

Management Information Systems

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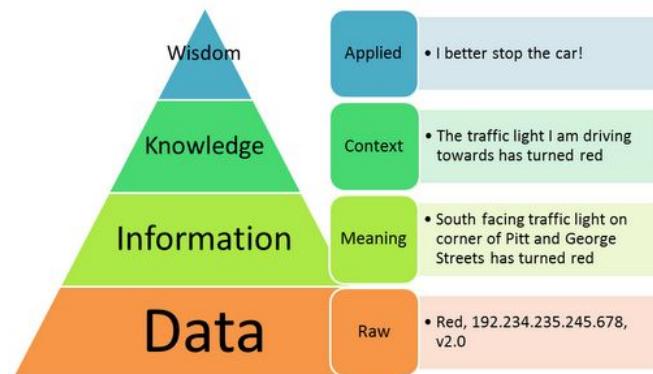
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Data Assets and Big Data

Definitions



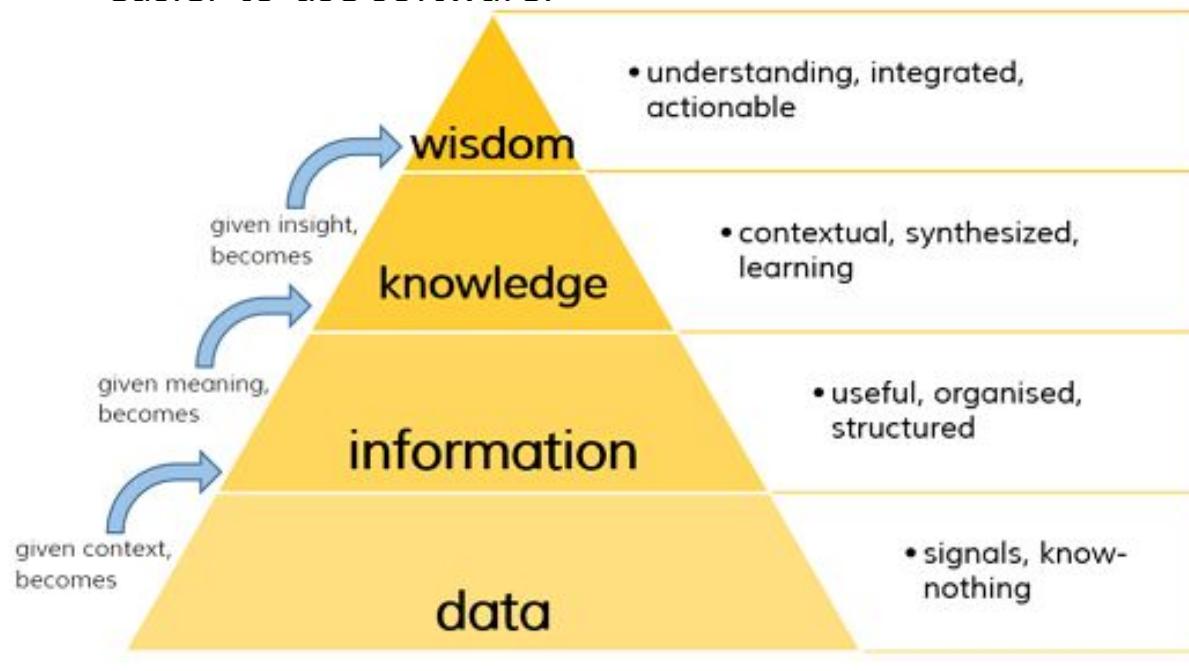
- **Data:** Raw facts and figures
 - Has in itself little semantic context
- **Information:** Data presented in a context so that it can answer a question or support decision-making.
 - Relevant if it makes a difference receive it or not
- **Knowledge:** Insight derived from experience and expertise
 - Information is a source of knowledge



Definitions



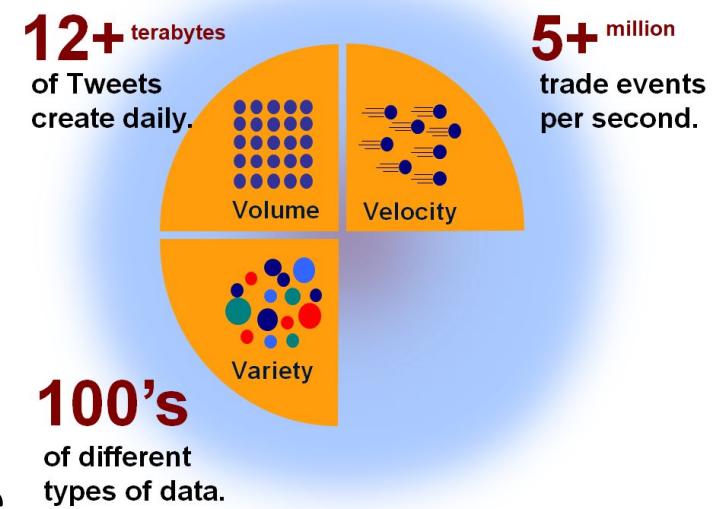
- **Big Data:** The collections, storage, and analysis of extremely large, complex, and often unstructured data sets that are used by organizations to generate insights.
 - Decision-making is data-driven, fact-based and enabled by:
 - Standardized corporate data.
 - Access to third-party data sets through cheap, fast computing and easier-to-use software.



