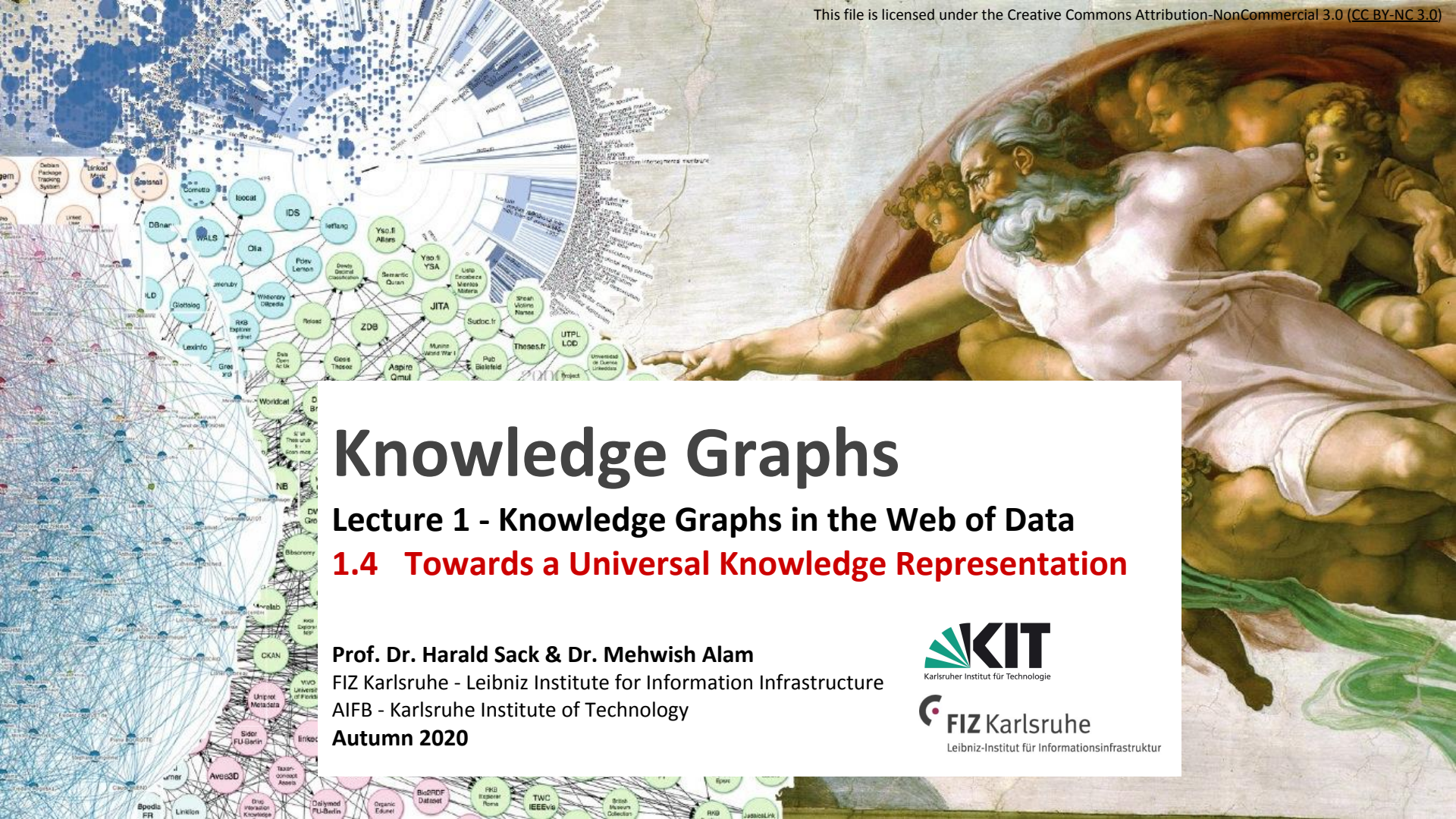


Knowledge Graphs

Lecture 1 - Knowledge Graphs in the Web of Data

1.4 Towards a Universal Knowledge Representation

Prof. Dr. Harald Sack & Dr. Mehwish Alam
FIZ Karlsruhe - Leibniz Institute for Information Infrastructure
AIFB - Karlsruhe Institute of Technology
Autumn 2020

Karlsruher Institut für Technologie

FIZ Karlsruhe
Leibniz-Institut für Informationsinfrastruktur

Knowledge Graphs

Lecture 1: Knowledge Graphs in the Web of Data

Climate Change is the **Everest** of all problems...

