



BIG DATA

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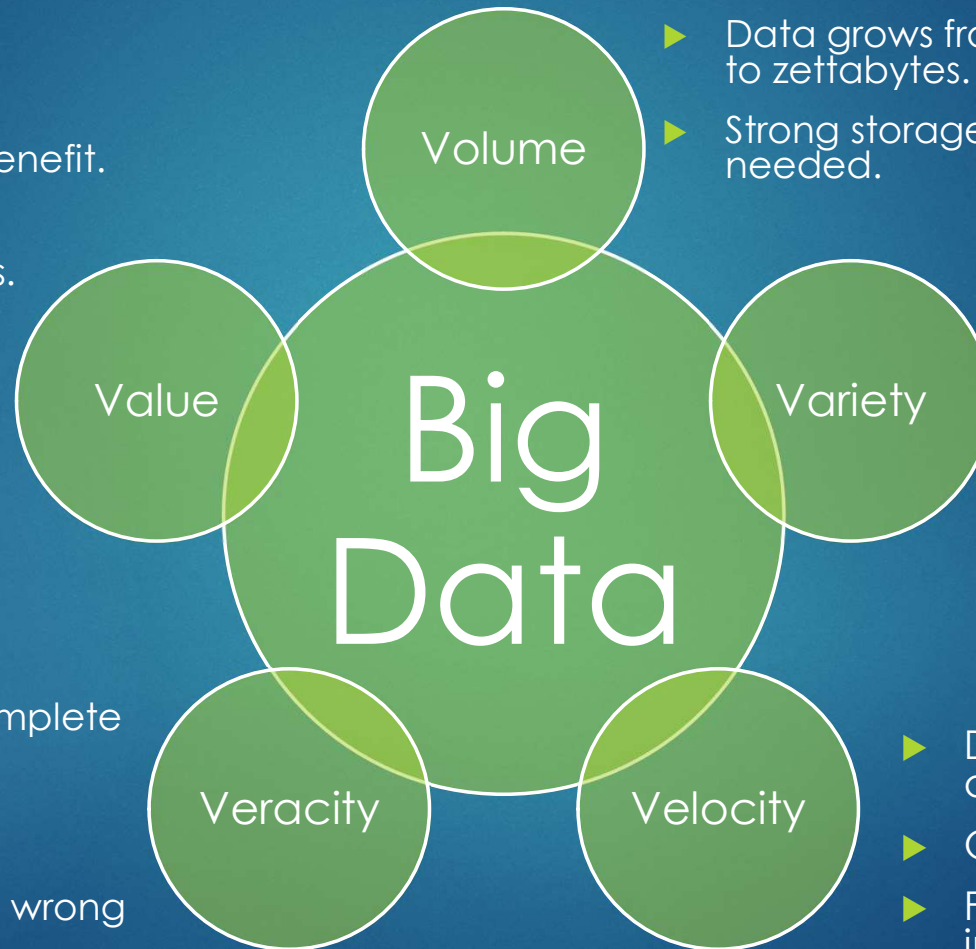


9.1 What is Big Data?

- ▶ Big Data means very large and fast-growing data sets.
- ▶ Normal databases cannot easily store or analyze them.
- ▶ Big Data includes structured and unstructured data.
- ▶ Examples: tables, emails, texts, images, videos, and social media posts.
- ▶ Data comes from many areas, for example finance, healthcare, traffic, and the internet.
- ▶ Big Data also includes the tools used to collect and analyze data.

The 5V of Big Data

- ▶ Data should create real benefit.
- ▶ Better decisions, better products, better processes.
- ▶ Without value, data is not useful.



- ▶ Very large amounts of data.
- ▶ Data grows from terabytes to zettabytes.
- ▶ Strong storage systems are needed.

- ▶ Many different types of data.
- ▶ Structured, semi-structured, and unstructured data.
- ▶ Different tools are needed.

- ▶ Data is not always complete or correct.
- ▶ Data quality is very important.
- ▶ Bad data can lead to wrong results.

- ▶ Data is created very quickly.
- ▶ Often in real time.
- ▶ Fast processing is important.

9.1 What is Big Data?

What is
Big Data?



9.2 Big Data Analytics

- ▶ Big Data Analytics means collecting, cleaning, analyzing, and presenting data.
- ▶ The goal is to turn raw data into useful information.
- ▶ Typical steps:
 - ▶ Collect data from different sources.
 - ▶ Clean and organize the data.
 - ▶ Analyze it with algorithms.
 - ▶ Show the results in reports or dashboards.
- ▶ It helps companies understand customers, machines, and markets better.