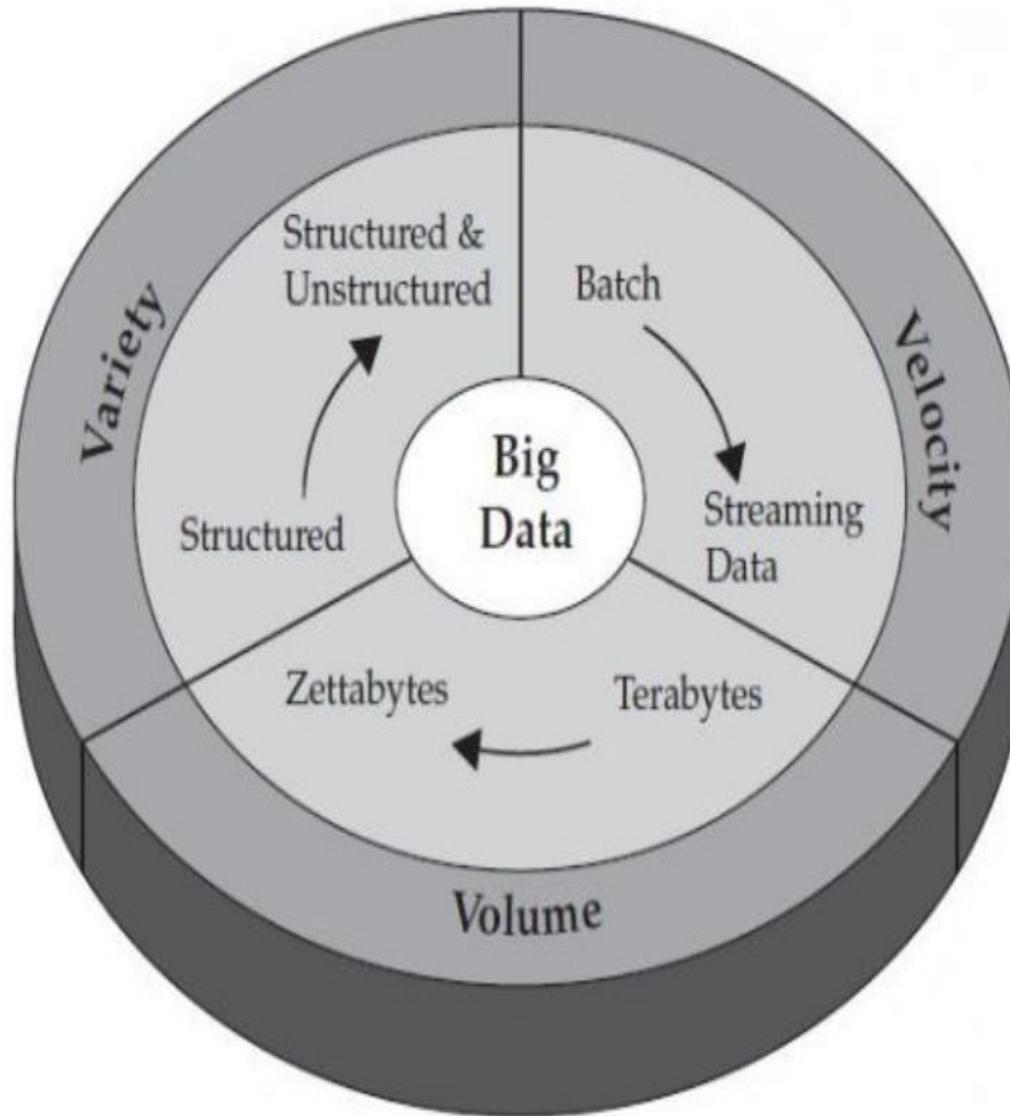
Big Data



- With Big Data, We've Moved into a New Era of Analytics
- Big data is better data
 - Kenneth Cukier's TED talk
- Businesses are dealing with the challenge of "Big Data"
 - High Volume
 - Unprecedented amounts of data
 - High Variety
 - Structured data
 - Unstructured data
 - High Velocity
 - Rapid processing to maximize value



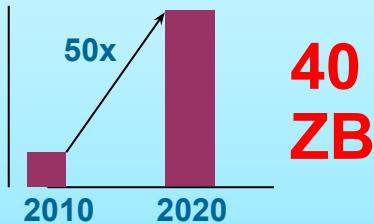
Big Data: 3 Vs



Big Data: 4 Characteristics



**Cost efficiently
processing the
growing
Volume**



**Responding to
the increasing
Velocity**



30 Billion
RFID sensors
and counting

**Collectively
Analyzing the
broadening
Variety**

90% of the
worlds data is
unstructured



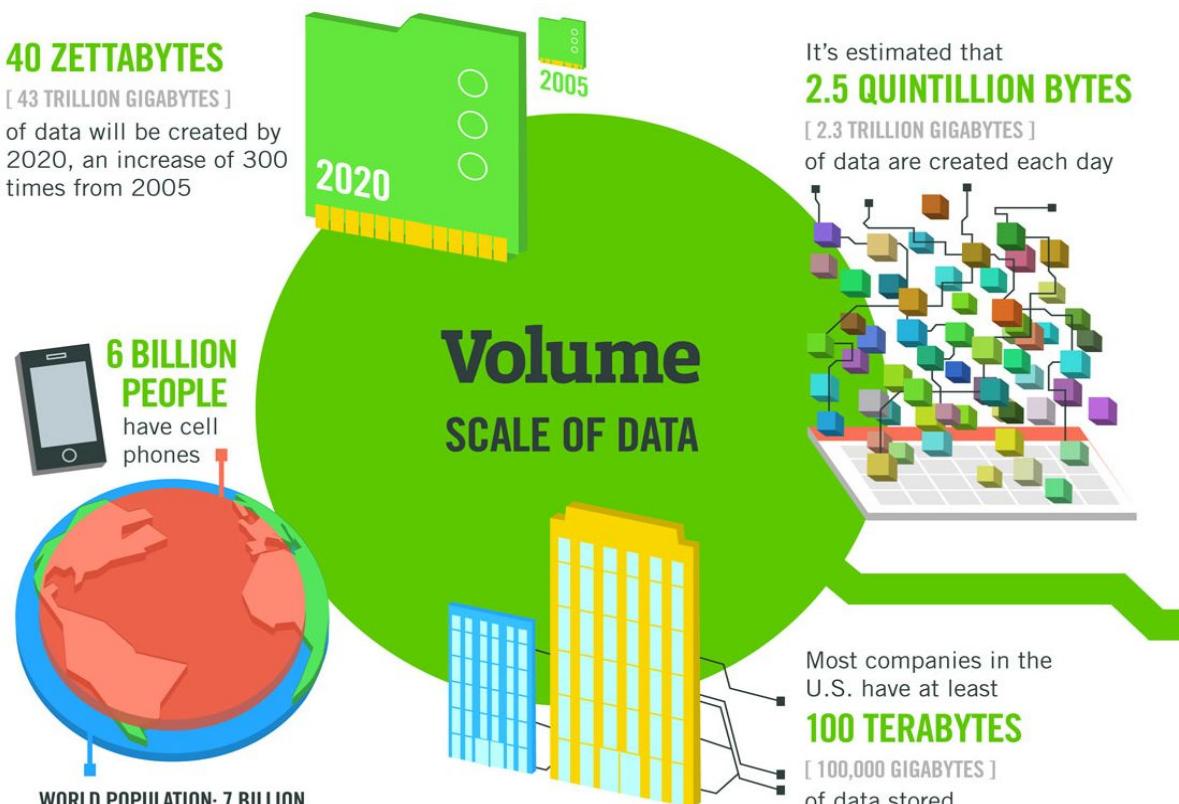
**Establishing the
Veracity of big
data sources**

