



The Role of Big Data in EHS

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Agenda

1. Big Data Fundamentals
2. Big Data in Our Personal and Work Life
3. The Role of Big Data in EHS



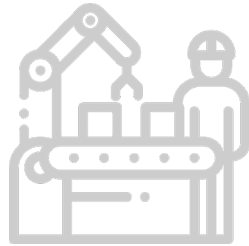
Big Data Fundamentals

Big Data Fundamentals



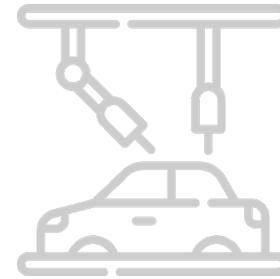
18th Century

Industry 1.0
Mechanical production.
Equipment powered by
steam and water



19th Century

Industry 2.0
Mass production assembly
lines requiring labor and
electrical energy



20th Century

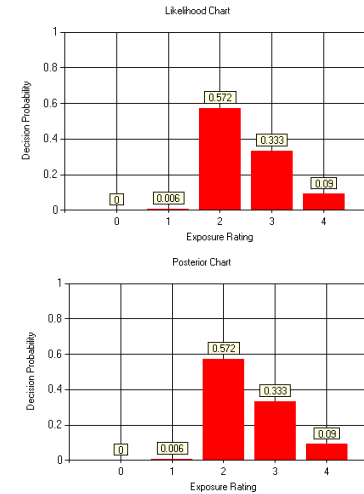
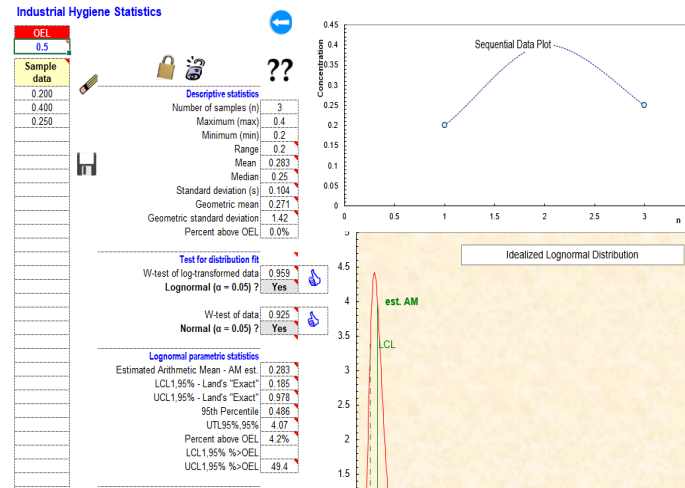
Industry 3.0
Automated production
using electronics and IT



Today

Industry 4.0
Intelligent production
incorporated with IoT, cloud
technology and big data

Big Data Fundamentals



Bird Data



Traditional Statistics



Bayesian Statistics



Big Data



“Information is the oil
of the 21st Century,
and analytics is the
combustion engine.”

Peter Sondergaard

EVP, Head of Research & Advisory,
Gartner Inc.

