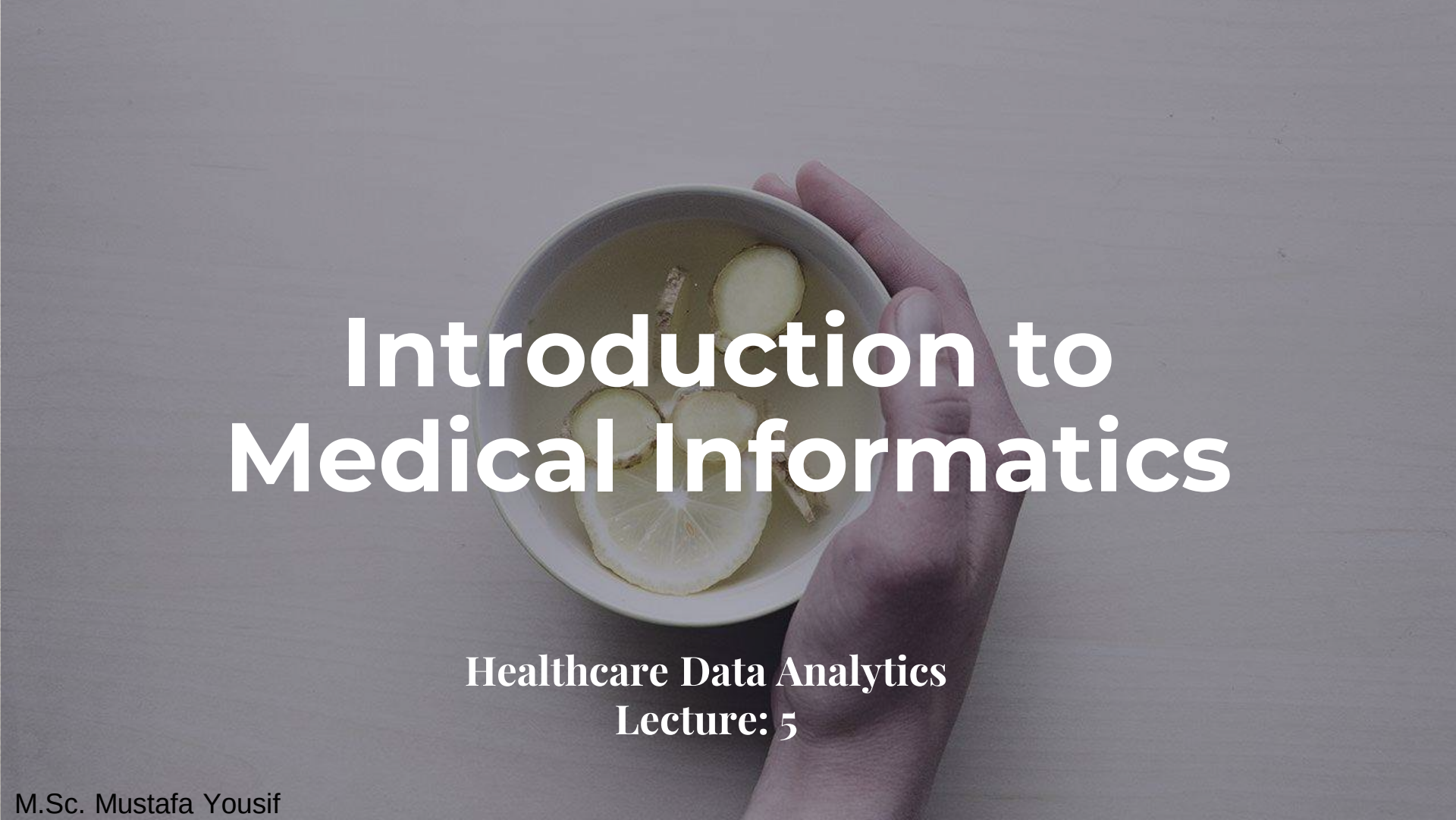


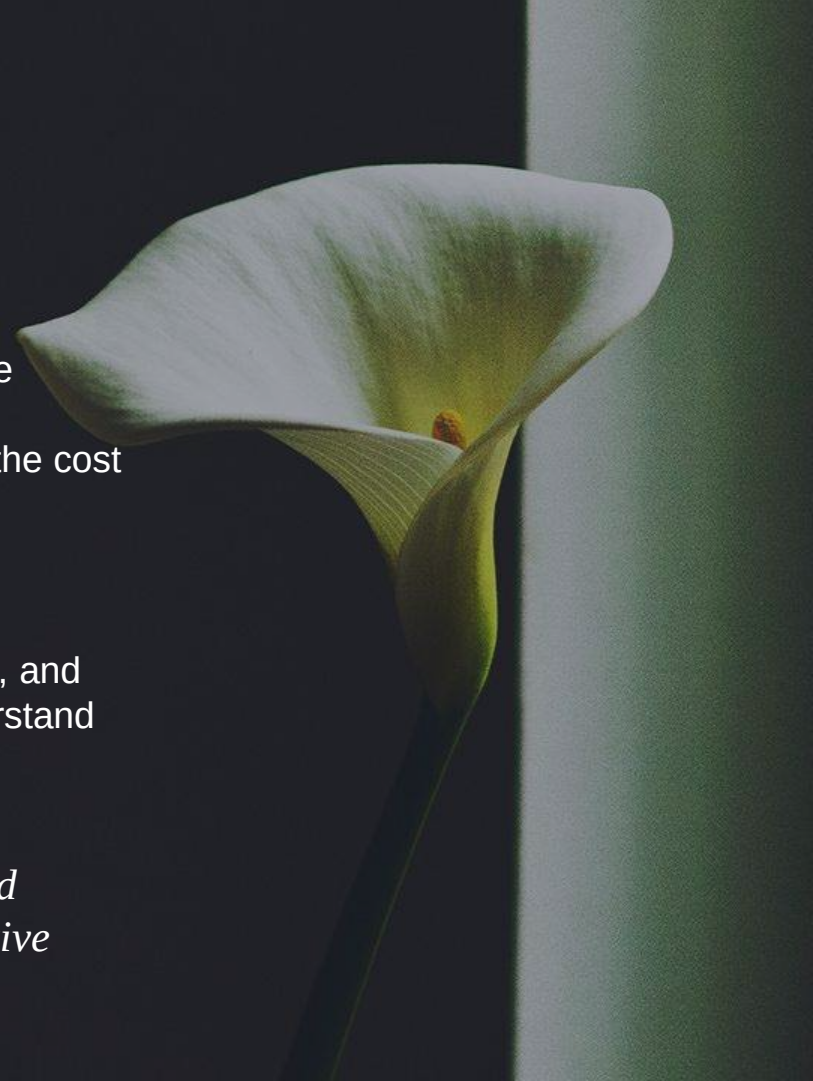
Introduction to Medical Informatics

Healthcare Data Analytics
Lecture: 5

M.Sc. Mustafa Yousif

1
Introduction to Data analysis

Let’s start with the first set of slides



“

They Collect and interpret data from a variety of sources (e.g., the electronic health record, billing , reports, and patient satisfaction surveys) to help organizations improve the quality of care, lower the cost of care, and enhance the patient experience

They are responsible for automating internal and external reports, and presenting information to help hospital mangers and others understand the operational impact of the data

The term **analytics** is “*the extensive use of data, statistical and quantitative analysis, explanatory and predictive models to drive decisions and actions*”

Healthcare analytics now allows

Collecting both Health, Behavioral data

Improve overall health for individual patients

Identify best treatments for diseases

Reduce excessive spending on health care

Identify preventive measures against illnesses

Use Case 1

What's the Best Medicine for a Cough?

