

Decoding Artificial Intelligence for Data Science Practitioners

July 2018



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

What is this talk about:

- Broad Framework to think about AI
- Highlight relationship between AI, ML & Deep Learning

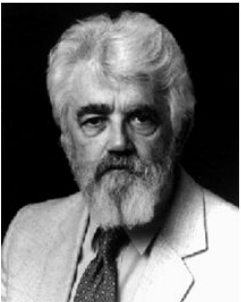
What this talk is not:

- Does not deal with cost-benefit analysis of AI
- Does not cover moral & ethical dimensions of AI
- Does not cover any math behind the techniques

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

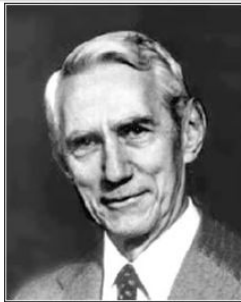
1956 Dartmouth Conference: The Founding Fathers of AI



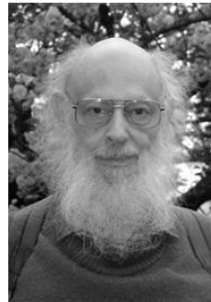
John McCarthy



Marvin Minsky

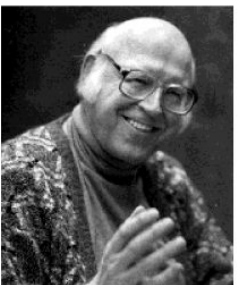


Claude Shannon



Ray Solomonoff

Alan Newell



Herbert Simon



Arthur Samuel



And three others...

Oliver Selfridge
(Pandemonium theory)

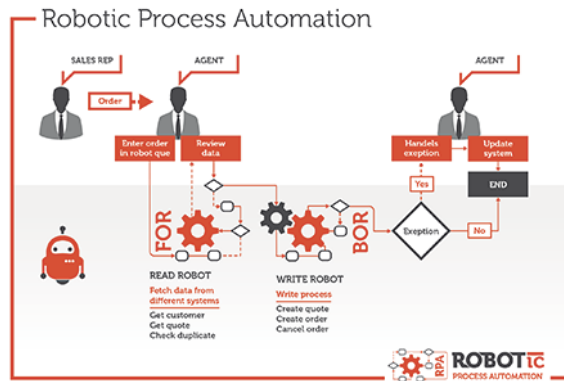
Nathaniel Rochester
(IBM, designed 701)

Trenchard More
(Natural Deduction)



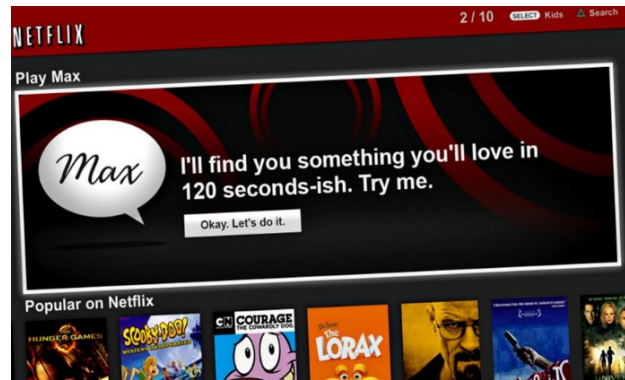
Why do we want computers to act like humans?

Assisted Intelligence



- Assisted intelligence amplifies the value of existing activity
- Assisted intelligence tends to involve clearly defined, rules-based, repeatable tasks. Ex: Robotic Process Automation (RPA)

Augmented Intelligence



- Augmented Intelligence fundamentally alters the nature of the task, and business models change accordingly.
- They involve advanced forms of machine learning and NLP, plus specialized interfaces tailored to your company and industry. Ex. Netflix using ML to build a recommendation engine.