Main technologies

- ▶ Machine Learning: finds patterns and makes predictions.
- ▶ Data Mining: searches for connections in data.
- ▶ Hadoop: helps store and process huge data sets.
- ▶ In-memory Analytics: works faster with data in memory.
- ▶ Predictive Analytics: looks at future trends.
- ▶ Text Mining: analyzes texts automatically.

9.3 Benefits of Big Data

Better customer understanding

- ▶ Companies can see customer behavior more clearly.
- ▶ They can find needs and preferences earlier.
- ▶ Marketing and products can be better adjusted.

Improved processes

- ▶ Big Data helps find bottlenecks.
- ▶ It can reduce costs and improve planning.
- ▶ Example: route planning in logistics.

Better decisions

- ▶ Companies can react faster and more accurately.
- ▶ Decisions are based on data, not just on guessing.
- ▶ This can prevent problems before they happen.

Competitive advantage

- ▶ Companies that use data well are often more successful.
- ▶ They work more efficiently and react faster.
- ▶ Big Data can improve business performance.

9.4 Risks associated with Big Data



Total Cost of Ownership



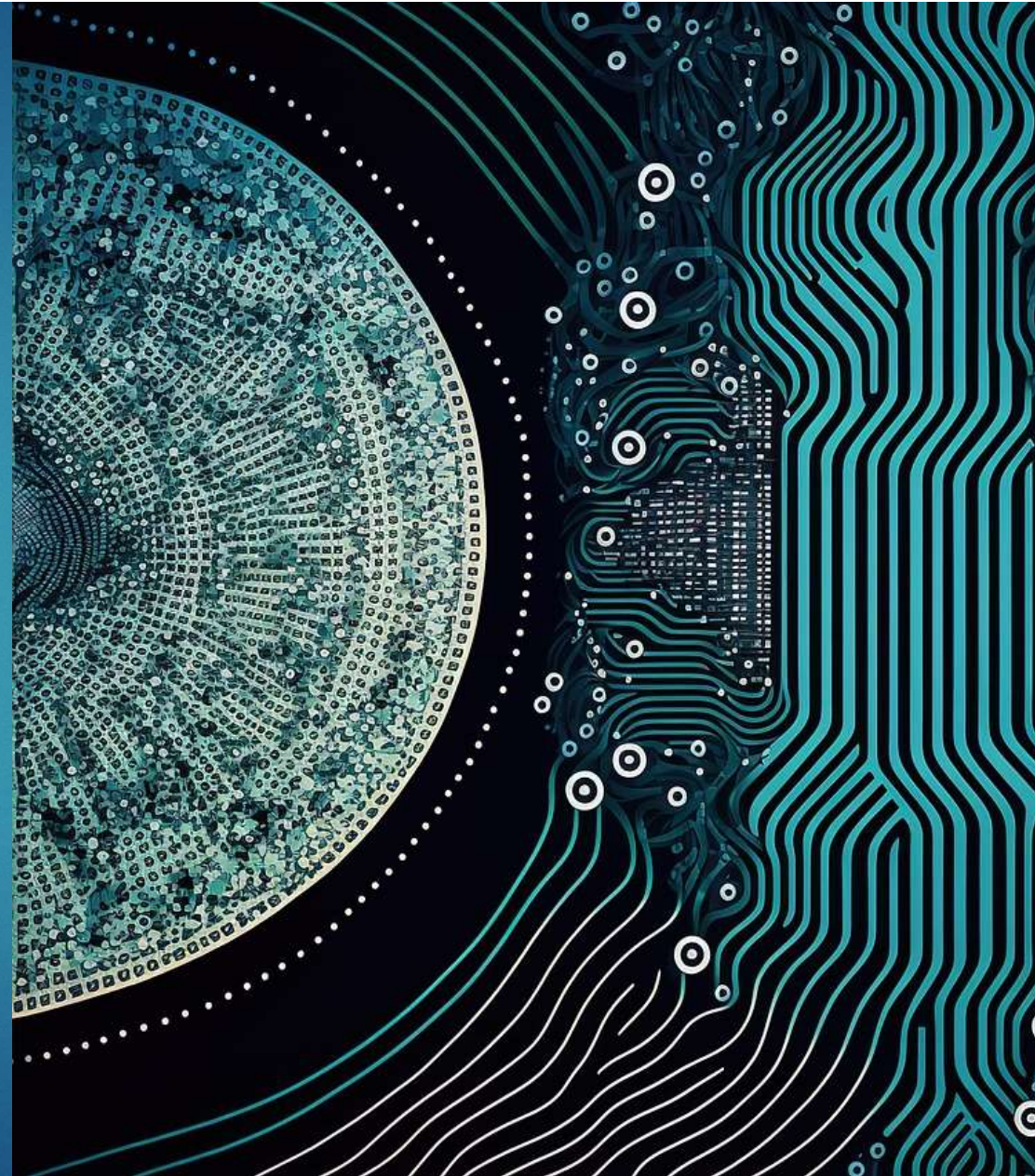
IT-Safety



Transparency

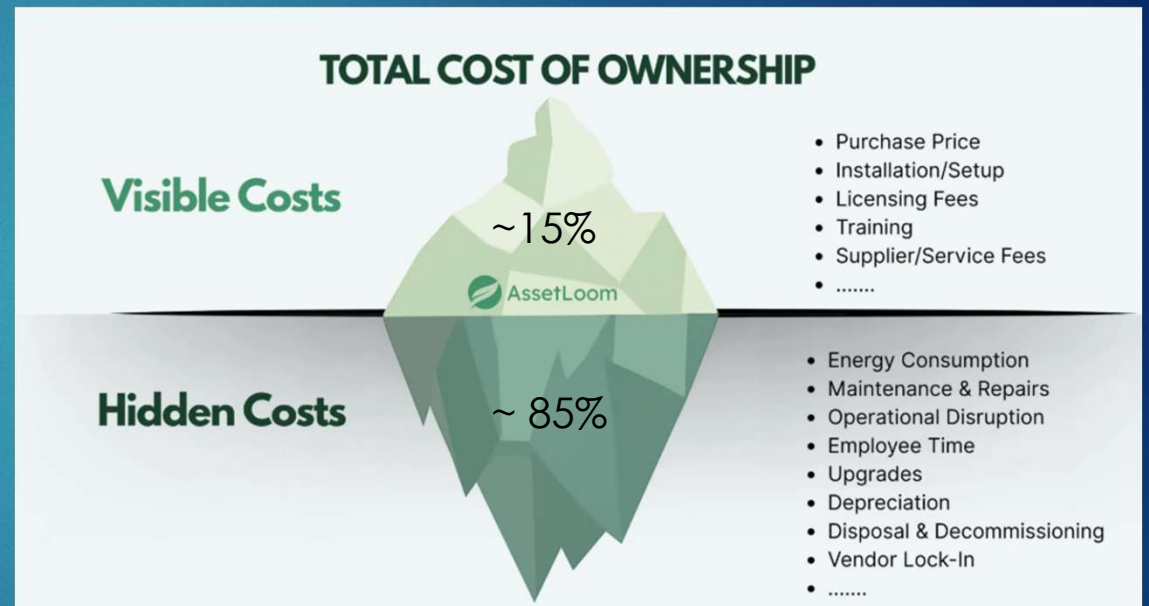


Data Loss



Total Cost of Ownership

- ▶ High costs
- heterogeneous and complex information landscapes
- New software configurations
- New Employees
- Software Maintenance
- Training courses
- etc.



IT-Safety

- ▶ Stricter requirements for fraud prevention and security
- ▶ Results can be manipulated by cybercriminals
- ▶ Sensitive data is often not encrypted
 - would slow down processing speed
- ▶ Data governance policies must be established
 - is intended to regulate the proper management of data
 - Preventing Fraud and Manipulation



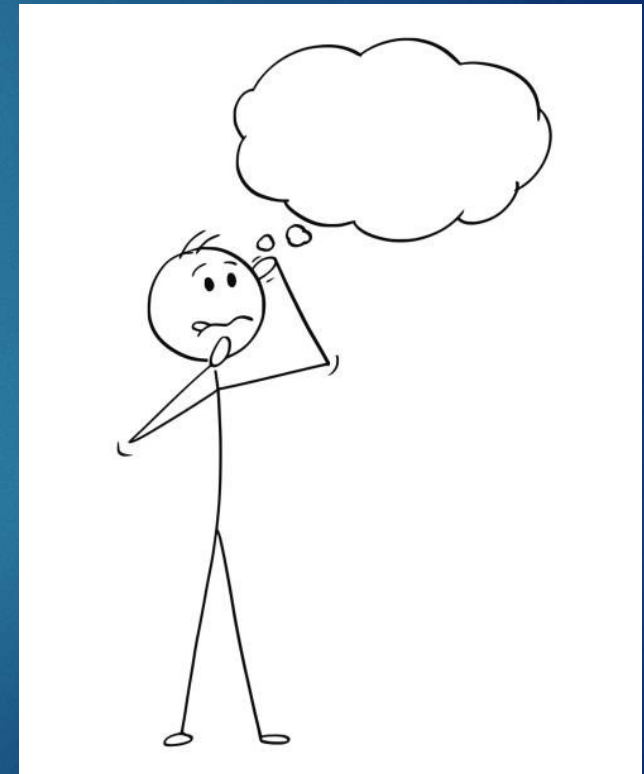
Transparency



- ▶ An appropriate data structure is of great importance
- ▶ Clear data structures and processes form the basis for:
 - Interpreting the data
 - Information flows
 - Responsibilities
- ▶ This is the only way to achieve clarity and transparency in a tangled web of data

