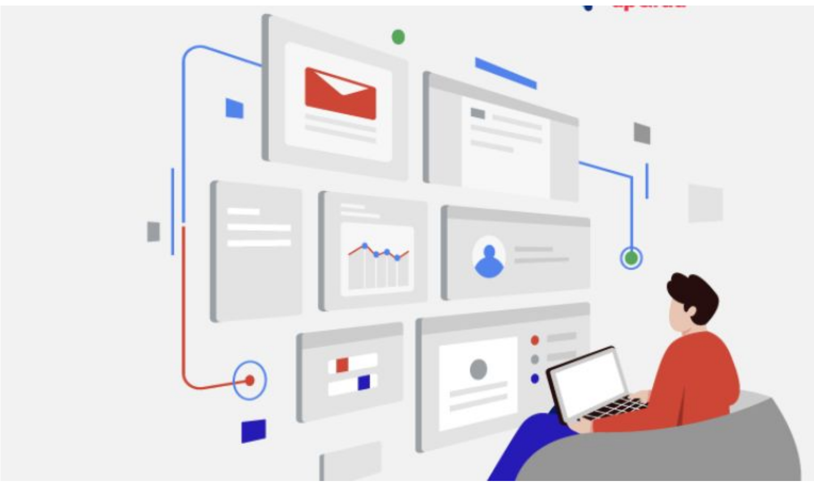
CIS 635 - 04 Knowledge Discovery & Data Mining

Data modalities - Introduction and Overview

Outline

- Everyday observed data and their modalities and types
- Data Trends, and where DS fits

Everyday observed (real life) data



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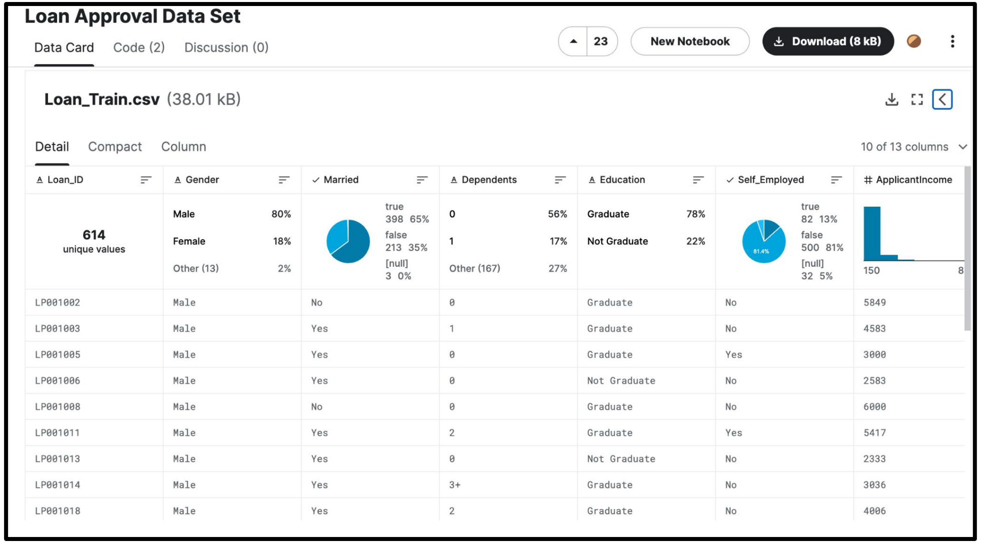
- It’s very difficult to **segregate them into different types** as data come in different **format** and in different **modalities**.
- We will try a **simplified approach** to **group** them and try to cover most (NOT ALL) data we perceive in our everyday life.

Everyday observed (real life) data

- Structured data
- Un(and Semi) structured data

Structured data



Loan Approval Data Set

Data Card | Code (2) | Discussion (0)

Loan_Train.csv (38.01 kB)

Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome
614 unique values	Male 80% Female 18% Other (13) 2%	true 398 65% false 213 35% [null] 3 0%	0 56% 1 17% Other (167) 27%	Graduate 78% Not Graduate 22%	true 82 13% false 500 81% [null] 32 5%	150 8
LP001002	Male	No	0	Graduate	No	5849
LP001003	Male	Yes	1	Graduate	No	4583
LP001005	Male	Yes	0	Graduate	Yes	3000
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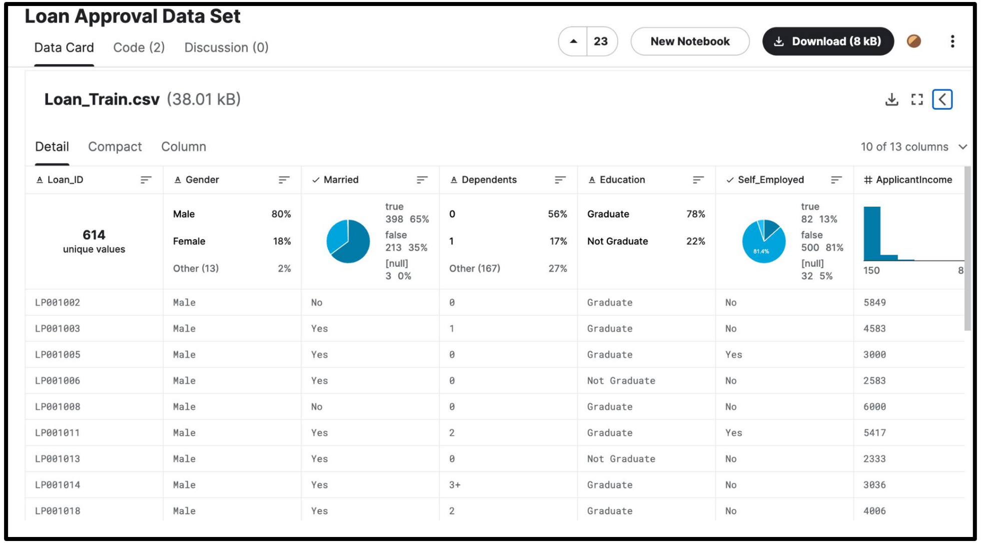
- Generally organized in **tables** and collected through filling **forms** (manual or online)
- Stored in **databases/spread -sheets** mainly
- Also popular the **.csv** file format

- Opening a bank account
- University registration
- Gmail
- Amazon account
- Your health profile

Kaggle loan approval dataset

Structured data



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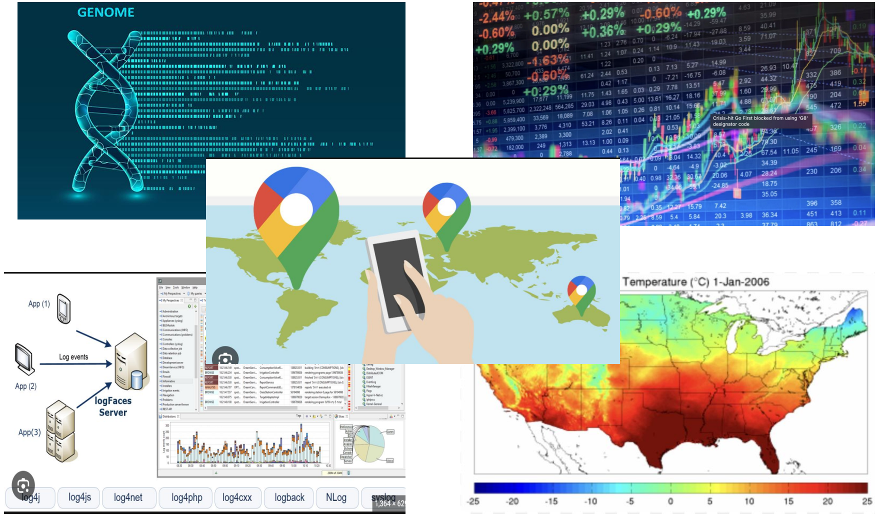
- Opening a **bank account**
- **University registration**
- **Gmail, Azure, and/or Amazon** account
- Your immigration, health, social media **profile**

Kaggle loan approval dataset

Structured data



- There also other formats, or you can convert them to
- Some are stand alone, while others are sequences and/or series
- Software generated logs

- Genomics data
- Stock prices
- Your CC history
- Weather data
- Google maps

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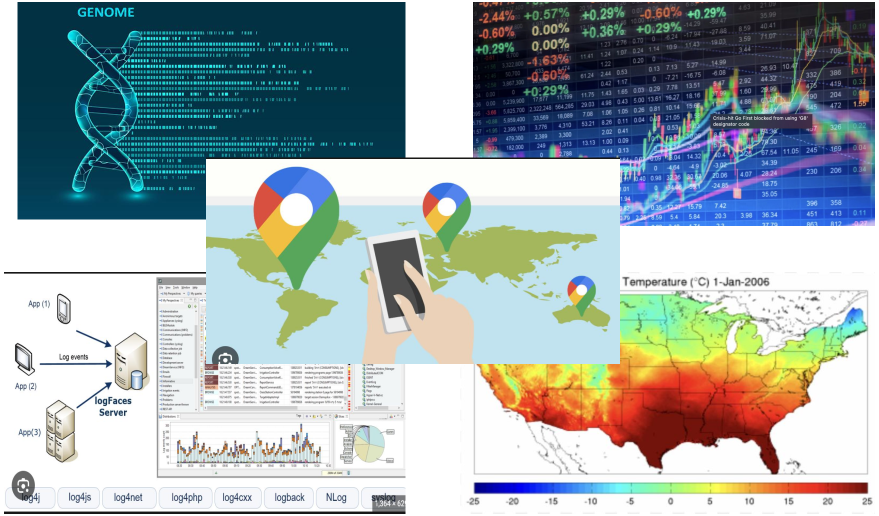