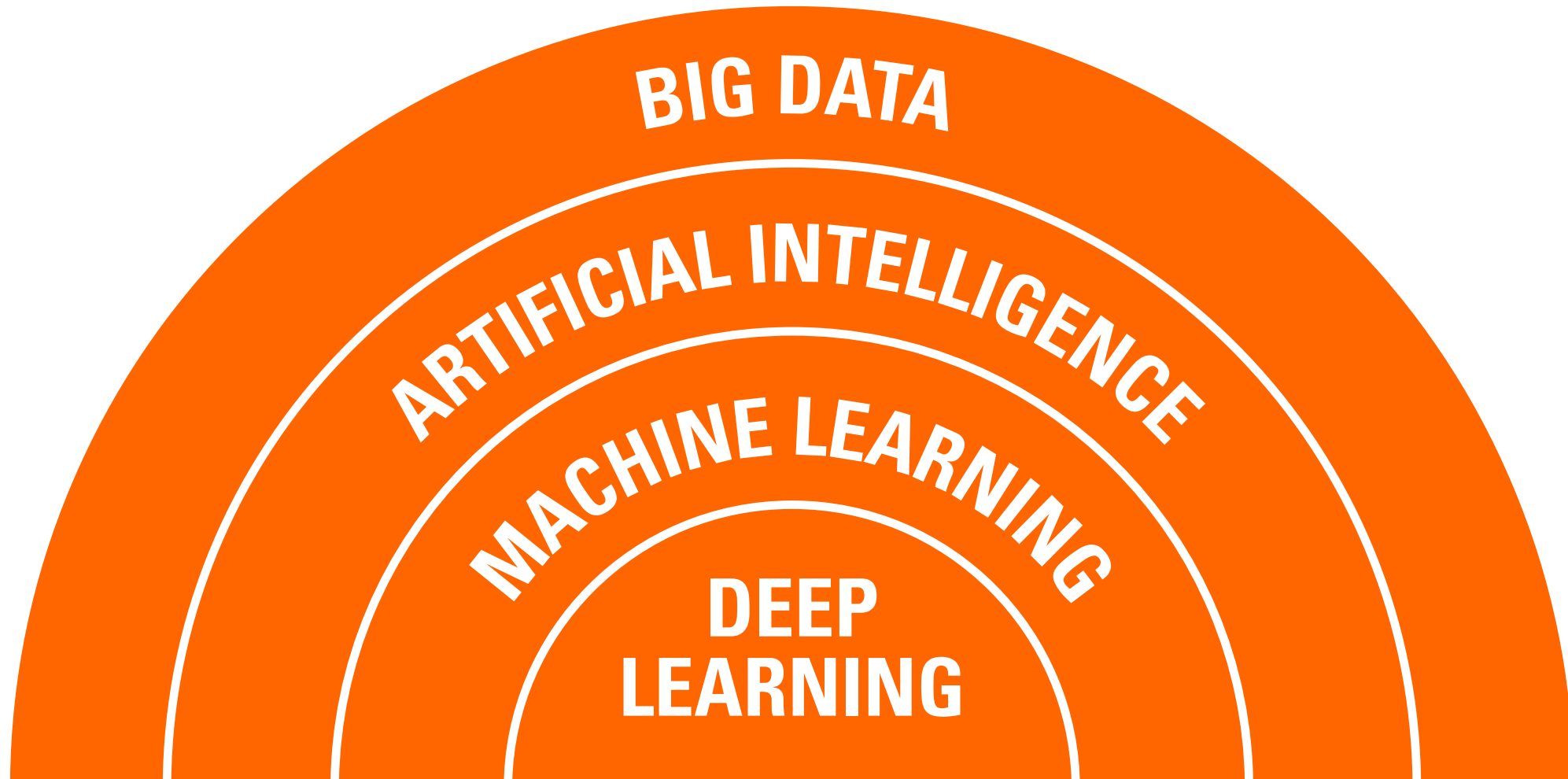




What is Big Data?

- Volume
- Velocity
- Variety
- Value
- Veracity

Big Data, AI and Machine Learning



Artificial Intelligence



“ Artificial intelligence is a general term that refers to hardware or software that exhibits behavior which appears intelligent.”

“...the science and engineering of making intelligent machines, especially intelligent computer systems

John McCarthy

Dartmouth Professor (1956)



Machine Learning

Learn via algorithms without being explicitly programmed.

Examples

- Decision Trees
- K-Means Clustering
- Recurring neural networks
- Convolutional neural networks
- Generative adversarial networks

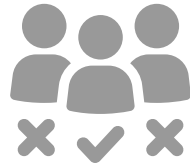
A circular inset image showing a night view of Earth from space. The curvature of the planet is visible, with a thin blue atmosphere layer. The landmasses are illuminated by city lights, appearing as a dense pattern of yellow and orange dots. The oceans are dark blue.