1 in 3 business leaders
don't trust the information
they use to make decisions

Big Data: Volume



- **Volume:** Scale of data
 - Size of available data is growing
 - More sources of data are added



<http://www.ibmbigdatahub.com/infographic/four-vs-big-data>
<https://opensistemas.com/en/the-four-vs-of-big-data/>

Big Data: Variety



- **Variety:** Diversity of Data

- Growth in data sources has fueled the growth in data types
- Structure can no longer be imposed

As of 2011, the global size of data in healthcare was estimated to be

150 EXABYTES

[161 BILLION GIGABYTES]



30 BILLION PIECES OF CONTENT

are shared on Facebook every month



Variety

DIFFERENT FORMS OF DATA

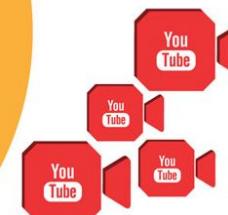


By 2014, it's anticipated there will be

420 MILLION WEARABLE, WIRELESS HEALTH MONITORS

4 BILLION+ HOURS OF VIDEO

are watched on YouTube each month



400 MILLION TWEETS

are sent per day by about 200 million monthly active users

<http://www.ibmbigdatahub.com/infographic/four-vs-big-data>

<https://opensistemas.com/en/the-four-vs-of-big-data/>

Big Data: Velocity



- **Velocity:** Speed of Data
 - Moved from batch to a real-time business

The New York Stock Exchange captures

1 TB OF TRADE INFORMATION

during each trading session



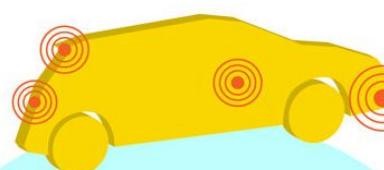
By 2016, it is projected there will be

18.9 BILLION NETWORK CONNECTIONS

– almost 2.5 connections per person on earth



Velocity
ANALYSIS OF
STREAMING DATA



Modern cars have close to

100 SENSORS

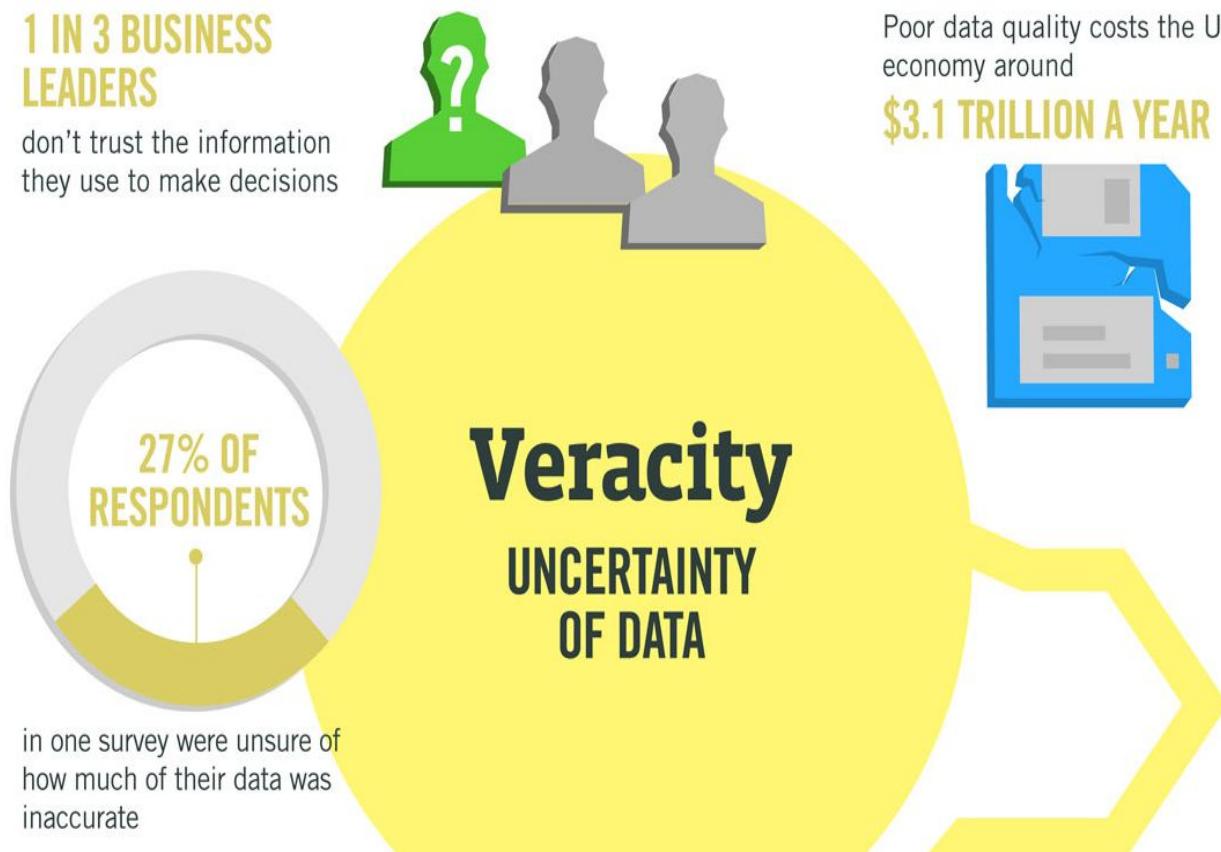
that monitor items such as fuel level and tire pressure



Big Data: 4th Vs



- **Veracity:** Certainty of Data
 - Establishing trust is a huge challenge



<http://www.ibmbigdatahub.com/infographic/four-vs-big-data>

<https://opensistemas.com/en/the-four-vs-of-big-data/>

Big Data: 5th Vs?