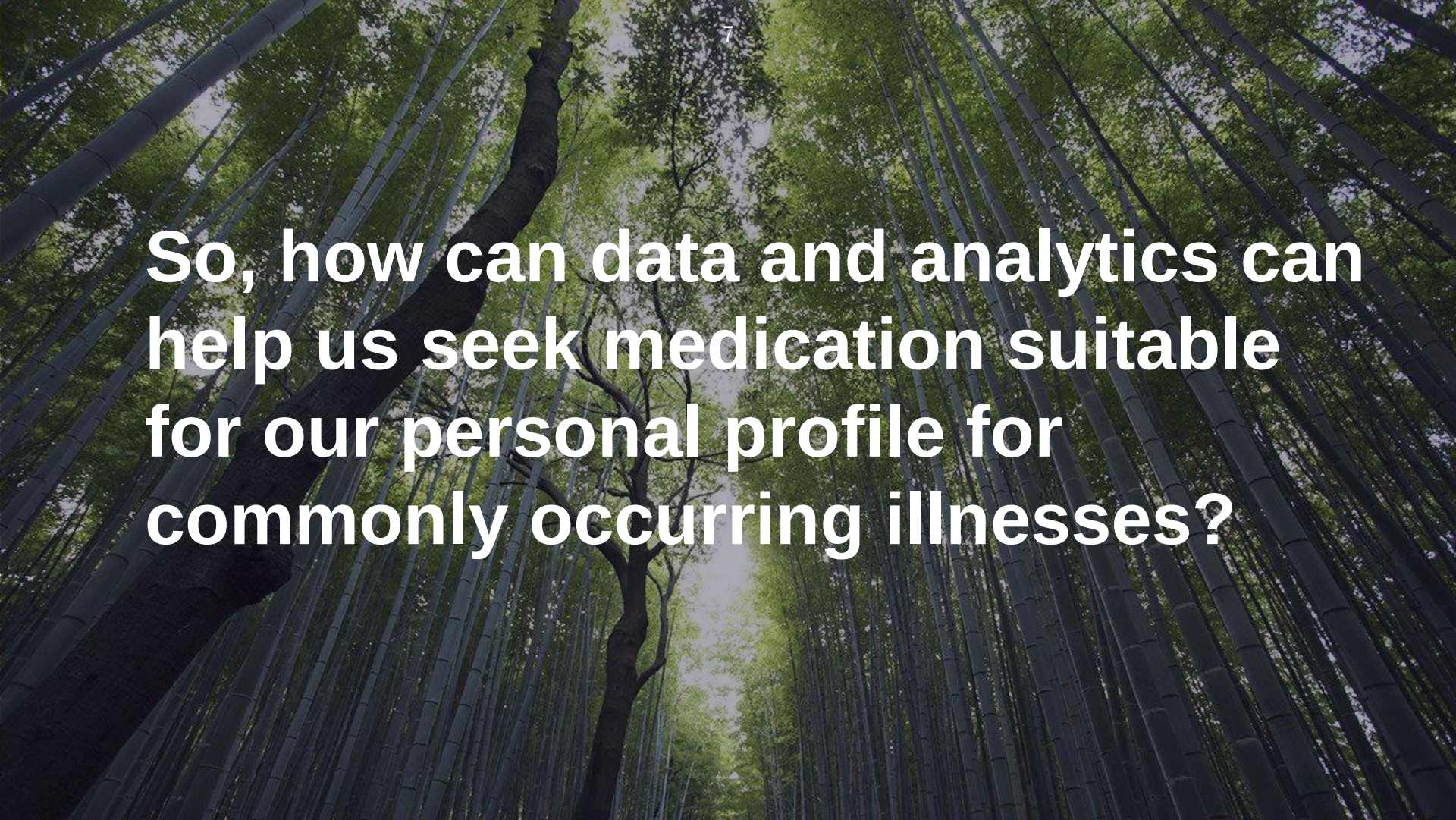
Symptoms of a cough &cold

- Stuffy nose
- Sore throat
- Shortness of breath

- Lasts up to a week
- in severe case months

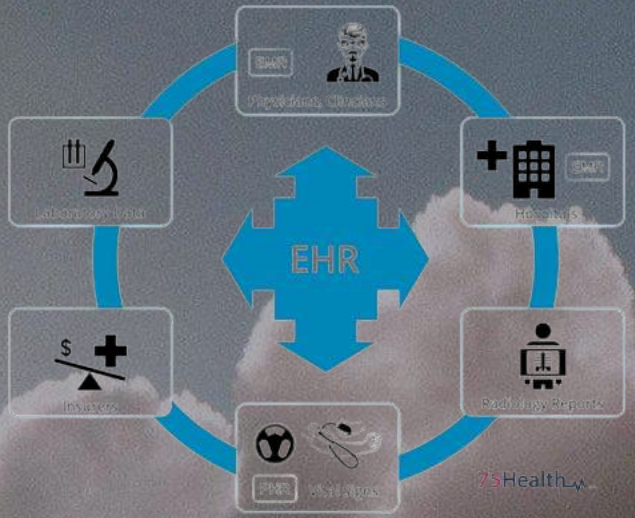
In most cases you end up buying generic cough / cold medication Which may only alleviate some symptoms

Little evidence that these medications are effective for al!