Data Loss

- ▶ All essential data must be captured
→ must not be lost
- ▶ Storing and processing large volumes of data is a challenge here
- ▶ Data volumes are constantly growing
→ Existing technologies are reaching their limits
- ▶ Data integrity, performance, and availability must be guaranteed
- ▶ Procurement, commissioning, maintenance, and operation differ from conventional infrastructures
→ Expertise required



9.4 Risks associated with Big Data



BIG DATA
BIG RISKS

9.4 Risks associated with Big Data



Privacy & Data Protection

- ▶ Invasion of privacy is the greatest risk
→ Everyone leaves data behind when browsing the web
- ▶ Cookies are used to analyze users' browsing behavior
→ Saving websites and products

Problem: Loss of anonymity if data is not stored securely

- ▶ Normalization of data collection



competitive disadvantage

- ▶ Big data requires significant investment
- ▶ A disadvantage for smaller companies
→ They cannot cover the costs and therefore cannot benefit from it
- ▶ Only large, established companies benefit
→ Their competitive advantage is further increased

9.5 Big Data Applications



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**HOW BIG DATA IS USED
IN AMAZON
RECOMMENDATION SYSTEMS
TO CHANGE OUR LIVES**

9.5 Big Data Applications



Connected Cars and Traffic Management

Connected cars collect data on speed, location, and traffic to improve navigation and reduce emissions.

Health Monitoring via Mobile Devices

Mobile devices gather health data to monitor conditions and support preventive healthcare decisions.

Retail Data Analytics

Retailers analyze customer behavior to personalize advertising and improve sales efficiency.

Big Data in Energy Management

Smart grids use Big Data to optimize energy distribution and integrate renewable sources sustainably.

9.5 Big Data Applications

Predictive Policing and Ethics

Law enforcement uses Big Data to predict crime locations, enhancing resource deployment but raising privacy concerns.

Aerospace Engineering Optimization

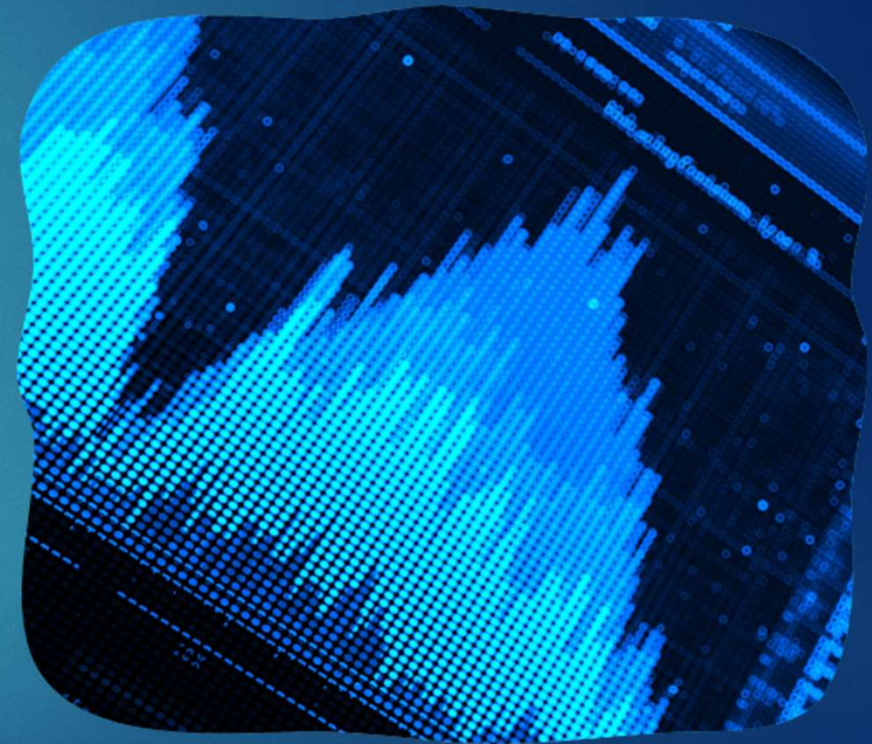
Big Data simulations help aerospace engineers model engine performance and improve safety before production.

Maritime Performance Monitoring

Sensor data from ships enables monitoring of engine and hull conditions to optimize fuel efficiency and maintenance.

Financial Fraud Detection

Real-time analysis of transaction patterns detects credit card fraud and triggers automatic security alerts.



The background features a dark blue field with numerous light blue, curved streaks that create a sense of motion and depth. In the upper right corner, there is a solid, bright green rectangular shape.

THANK YOU!

SINAH STIEHLE, MAX RAPP