Big Data in our Personal and Work Life

Artificial Intelligence in our Personal Life



Finance



Hiring & Promotion



Insurance



Law



Psychology



Politics



Social Media & Marketing



Education



Automotive

Artificial Intelligence in our **Work Life**



Connected
Worker



Laboratory Analysis



Injury/Illness
Data



Image
Recognition



Telemetry
Data



Politics



Shift Scheduling

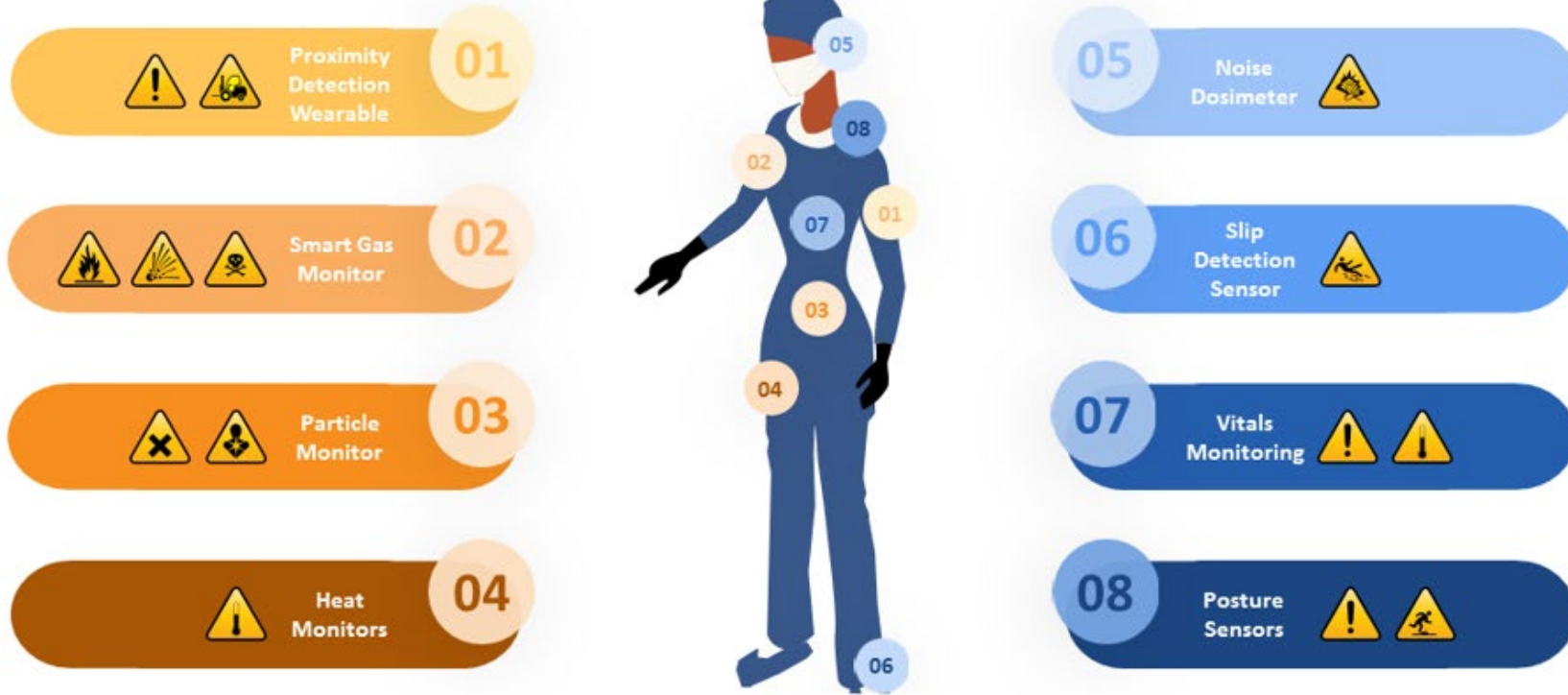


Wellness Programs



Behavior

Connected Worker





The Role of Big Data in EHS

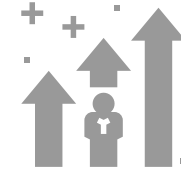
What's in it for EHS?