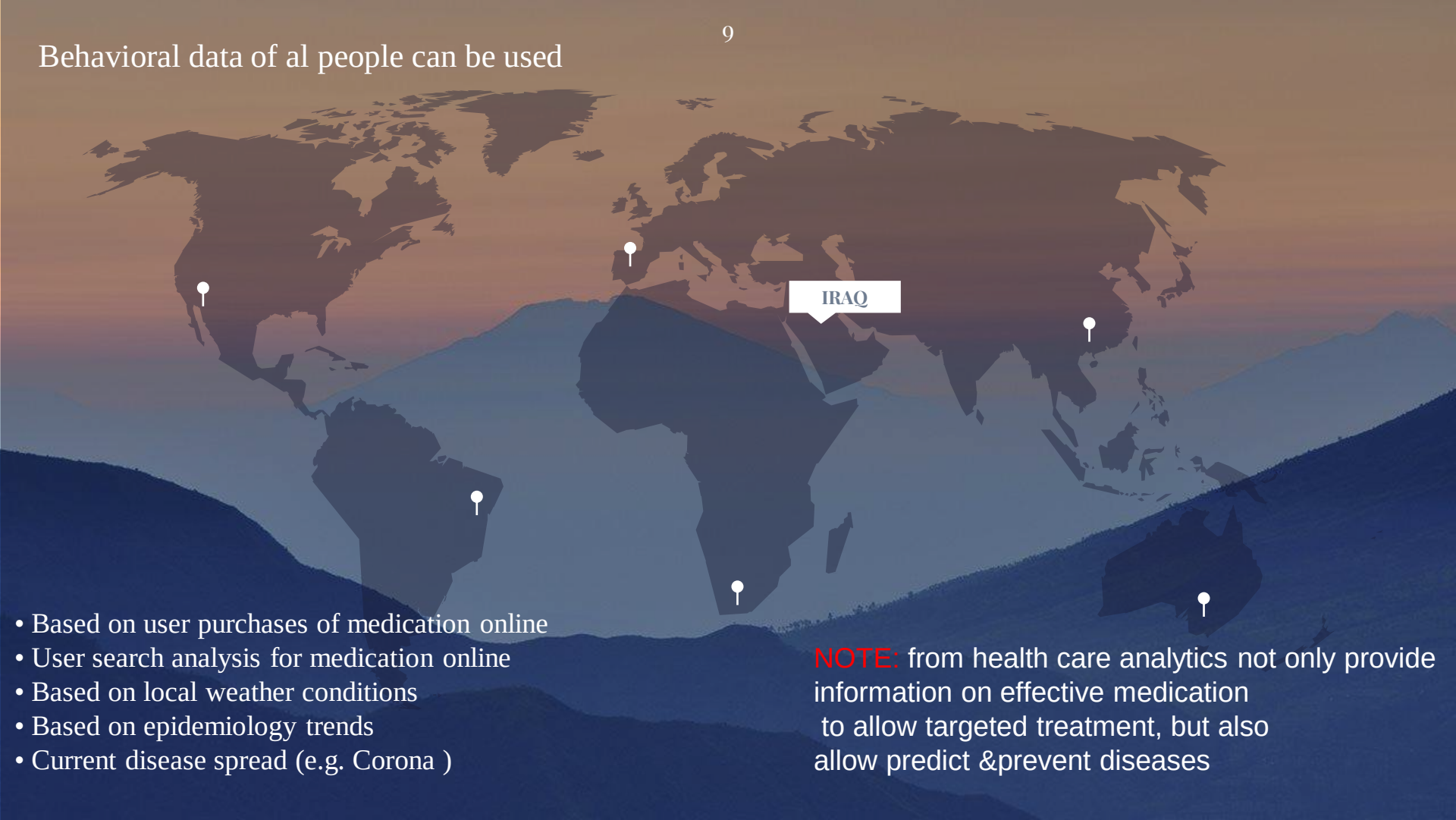
So, how can data and analytics can help us seek medication suitable for our personal profile for commonly occurring illnesses?

The insights depends on which data is available from you personal medical history, on your location, online behavior, recent climatic trends etc.