#Lectures4Future


Climate Change is
the Everest of all
problems...

Knowledge and Understanding

Text: "**Everest**"

Entity Mapping
Entity Disambiguation

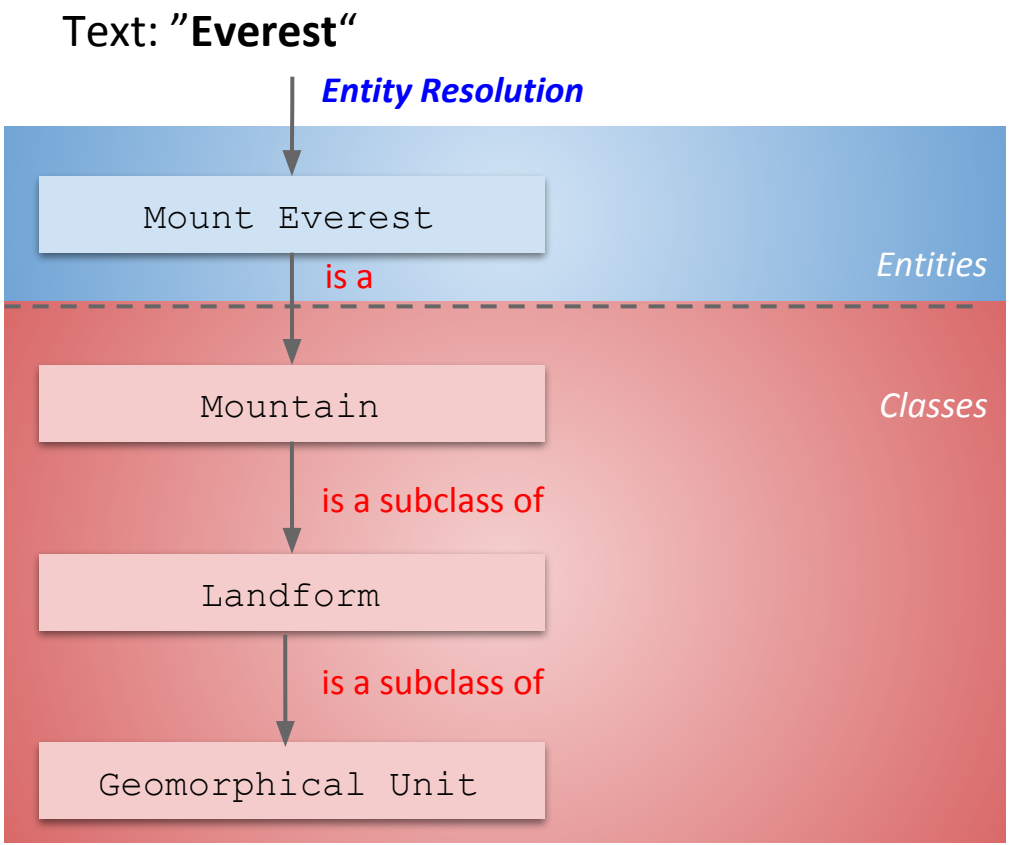
Everest, Kansas	a small village
Everest, Gasfield	a gas field near Scotland
George Everest	a Surveyor General of India
Jack Everest	an Irish football player
...	
Mount Everest	a mountain

Disambiguation

- solution of linguistic ambiguities

Knowledge and Understanding

- The **Meaning (Semantics)** of entities and classes must be defined explicitly.