Predict risks so they can be prevented



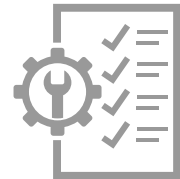
Identify problems in real time



Identify opportunities for improvement



Improve decision making, even in the face of limited resources



Support policy and process changes



Reduce costs associated with workplace injuries & non-compliance



Big Data - Challenges

- Data Silos
- Data Quality & Standardization
- Model Design
- Opacity
- Data Privacy
- Error Costs
- Technological Change
- Standards/Laws

Data Quality & Standardization

- Data Quality
 - Completeness
 - Accuracy
 - Timeliness
 - Data Standardization
 - Attribute/variable descriptors
 - Job positions
 - Process/tasks
- ...any many more

Model Design

- What model/algorithm is used?
- What is the objective of the model?
- What assumptions does the model make or require?
- What variables are used in the model?
- What data is used in the model?
- How is the model validated?

Explainable AI



Methods and techniques in the application of artificial intelligence technology (AI) such that the results of the solution can be understood by human experts.

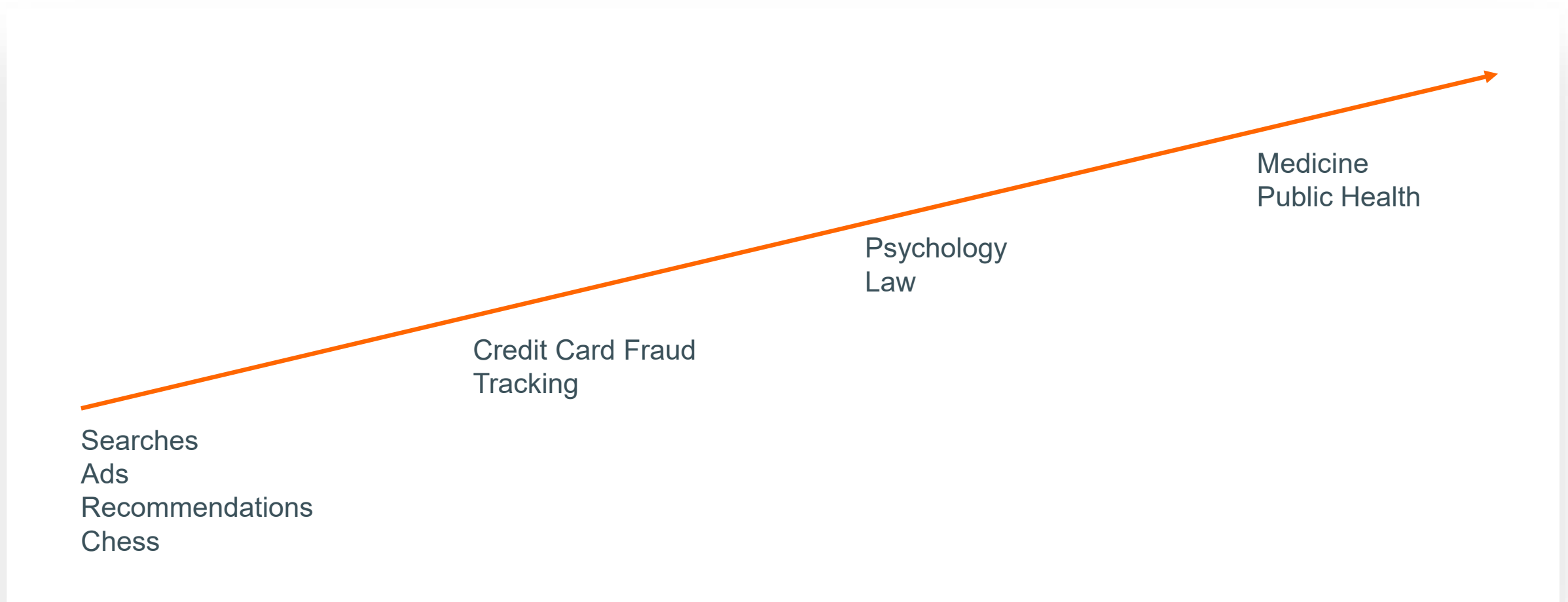
Data Privacy & Anonymization

Data anonymization is a type of information sanitization whose intent is privacy protection.