- Value of Data
 - Through insights from data analytics

The infographic features a large, stylized mechanical gear on the left and a stack of four silver cylinders with blue glowing bands in the center-right. A gold coin with a dollar sign is shown falling into the top cylinder. The title "The fifth “V”?" is at the top. The main text defines big data as the ability to achieve greater **Value** through insights from superior analytics. A case study box on the left details how a US-based aircraft engine manufacturer uses analytics to predict engine events, leading to 97% accuracy and \$63 million in savings.

The fifth “V”?

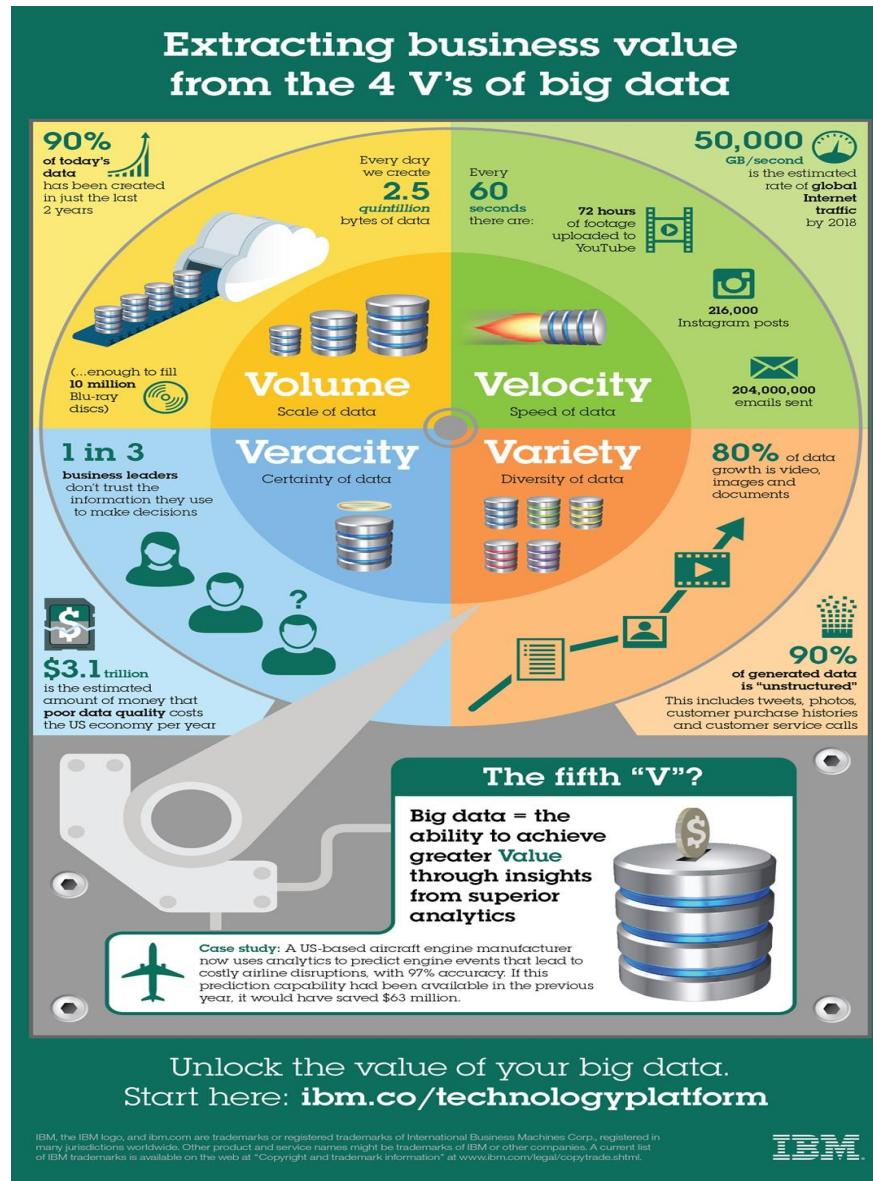
Big data = the ability to achieve greater **Value** through insights from superior analytics

Case study: A US-based aircraft engine manufacturer now uses analytics to predict engine events that lead to costly airline disruptions, with 97% accuracy. If this prediction capability had been available in the previous year, it would have saved \$63 million.

<http://www.ibmbigdatahub.com/infographic/extracting-business-value-4-vs-big-data>

<https://www.bbva.com/en/five-vs-big-data/>

Big Data: Extracting Business Value



Review Questions

- What is the difference between information and knowledge?
- Provide at least 3 examples of unstructured data.
- Describe first 3Vs of the Big Data.
- What is Veracity?

Sources of Enterprise Data



- **Transaction Processing System:** Systems that record a transaction or some form of business-related exchange
 - **Transaction:** Any kind of business exchange
- Enterprise Software
 - Customer relationship management systems (CRM)
 - Supply chain management (SCM)
 - Enterprise resource management (ERP).