Knowledge and Understanding

$MountEverest \in Mountain$

$Mountain \subseteq Landform$

$Landform \subseteq GeomorphicalUnit$

$GeomorphicalUnit \subseteq NaturalGeographicObject$

$GeorgeEverest \in Person$

$Person \cap Mountain = \varnothing$

Logical Inference

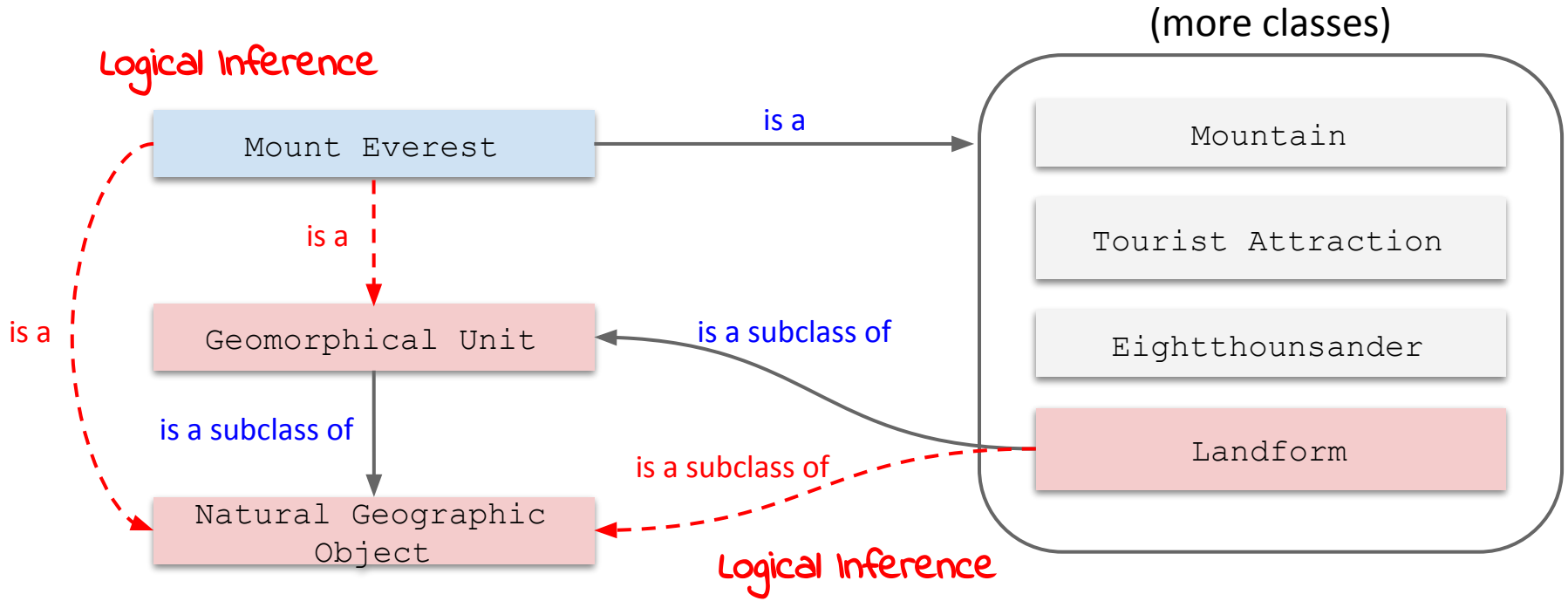
$MountEverest \notin Person$

$GeorgeEverest \notin Mountain$

Basic Set Theory

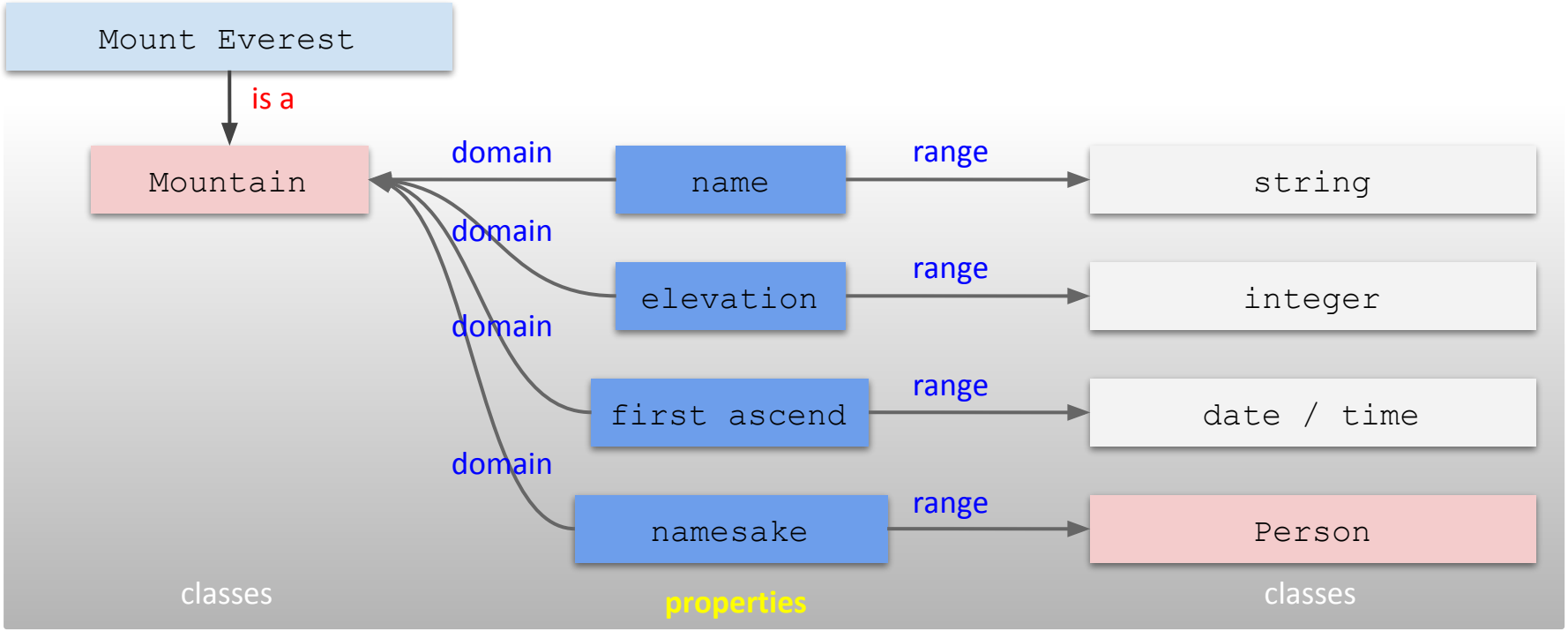
Knowledge and Understanding

- The Meaning (Semantics) of information is expressed with the help of knowledge representations (**Ontologies**)



Knowledge and Understanding

- The Meaning (Semantics) is expressed with the help of knowledge representations (**Ontologies**)



Knowledge Representation vs Data Structures

What's the difference to traditional data structures?

1. **Mathematical Logic** provides a framework to **formally express the semantics** of knowledge representations.
2. **Semantics** of knowledge representations can be defined **explicitly**.
3. **Mathematical Logic** enables **logical inferences** and **reasoning** for knowledge representations.