Electronic health records give information on your Personal Health profile

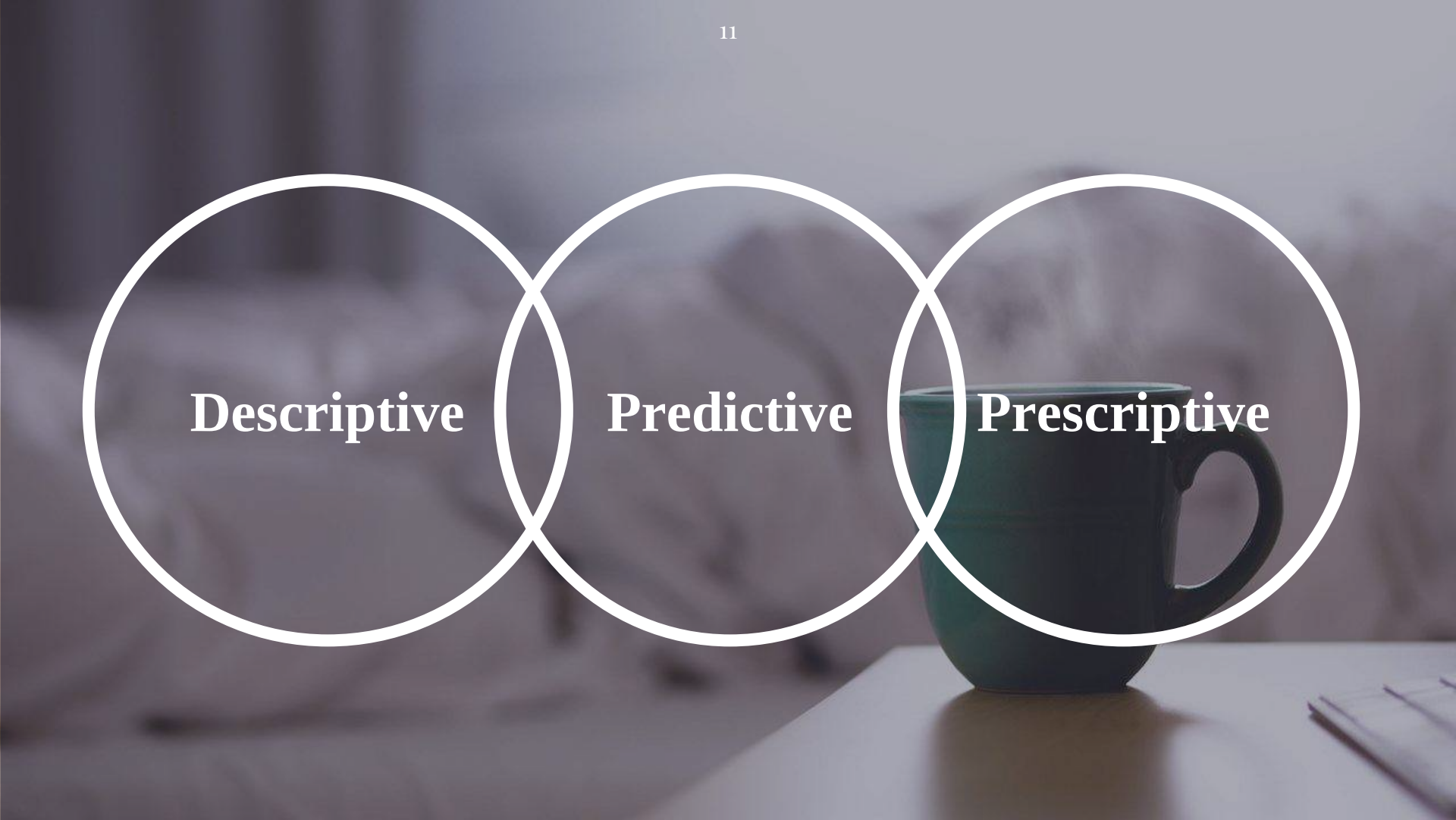
Behavioral data of al people can be used



- Based on user purchases of medication online
- User search analysis for medication online
- Based on local weather conditions
- Based on epidemiology trends
- Current disease spread (e.g. Corona)

NOTE: from health care analytics not only provide information on effective medication to allow targeted treatment, but also allow predict &prevent diseases

Types of Analytics


Descriptive
Predictive
Prescriptive

Types of Analytics

1- Descriptive : "standard types of reporting that describe current situations and problems".

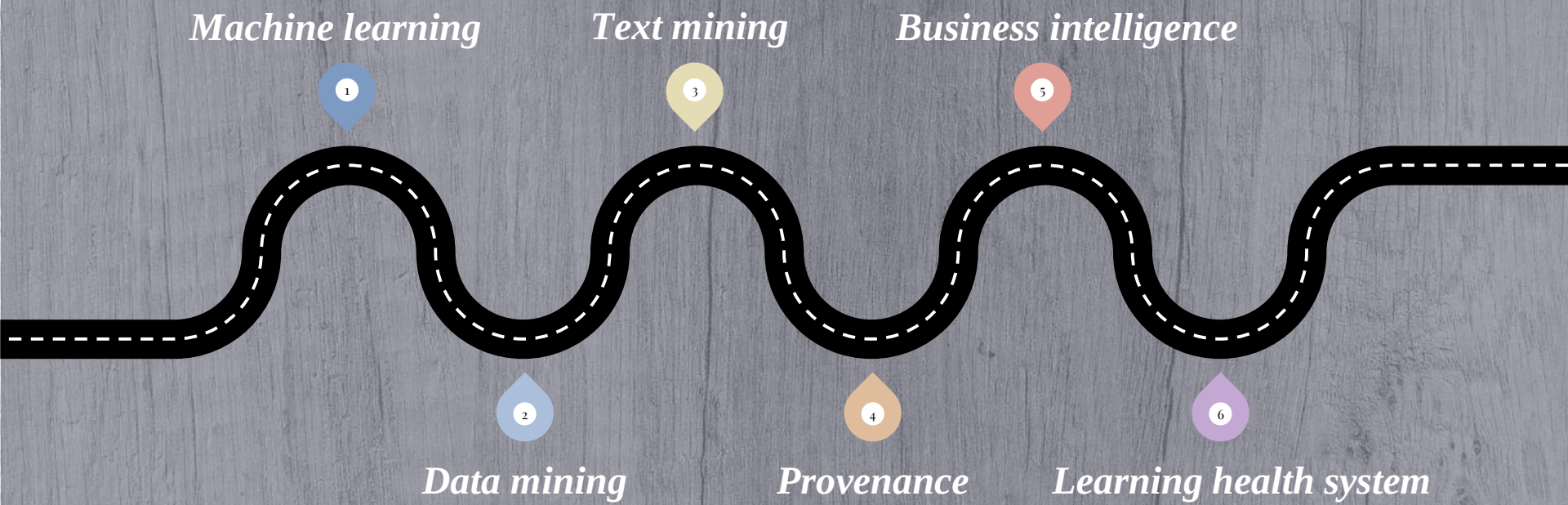
2- **Predictive:** "simulation and modeling techniques that identify trends and predict outcomes of actions taken"