Autonomous Intelligence



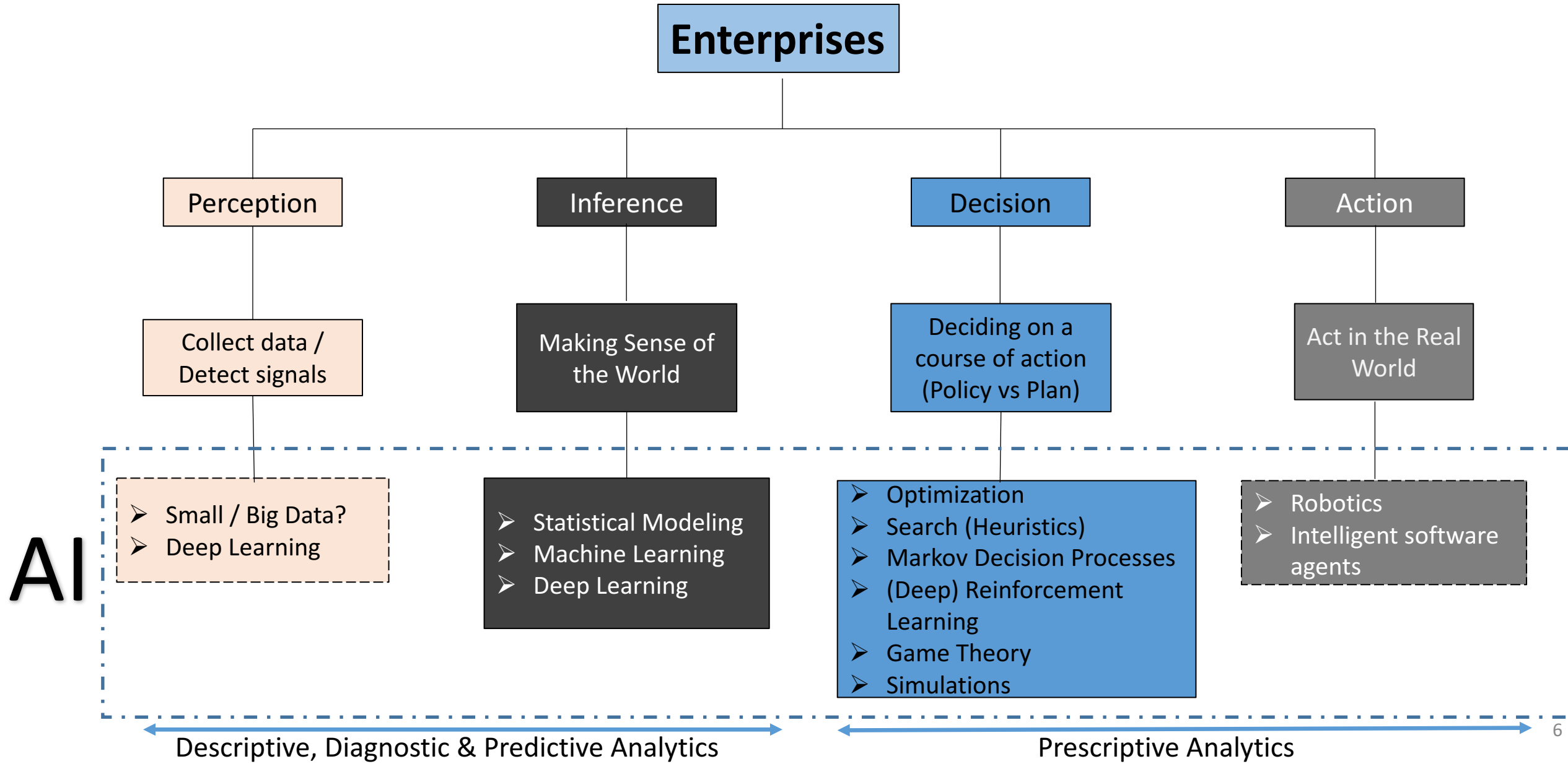
- Systems that make decisions without direct human involvement or oversight
- They will do so only after the human decision maker starts trusting the machine or becomes a liability for fast transactions. Ex. Autonomous cars, robots that dispose of bombs

What constitutes Human Intelligence?