Sources of Enterprise Data



- Surveys:
 - Direct surveys can give better information than a cash register.
 - CRM products have survey capabilities
- External Sources
 - Operational insight
 - Increased efficiency
 - Cost savings



Business Intelligence And Analytics



- **Business Intelligence (BI)**: Tools and techniques for analyzing and visualizing past data
 - **Advanced Analytics**: Tools and techniques used to understand why something happened, discover hidden patterns in large data sets and predict future outcomes.
 - **Business Analytics** is an umbrella term for these concepts



Databases: Providing Inputs

- Databases provide input to Business Intelligence and Analytics
 - Maintaining customer records, supporting business processes, sales transactions, inventory management, and marketing.
- Enabling interactive Web sites
 - Product catalog data
 - Customer billing and shipping
 - E-commerce applications process millions of transactions per day

Hadoop: Big Insights



- **Hadoop:** Open-source project created to analyze massive amounts of raw information better than traditional databases
 - Works by splitting large files into blocks which are then distributed across nodes in a cluster to be processed.
- Advantages:
 - Flexibility
 - Computing Power and Scalability
 - Cost effectiveness
 - Fault tolerance



Big Data: Challenges



- Per Accenture Survey
 - 57% of companies didn't have consistently updated, companywide analytical capability
 - Only 60% decisions were backed by analytics
- Incompatible systems:
 - **Legacy Systems:** Older information systems that are incompatible with newer systems and technologies
 - Worsen by mergers and acquisitions
 - Hidden costs of technology integration
- Operational data cannot always be queried:
 - Most transactional databases can't be accessed for reporting and analysis simultaneously.
 - Database analysis requires significant processing.

Big Data Problems : Big Three

- Data Privacy
 - Do we have any control about how much of our personal information is used?
- Data Security
 - Can we trust the organization we shared our data with to keep our data safe?
- Data Discrimination
 - When everything is known, will it become acceptable to discriminate against people based on data we have on their lives?
 - “Big Data: A Tool for Inclusion or Exclusion?”

Federal Trade Commission Report, 2016

Artificial Intelligence



- **Artificial Intelligence:** Computer software that can mimic or improve upon functions that would otherwise require human intelligence.
- Factors fueling growth:
 - New generation hardware chips
 - Big Data
 - Cloud resources
 - Open source algorithms
 - Software development kits
 - Data-capture tools
- The market is exploding
 - Total market size was \$12 billion in 2017
 - The global market size was around \$200 billion in 2023
 - It is expected to grow well beyond that to over \$1.8 trillion by 2030..



<https://www.grandviewresearch.com/industry-analysis/artificial-intelligence-ai-market>

Artificial Intelligence: Types

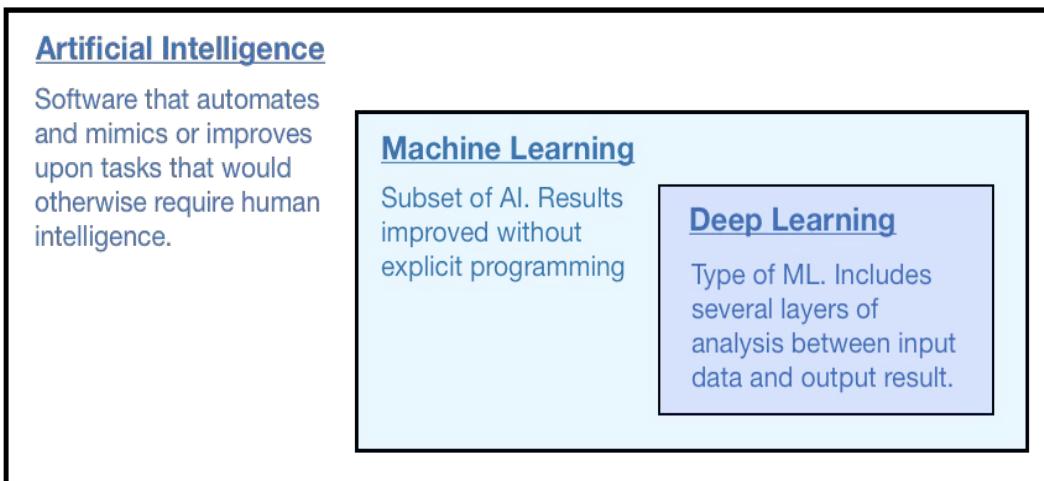


- **Machine Learning** : Type of Artificial Intelligence

- Leverages data so that computers can act and improve on their own without additional programming.

- **Deep Learning:** Type of Machine Learning

- Uses interconnections among data to identify patterns and improve predicted results.



AI can be found in:



Pattern
Recognition



Medical diagnosis



Speech
Recognition



Computer
Vision



Self-driving
Automobiles

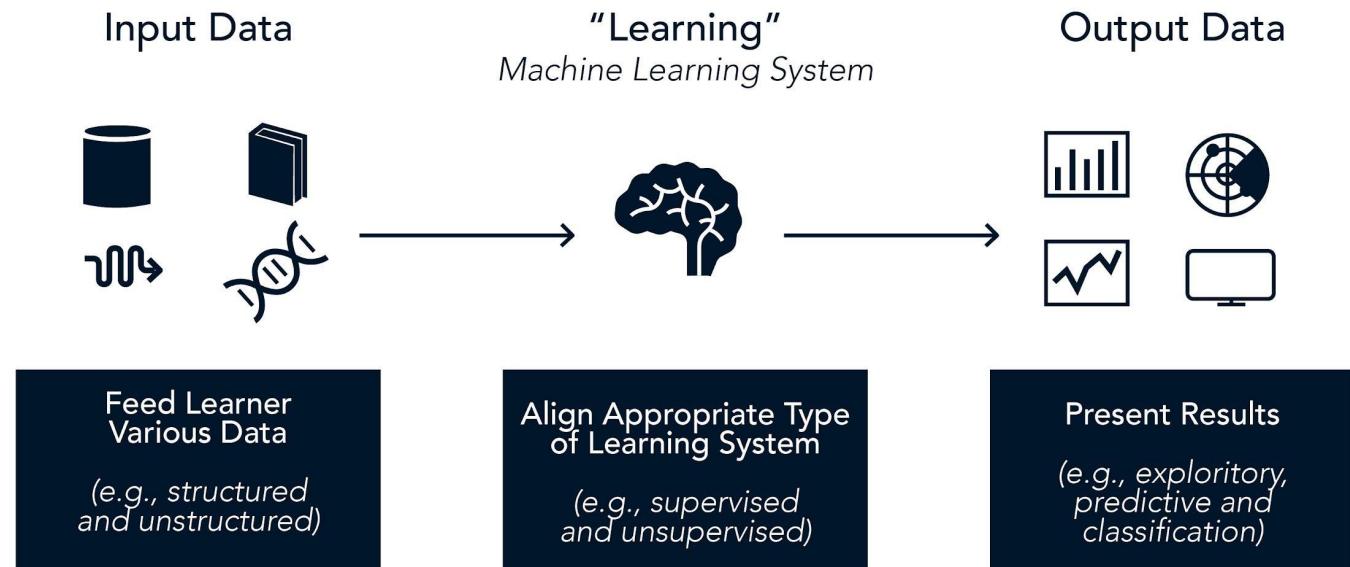


Natural Language
Processing

Artificial Intelligence: Types

- Machine Learning Technology

THE BASICS OF MACHINE LEARNING TECHNOLOGY



Source: Gartner (January 2017)