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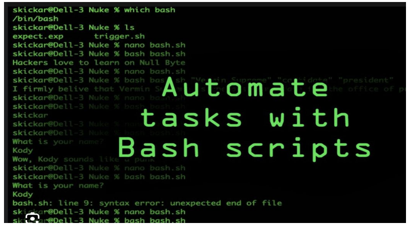
Un/Semi Structured data

- Free forms
- Stored in data lake/warehouses mainly
- **Languages**: sequence of strings (semantics)
- **Audio**: Language + Acoustics; Music
- **Image** : Visual representation of the world
- **Video**: Sequence of images



```
skickar@Dell-3 Nuke % which bash
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Hackers love to learn on Null Byte
skickar@Dell-3 Nuke % nano bash.sh
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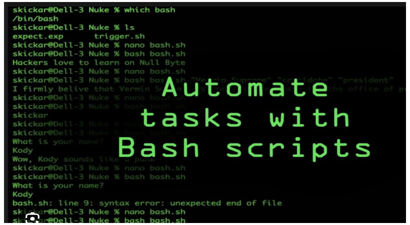

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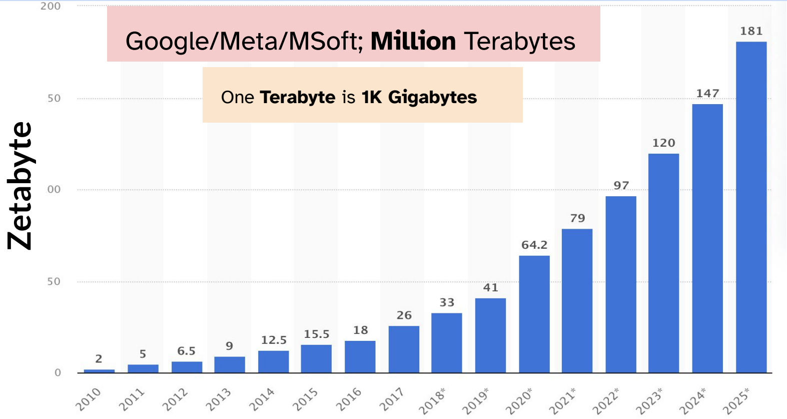
- **Social media** data (discussions, messages, emotions, vives)

Data Growth and the Trend

Data Growth and the Trend

One **Zettabyte** is approximately equal **1 billion Terabytes**



Google/Meta/MSoft; **Million** Terabytes

One **Terabyte** is **1K Gigabytes**