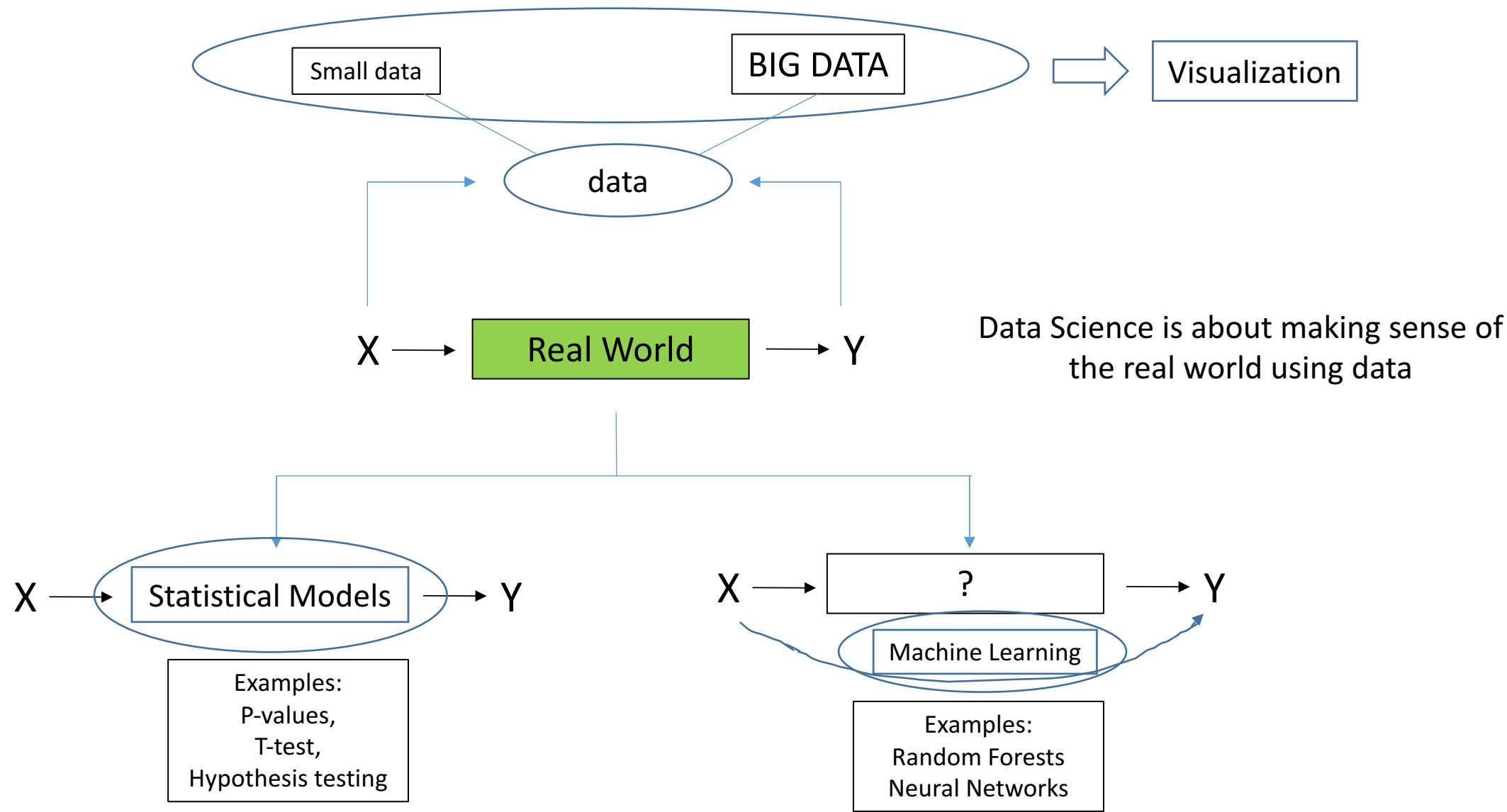


1. Perceive the world, detect signals and collect data
2. Make sense of the world using data (Insights, Inference, Predictions etc.)
3. Decide on the next course of action
4. Act in the Real World

AI Techniques in Enterprises – Parallels to Human Intelligence



Making Sense of the World (using Data)



Inference to Decisions – Next Wave of AI driven Applications



The Decision Gap – Why it exists?



Predictions from Machine Learning

1

Need to **interpret** the predictions of black-box algorithms (GBMs, CNNs etc.) and **explain at a local level** (specific customer) as opposed to global level (feature importance)

2

Clearly articulate **the uncertainty in predictions** rather than provide a single estimate as business needs to be aware of upside potential and downside risk to make decisions

3

ML for all its sophistication does not provide “**cause & effect**” relationships. Business decision making is very much about ‘interventions’ for positive impact and that requires an understanding of causation (and not just correlations!)

4

Business decision making is always under **constraints** (time, capital, resources etc.). Predictions using ML does not typically take these constraints into account for modelling

5

Hey, what do I do with just predicted numbers when there is a **complex environment out there with random effects, multiple agents and non-linear interactions?**



Business Decision Making

How to bridge the Decision Gap?



Predictions
from
Machine
Learning

1

Machine Learning Interpretability (MLI) – Techniques (LIME, Shapley values etc.) that deal with explains predictions at a local / individual record level

2

Probabilistic Programming – Techniques that leverage Bayesian Inference to provide distribution of parameter values (not point estimates) thus quantifying uncertainty

3

Causal Machine Learning – Techniques like Bayes Nets, Structural Equation Models (SEM) etc. that helps determine causal interaction among variables with ability to represent complex interactions in a manageable compact form

4

Optimization – Well understood area with techniques like linear programming to help maximize or minimize objective functions along with decision variables and related constraints

5

Real World Actions – Techniques that helps build models of the real world to find optimal policies in that environment. Includes topics like Simulations (Discrete Event Modeling, System Dynamics, Agent Based Modeling), Reinforcement Learning, MDPs etc. and any combinations thereof.



Business
Decision
Making

AI in relation to ML & Deep Learning

Artificial Intelligence

AI theory emerged, stirs excitement



Machine Learning

ML began to flourish



Deep Learning

Deep Learning breakthroughs driving AI boom



1950's

1960's

1970's

1980's

1990's

2000's

2010's

....