Artificial Intelligence: Types

- Supervised Machine Learning

- requires humans to provide input and desired output as well as feedback about prediction accuracy during the beginnings of the system

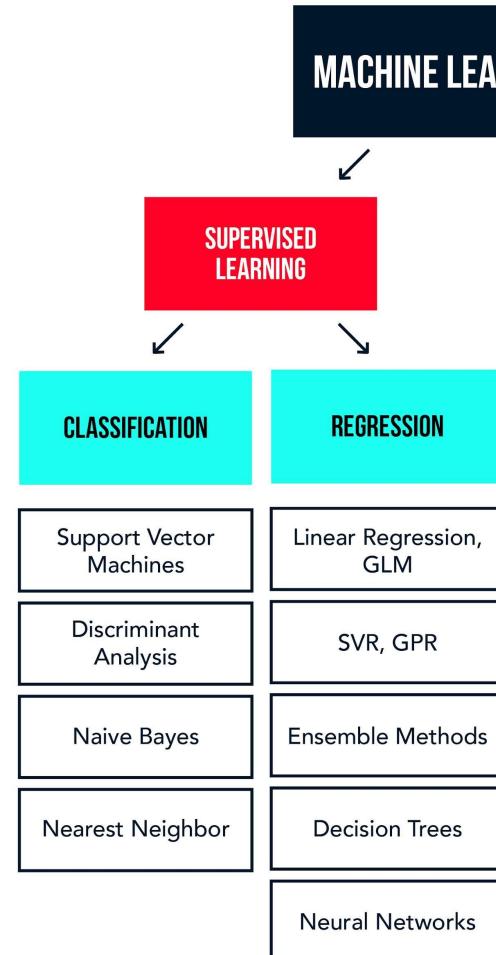
- **Classification** models predict a class label, such as whether a customer will return or not, whether a certain transaction represents fraud or not, or whether a certain image is a car or not.
- **Regression** is used to establish a relationship between a single dependent variable and multiple independent variables. Example of regression is factors that estimate a house's price based on its location, size, ROI, etc

- Unsupervised Machine Learning

- does not need input for the algorithms and does not need to be trained

- **Clustering** is the act of organizing similar unlabeled objects into groups, For instance, the customers can be grouped based on their behavior. Other applications of clustering include image segmentation, document clustering, anomaly detection, and recommendation engines

- led to “Deep Learning”



Artificial Intelligence: Types

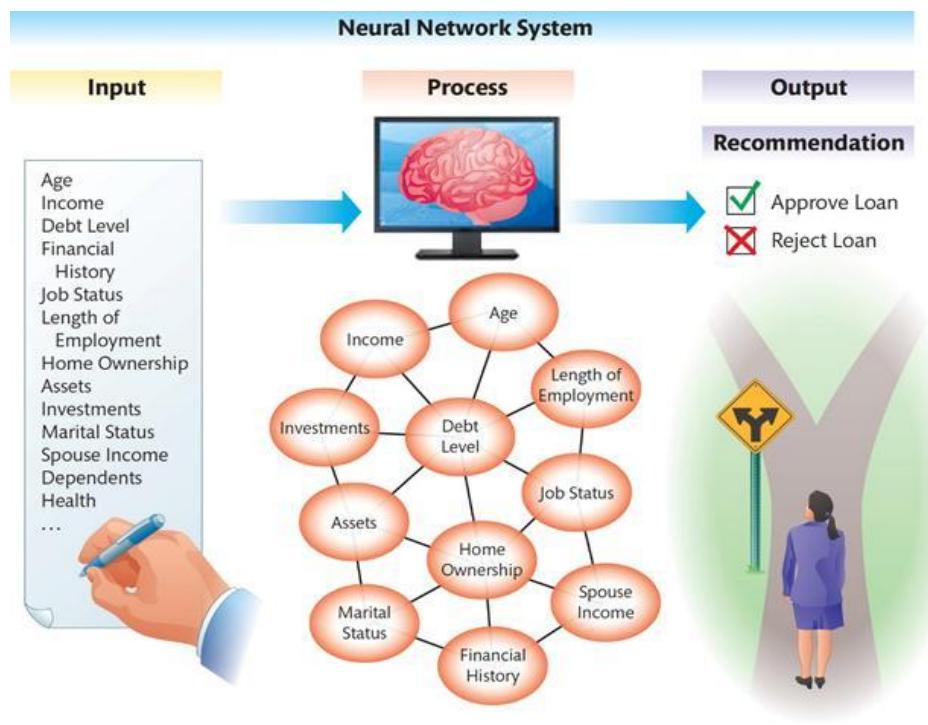
- Deep Learning
 - Algorithms identifying relations in data inspired by process of the human brain
 - Utilizes artificial **neural networks**, which are computer systems modeled after the human brain & nervous system
 - Allows ability to adapt to changes to maximize results

Artificial Intelligence: Types



• Neural Network

- Based on a model of biological activity in the brain, where neurons are interconnected and learn from experience
- Examines data and exposes patterns to build models to exploit findings