Volume of data/information created, captured, copied, and consumed worldwide from 2010 to 2020, with forecasts from 2021 to 2025

- **Exponential growth**
  - ○ ***Before 2010 collectively relatively close to Zero***
- Mainly due to
  - ○ IoT sensors
  - ○ Social media
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- Forecast might be underestimated as we expect more due to the recent Generative AI/LLM releases (ChatGPT for an example)

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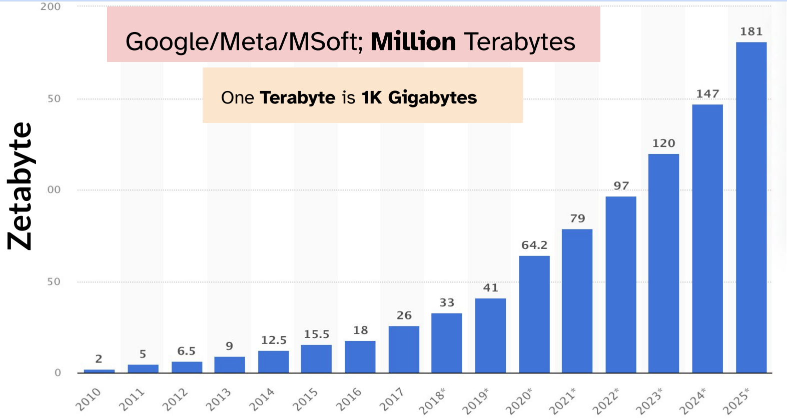

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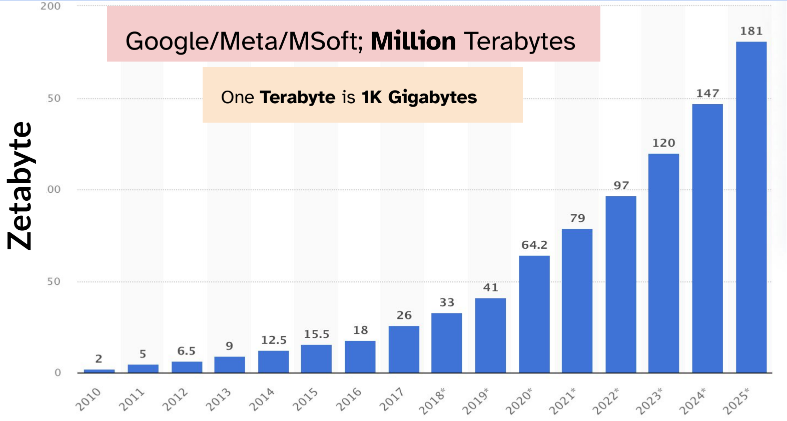

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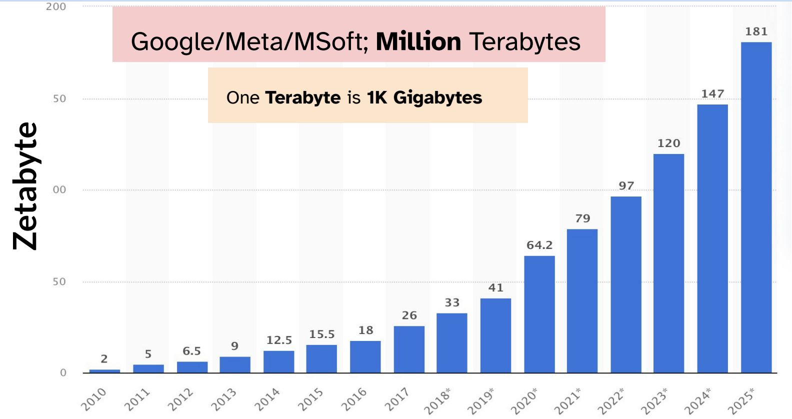

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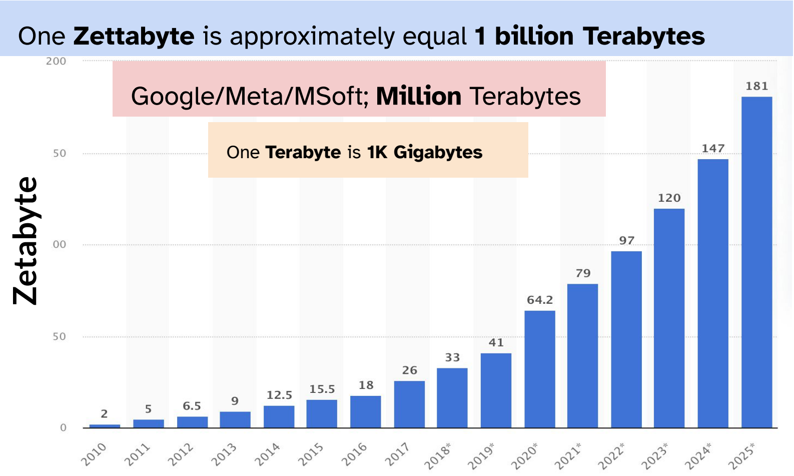

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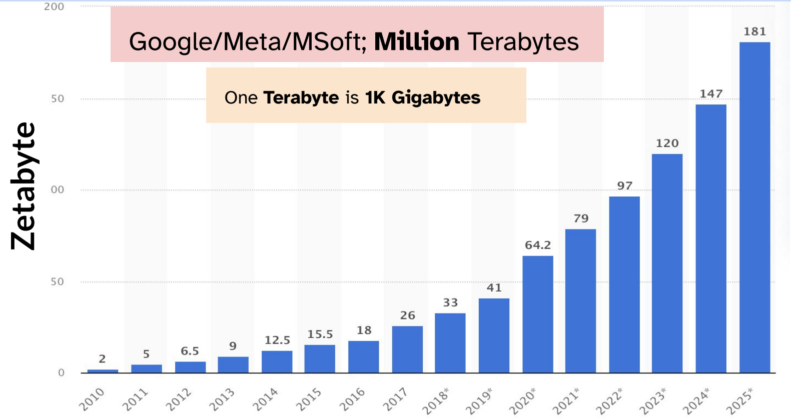
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- We need to tackle new challenges, and many more are yet to come