Examples

- Attribute suppression
- Record Suppression
- Character masking
- Pseudonymization
- Synthetic Data
- Differential Privacy

AI Error Costs



Pace of Technological Change Pace of Standards/Laws





Big Data - Opportunities

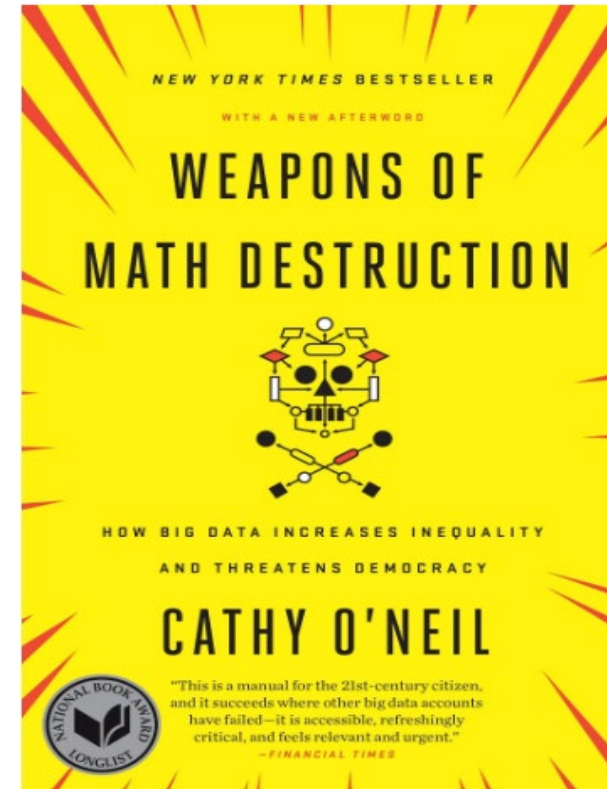
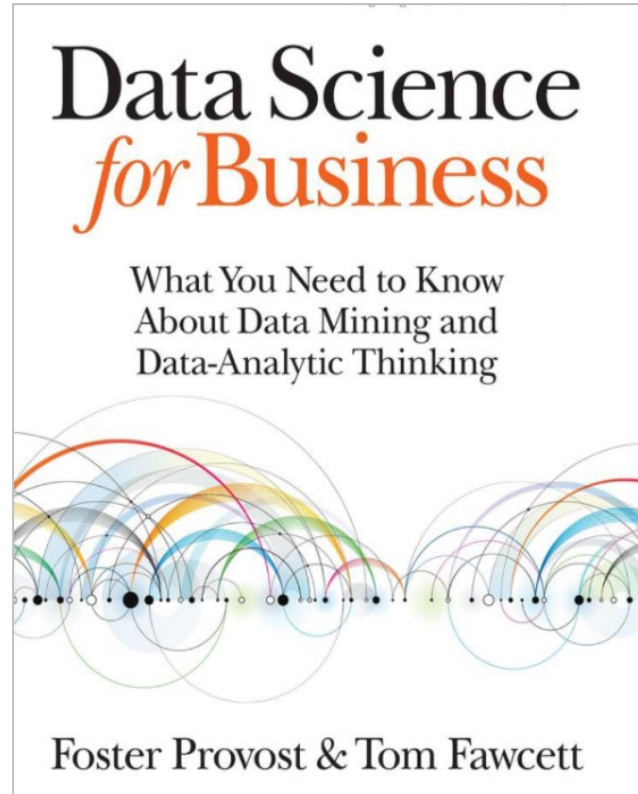
- ✓ Educate the profession.
- ✓ Strive for data quality & standardization.
- ✓ Have understanding of the model design and data used.
- ✓ Participate in model design and anonymization decisions.



Big Data - Opportunities

- ✓ Select trusted vendors who collect and process data.
- ✓ Push for transparency and accountability of models.
- ✓ Ensure ethical and grounded use.

Recommended Reading





Thank you!

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