3- Prescriptive: "is the area of data analytics that focuses on finding the best actions in a scenario given the available data. It's related to both descriptive analytics and predictive analytics but focus actionable insights instead of data monitoring".

Analytics Concepts

1. first → 2. second → 3. last

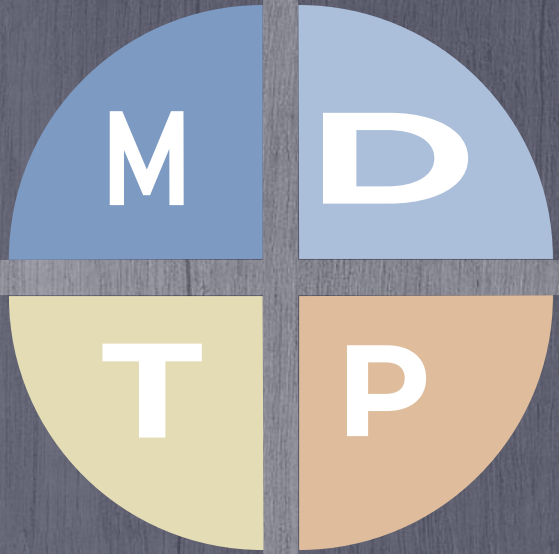
Analytics Concepts



Analytics Concepts

Machine learning

is the area of computer science that aims to build systems and algorithms that learn from data



Data mining

is defined as the processing and modeling of large amounts of data to discover previously unknown patterns or relationships

sub-area, applies data mining techniques to mostly unstructured textual data.

Text mining

which is where the data originated and how trustworthy it is for large-scale processing and analysis

Provenance

Analytics Concepts

Business intelligence

in healthcare refers to the “processes and technologies used to obtain timely, valuable insights into business and clinical data”

where data can be used for continuous learning to allow the healthcare system to better carry out disease surveillance and response, targeting of healthcare services, improving decision-making, managing misinformation, reducing harm, avoiding costly errors, and advancing clinical research

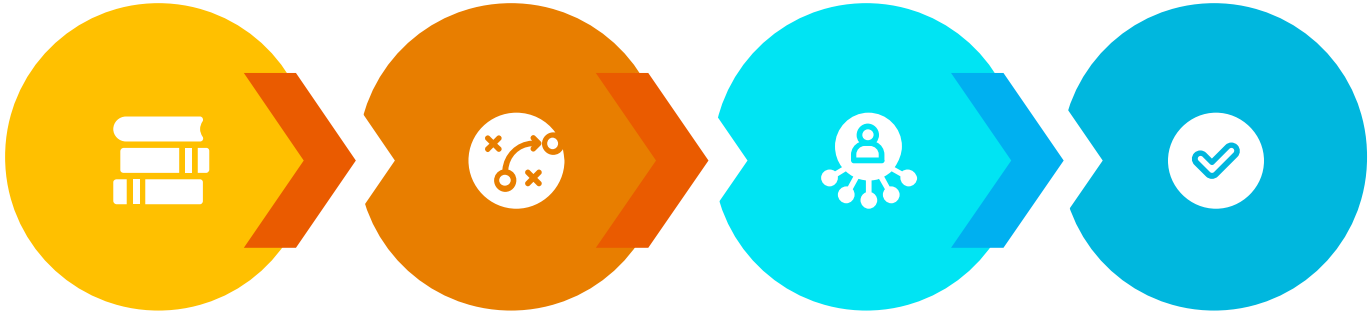
Learning health system


Big Data

Big Data

describes large and ever-increasing volumes of data that have the following attributes:

Big Data



ever-increasing amounts

quickly generated

many different types

from trustable sources

Big Data

- **In healthcare informatics, we are having to deal with terabytes and petabytes of information today**