The Semantic Web - A Web of Data

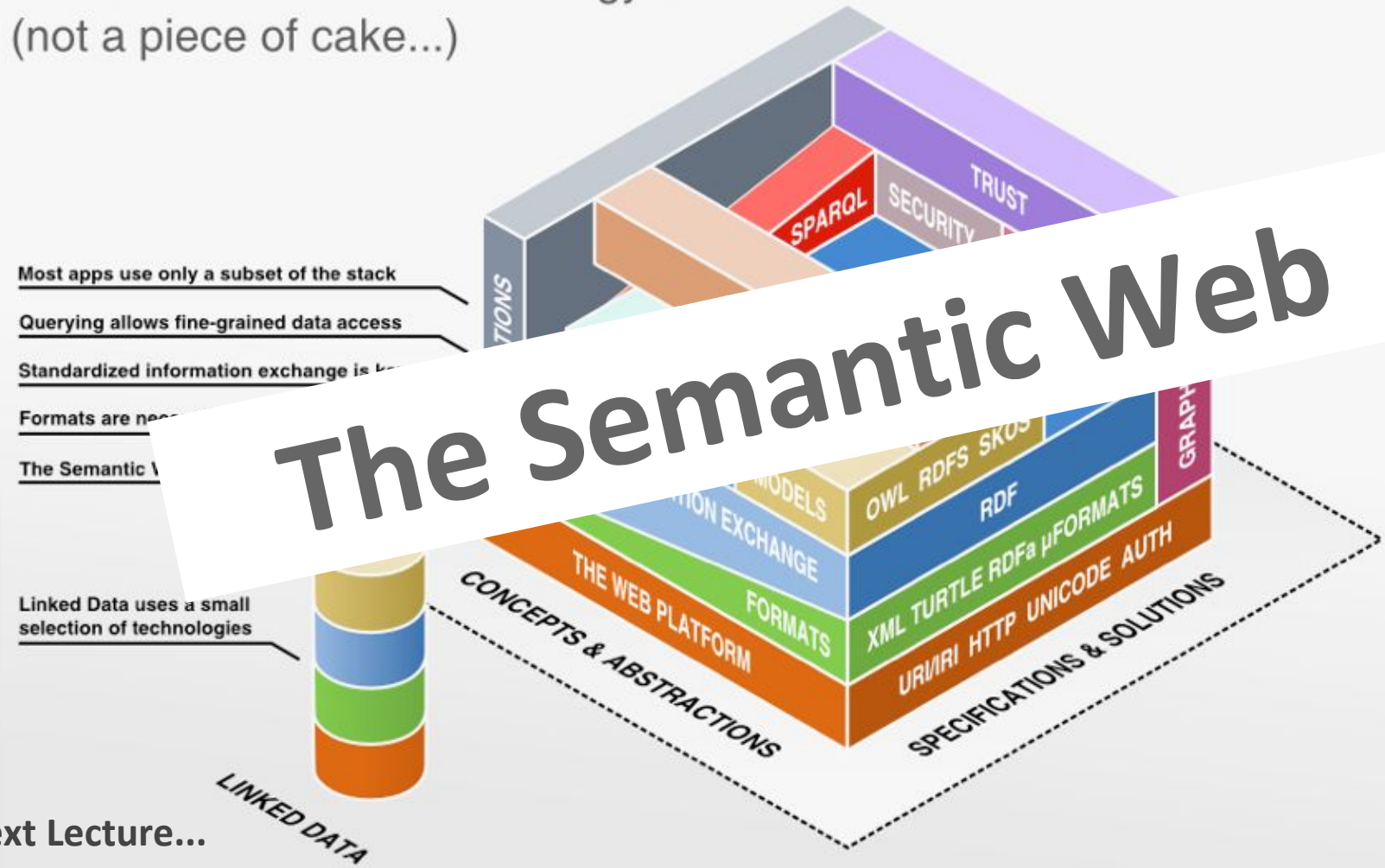
- The Semantic Web is an **Extension of the current Web.**
- The meaning of information (Semantics) is made explicit by **formal (structured) and standardized knowledge representations (Ontologies)**.
- Thereby it will be possible,
  - to **process** the meaning of information automatically,
  - to **relate** and **integrate** heterogeneous data,
  - to **deduce** implicit (not evident) information from existing (evident) information in an automated way.
- The Semantic Web is kind of a **global database** that contains a **universal network of semantic propositions**.

The Semantic Web - A Web of Data

„The Semantic Web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation."

Tim Berners-Lee, James Hendler, Ora Lassila: The Semantic Web, Scientific American, 284(5), pp. 34-43(2001)

The Semantic Web Technology Stack
(not a piece of cake...)



The Semantic Web

Next Lecture...

[3]

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Picture References:

- [1] Mount Everest as seen from an aircraft from airline company Drukair in Bhutan.
  Shrimpo1967 derivative work: Papa Lima Whiskey 2 (Diskussion) [CC BY-SA 2.0]
  https://commons.wikimedia.org/wiki/File:Mount_Everest_as_seen_from_Drukair2_PLW_edit.jpg?uselang=de
- [2] Tim Berners-Lee, James Hendler, Ora Lassila: *The Semantic Web*, Scientific American, 284(5), pp. 34-43(2001)
- [3] Benjamin Nowack, *The Semantic Web - Not a Piece of cake…*, at bnode.org, 2009-07-08 , [CC BY 3.0]
  http://bnode.org/blog/2009/07/08/the-semantic-web-not-a-piece-of-cake