AI Conceptualized



Data Availability



Advent of Cloud

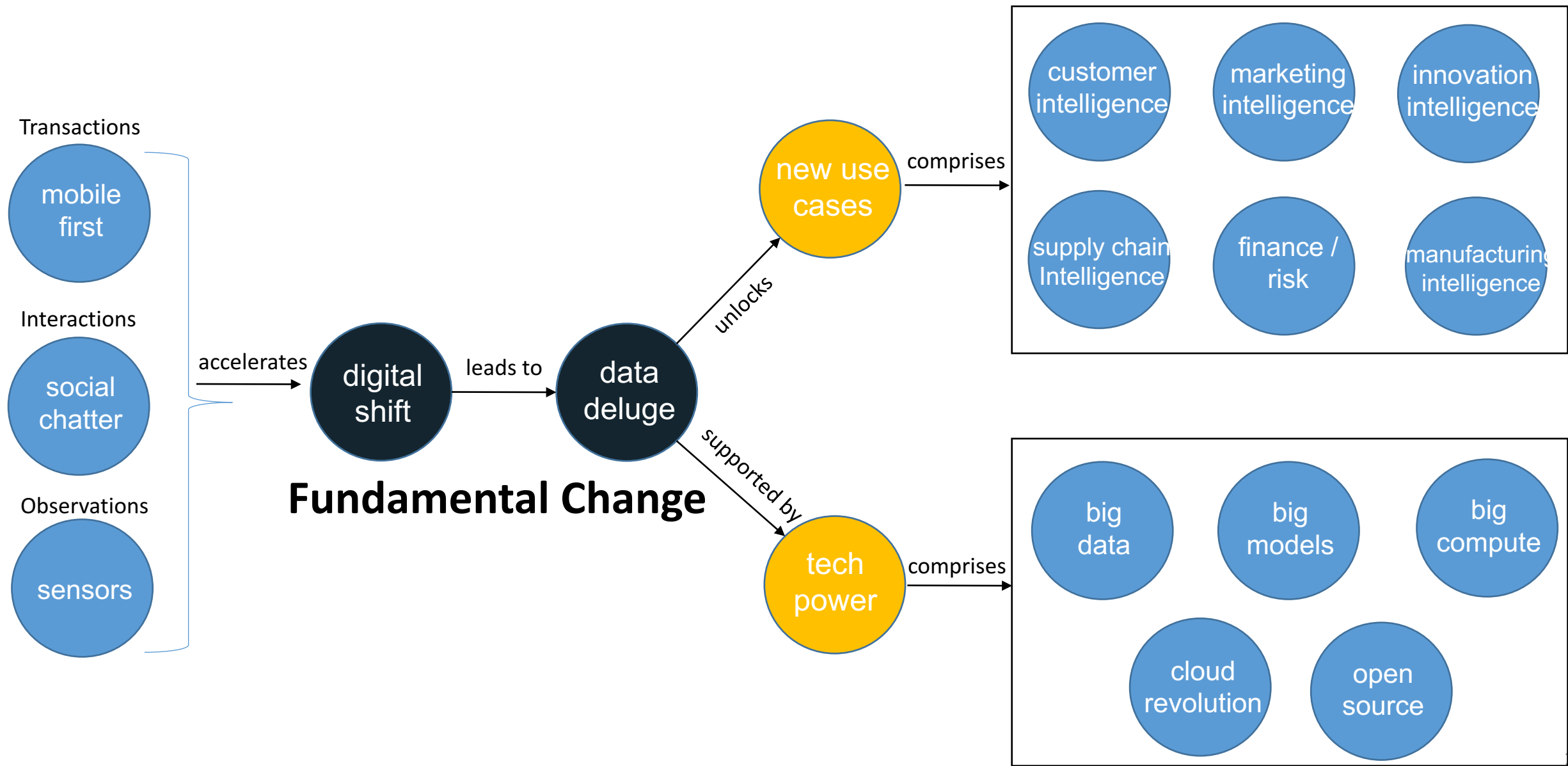
Let's break some AI myths to conclude...

- x AI is a recent phenomenon
- x AI will take over the world in the (near) future
- x AI, Statistics, Machine Learning, Deep Learning etc. are unrelated concepts
- x AI = Robotics
- x AI is only relevant for research and not for business



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Data Science & Analytics – ‘Clear & Present’ Opportunity



My Analytics Mindmap

- Global Trends in Society
- Macro-economy
- Business Fundamentals
- Specific Industry Domain
- Analytical use cases



Analytics for Business Value
<http://bit.ly/31KArT8>



- Data Management
- Reporting & Self-service
- Quantitative Techniques
- Performance Mgmt
- Insight Delivery

- Scan for New Products
- Evaluate Maturity



- Monitor Ecosystem
- Leverage Resources