- **Healthcare organizations are generating an ever-increasing amount of data**

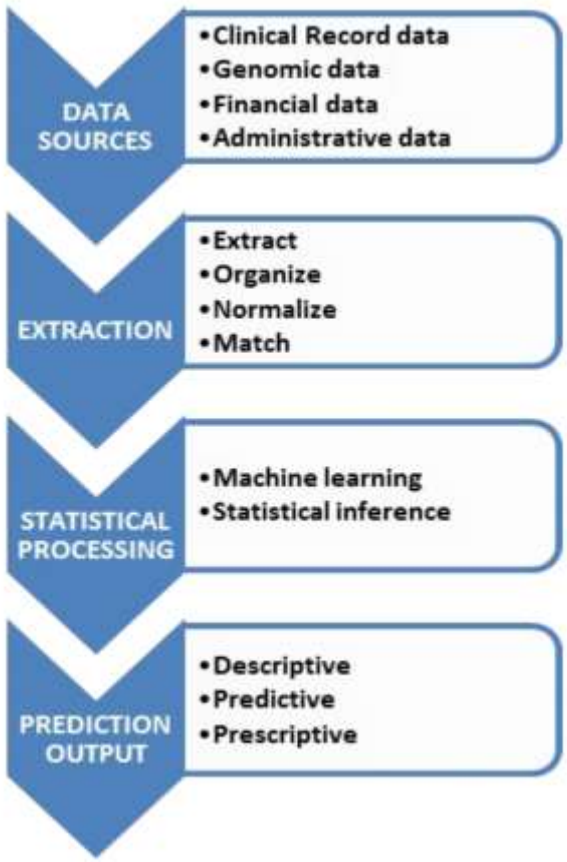
- **In all healthcare organizations, clinical data takes a variety of forms**
  - **structured** (e.g., images, lab results, etc.)
  - **unstructured** (e.g., textual notes including clinical narratives, reports, and other types of documents)

  - IBM's Watson is now focusing on healthcare, specifically Oncology so that massive amounts of cancer information/research can be analyzed and applied to individual patient decision making

The Analytics Big Data Pipeline

Process of big data analytics resembles a pipeline,
and have developed an approach that specifies four major steps in this pipeline

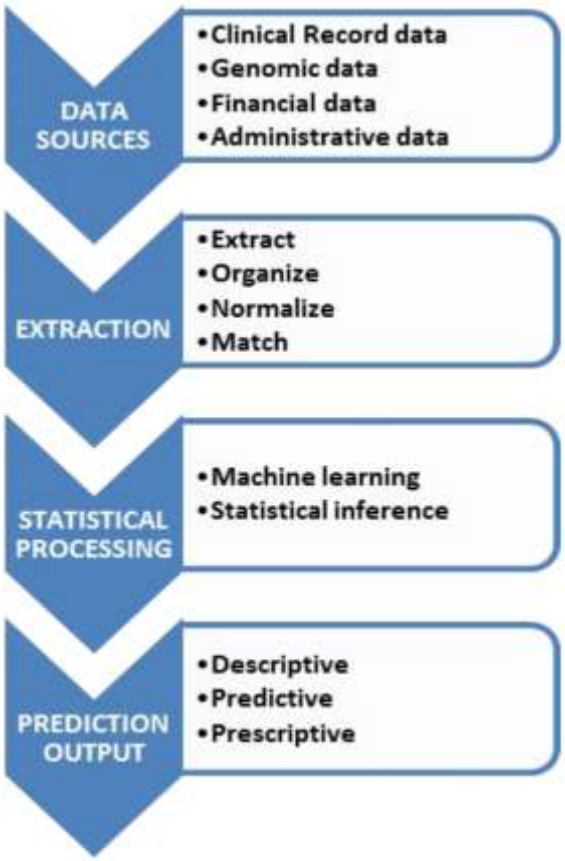
1- The pipeline begins with input data sources, which in healthcare And biomedicine may include clinical records, financial records, genomics and related data, and other types, even those from outside the healthcare setting (e.g., census data).



The Analytics Big Data Pipeline

2- The next step is feature extraction, where various computational Techniques are used to organize and extract elements of the data, such as linking records across sources, using natural language processing (NLP) to extract and normalize concepts, and matching of other patterns.

3-This is followed by statistical processing, where machine learning and related statistical inference techniques are used to make conclusions from the data. The final step is the output of predictions, often with probabilistic measures of confidence in the results.



