperspace
- Github
- Kaggle (Competition & Kernels), AnalyticsVidhya
- Database / SQL knowledge (preferable)

Q9: With so many algorithms & techniques available, how does one keep track and apply it?

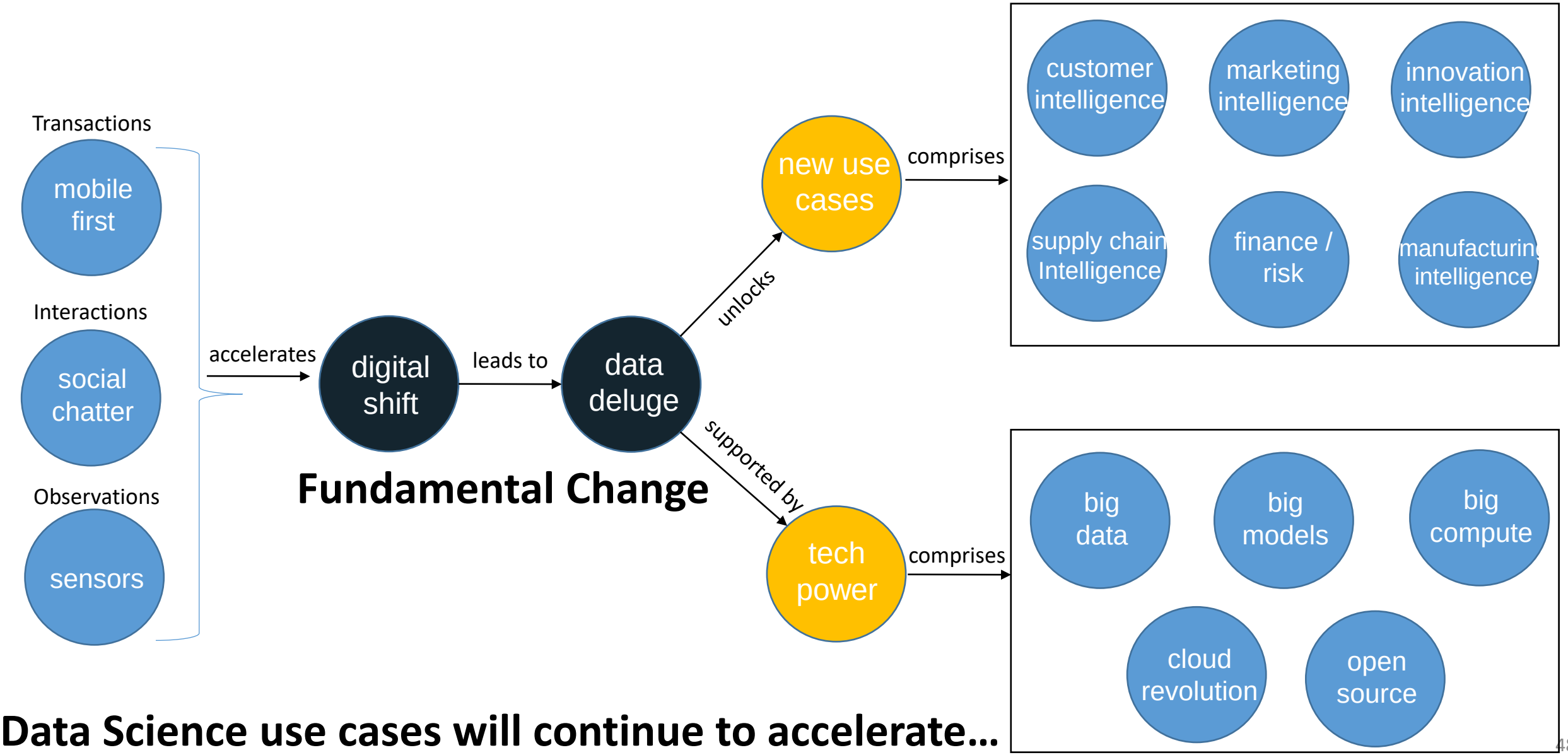
# AI / ML Techniques – There are a lot of them!

# Categorization of Machine Learning Topics – My personal map



Q10: How are you sure that this field (Analytics, AI & ML) has long-term growth prospects and is not just a short-term fad?

# Digital Shift is a Fundamental, Irreversible Change




**Data Science use cases will continue to accelerate…**

# Thank You!

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