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- However, most the basic principles relates to basics of Math, Statistics and Probability theories. **Tribute** to

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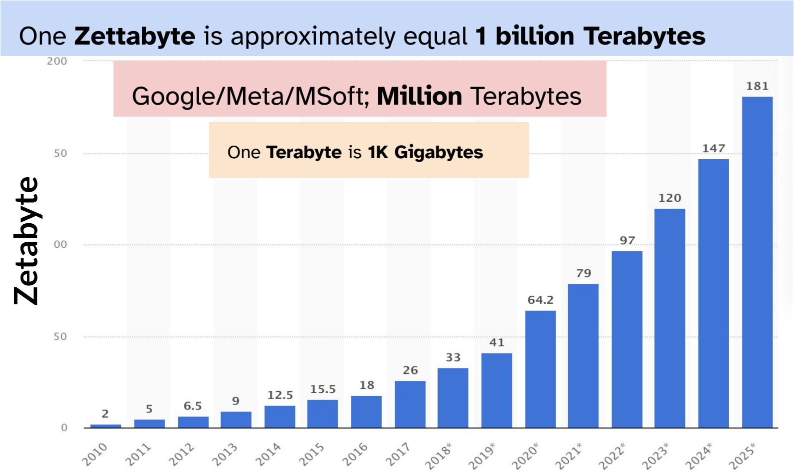

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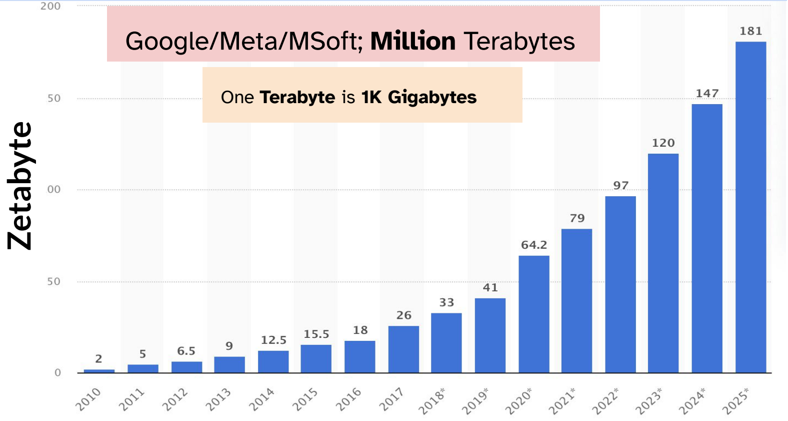

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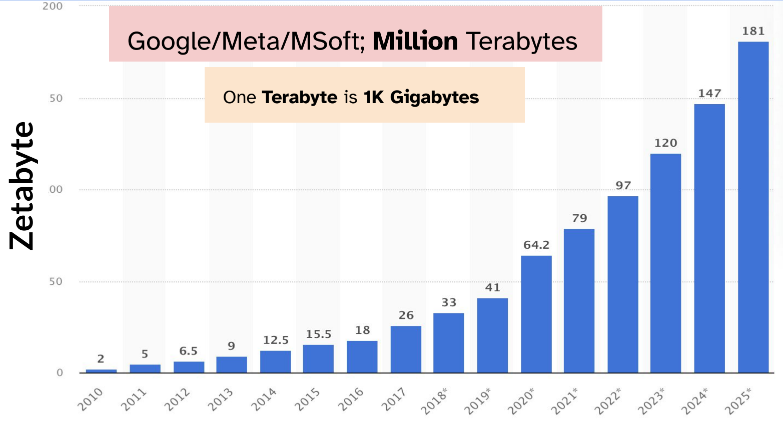

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Bernoulli's *Ars Conjectandi* was the first work that dealt with probability theory as currently understood.

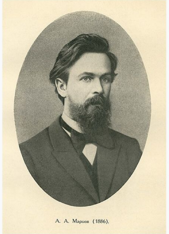
Carl Friedrich Gauss made major contributions to probabilistic methods leading to statistics;

Thomas Bayes

ortrait purportedly of Bayes used in a 1936 ok,[1] but it is doubtful whether the portrait is ually of him.[2] No earlier portrait or claimed portrait survives.

Gerolamo Cardano (16th century)

Andrey Andreyevich Markov



Markov in 1886

QA