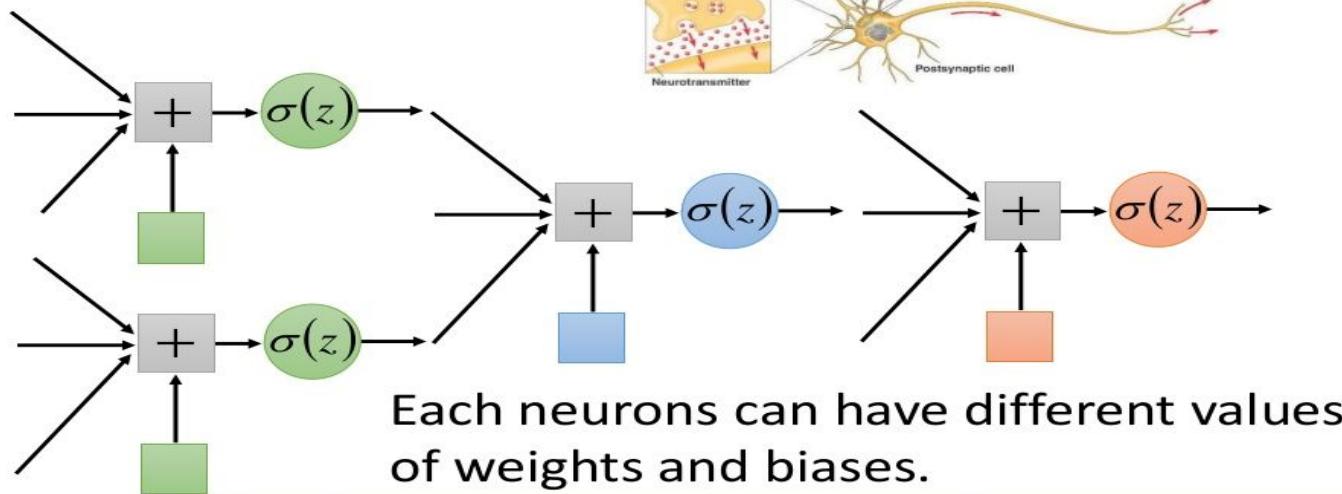
Artificial Intelligence: Types

• Neural Network

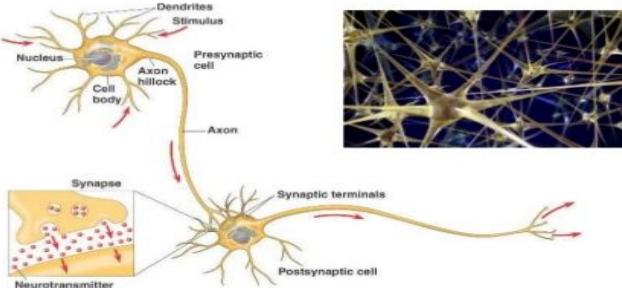
- Training the neural network model means estimating the weights and biases that lead to the best predictive results

Neural Network

Different connections leads to different network structure

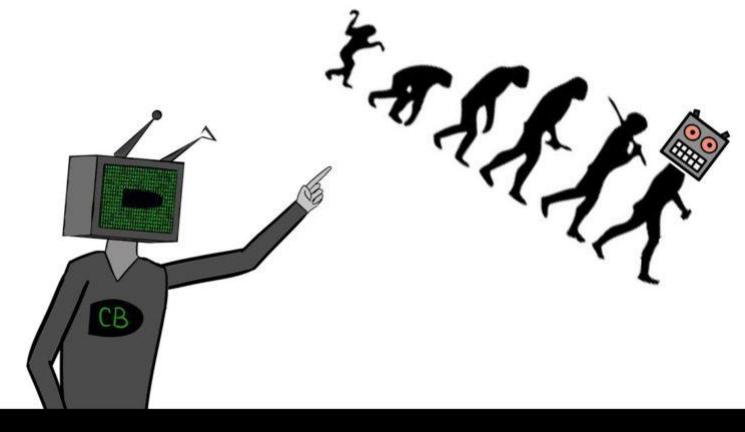


Weights and biases are network parameters θ



Artificial Intelligence: Types

- **Expert Systems:** Leverages rules or examples to perform a task in a way that mimics applied human expertise
- **Genetic algorithms:** Model building techniques where computers examine many potential solutions to a problem.



Artificial Intelligence : Issues

- AI starts with “naked algorithms” that need to be trained.
- Data Issues
 - Quality, inconsistency
 - Not enough data.
- Personnel Issues
 - Lack of technical staff with skills required for maintaining AI systems
- Legal Issues
 - Some types of machine learning may be legally prohibited
 - Data misuse might lead to regulation that limits techniques used

Artificial Intelligence : Issues

- “Generalist” AI (GAI) that’s more intelligent and/or faster than a human
 - Concern that GAI could do serious damage or destroy humanity
 - Human intelligence can be boosted alongside a GAI being built
 - Long term goal of melding the human mind to a computer-based “neural network”
 - Example: “Neuralink”
- Giant AI Experiments: An Open Letter (03/29/2023)
 - Elon Musk and others urge AI pause, citing ‘risks to society’
 - “Powerful AI systems should be developed only once we are confident that their effects will be positive and their risks will be manageable,”
 - calling for a six-month pause in developing systems more powerful than OpenAI's newly launched GPT-4
 - signed by 33,708 people including more than +1,000 of artificial intelligence experts
- Open Letter on Superintelligent AI (Oct 22, 2025)
 - Released by Future of Life Institute; signed by 700+ experts, scientists & public figures
 - Calls for a pause or ban on developing “superintelligent” AI until proven safe
 - Warns of loss of human control, job displacement, and existential risks
 - Highlights the AI race among tech giants (OpenAI, Meta, etc.)
 - Broad concern across tech industry and general public ($\approx 64\%$ support a pause)

<https://cyberscoop.com/ai-superintelligence-ban-open-letter-future-of-life-harry-meghan-tech-leaders/>

Artificial Intelligence: Examples

- **AI chatbot** is a computer program that simulates human conversation using artificial intelligence

- » Answer Questions
- » Write and debug code
- » Analyze and visualize data
- » Write an article or blog post
- » Translate
- » Write a story/poem

- ChatGPT

- » a language-based model fine-tuned for human interaction in a conversational manner.
 - Released by Open AI in November, 2022
 - Reached 100 million monthly active users in January.2022
 - Source of its data is textbooks, websites, and various articles, which it uses to model its own language for responding to human interaction.