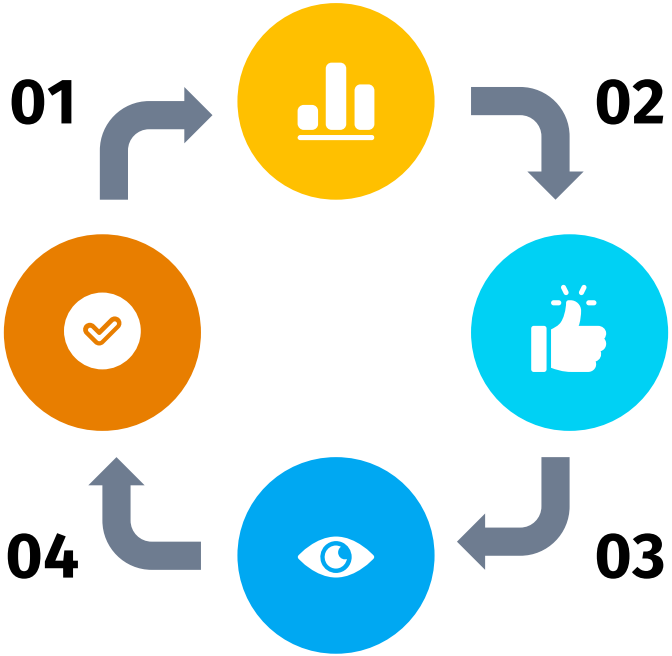
Challenges to Data Analytics

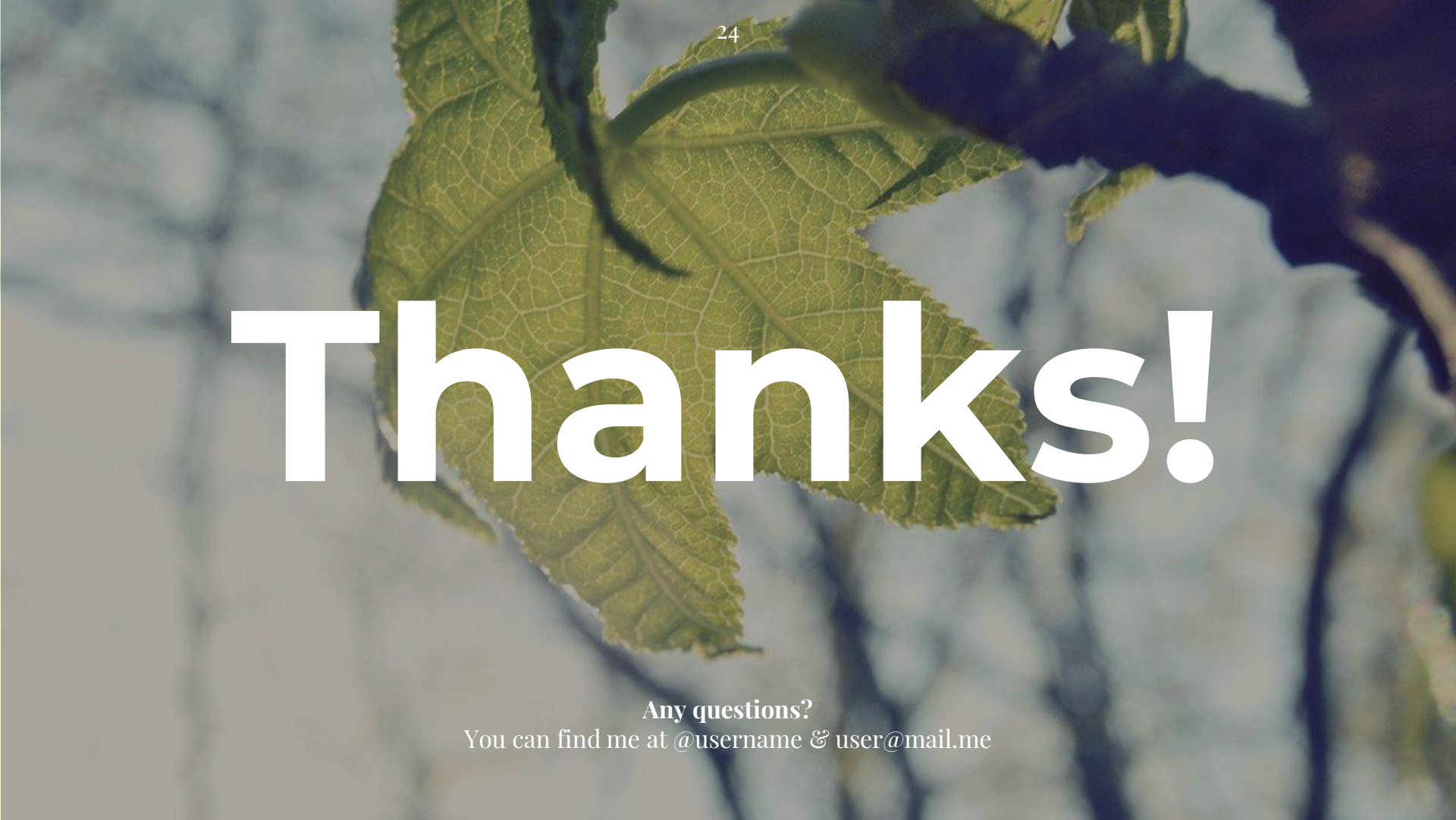
01 The amount of data being collected

02 Collecting meaningful and real-time data

03 Poor quality data

04 Inaccessible data





Thanks!

Any questions?
You can find me at @username & user@mail.me