- Grok

- » developed by company, xAI, which is integrated with the **X** platform
 - Aims to provide creative and practical assistance, leveraging real-time data from X
 - Grok Imagine
 - image and video generation experience

Artificial Intelligence: Examples



Artificial Intelligence: Examples

- AI in Apple products
 - Data collected and constantly analyzed by Siri
 - Better understanding of voices and accents worldwide
 - Greater understanding of context
 - ApplePay—AI fights fraud by improving analysis with each transaction.
 - Maps—AI helps plot the best route by analyzing all sorts of traffic input.
 - HealthKit—can help keep cheats from climbing the leaderboard.
 - Photos—AI recognizes faces and builds photo collages on what are determined to be your “best” pictures.
 - AI is behind extending device battery life

Artificial Intelligence: Examples

- Neuralink
 - Mission: "Create a generalized brain interface to restore autonomy to those with unmet medical needs today and unlock human potential tomorrow."
 - First patient received the implant in January 2024
 - 7 People Now Have Brain Implant
 - ([Reuters, Feb 20, 2024](#))
- Casino Caesars uses its Ivy virtual concierge to answer questions received via text, reducing calls by 30%.
- Uber uses Microsoft-provided computer vision to scan driver faces and confirm their identity.
- Casino Caesars uses its Ivy virtual concierge to answer questions received via text, reducing calls by 30%.
- C-SPAN uses Amazon's image recognition tools to identify on-screen lawmakers
- Humana and MetLife are using voice analysis software to identify if customer service reps have experienced "compassion fatigue."

Artificial Intelligence : Exercises

- AI Chatbot Prompt Frameworks

CHATGPT CHEAT SHEET			
CHATGPT PROMPTING CHEAT SHEET	PROMPT FRAMEWORKS	TOOLS	
<ol style="list-style-type: none">Tone: Specify the desired tone (e.g., formal, casual, informative, persuasive).Format: Define the format or structure (e.g., essay, bullet points, outline).Act as: Indicate a role or perspective to adopt (e.g., expert, critic, enthusiast).Objective: State the goal or purpose of the response (e.g., inform, persuade).Context: Provide background information, data, or context for content generation.Scope: Define the scope or range of the topic.Keywords: List important keywords or phrases to be included.Limitations: Specify constraints, such as word or character count.Examples: Provide examples of desired style, structure, or content.Deadline: Mention deadlines or time frames for time-sensitive responses.Audience: Specify the target audience for tailored content.Language: Indicate the language for the response, if different from the prompt.Citations: Request the inclusion of citations or sources to support information.Points of view: Ask AI to consider multiple perspectives or opinions.Counterarguments: Request addressing potential counterarguments.Terminology: Specify industry-specific or technical terms to use or avoid.Analogy: Ask AI to use analogies or examples to clarify concepts.Quotes: Request inclusion of relevant quotes or statements from experts.Statistics: Encourage the use of statistics or data to support claims.Call to action: Request a clear call to action or next steps.Questions: Have the AI ask you questions for further clarification or direction.	<p>R-T-F ACT AS A [ROLE] CREATE A [TASK] SHOW AS [FORMAT]</p> <p>T-A-G DEFINE THE [TASK] STATE THE [ACTION] CLARIFY THE [GOAL]</p> <p>B-A-B EXPLAIN PROBLEM [BEFORE] STATE THE GOAL [TASK] ASK FOR OUTPUT [FORMAT]</p> <p>C-A-R-E GIVE THE [CONTEXT] DESCRIBE [ACTION] CLARIFY [RESULTS] GIVE THE [EXAMPLE]</p> <p>A-P-E STATE THE [ACTION] CREATE A [PURPOSE] DESCRIBE [EXPECTATION]</p> <p>E-R-A DESCRIBE [EXPECTATION] ACT AS A [ROLE] STATE THE [ACTION]</p> <p>R-I-S-E SPECIFY THE [ROLE] DESCRIBE THE [INPUT] ASK FOR OUTPUT [STEPS] DESCRIBE [EXPECTATION]</p> <p>R-A-C-E SPECIFY THE [ROLE] STATE THE [ACTION] GIVE THE [CONTEXT] DESCRIBE [EXPECTATION]</p>	 ChatGPT  Visla  Claude  Leia  Visme  Mint  Opus Clip  Uber Suggest  Adobe Firefly  Speechify	<p>PLUGINS</p>  Video Insights  Keymate Search  Scholar AI  WebPilot  Wolfram  VoxScript  Zapier  Pixelow  Create QR Code  Ask Your PDF

Artificial Intelligence : Exercises

- R-T-F Chatbot Prompt Framework
 - Strong AI prompt clearly tells the system:
 - **Role:** Who the AI should act as
 - **Task:** What the AI should do
 - **Format:** How the output should be presented
 - Example
 - Explain a concept of Big Data for beginners
 - **Role:** Act as
 - **Task:** Explain a concept of Big Data for
 - **Format:** Present a concept in
 - AI Test Run
 - Questions
 - Did the response match what was expected?
 - How could the Role, Task, or Format be improved for a clearer result?
 - What part of the R-T-F made the biggest difference in response quality?
 - How can this framework help in academic or professional settings?

Artificial Intelligence : Exercises

- R-T-F Chatbot Prompt Framework
 - Modify the prompt to target a different audience (e.g., “for high school students” or “for company executives”).
 - Compare how the AI’s tone, complexity, and examples change.
 - Discussion questions:
 - How did adjusting the Role or Format change the usefulness of the response?
 - Which version communicated the concept most clearly?

Artificial Intelligence : Exercises

- Teachable Machine
- Akinator
- Quick, Draw

Sources:

Joseph Valacich, Christoph Schneider, *Information Systems Today: Managing in the Digital World*, 8th Edition
John Gallaugher, Information Systems: A Manager's Guide to Harnessing Technology, v. 7.0
Minder Chen, Ph.D., Management Information Systems Lectures