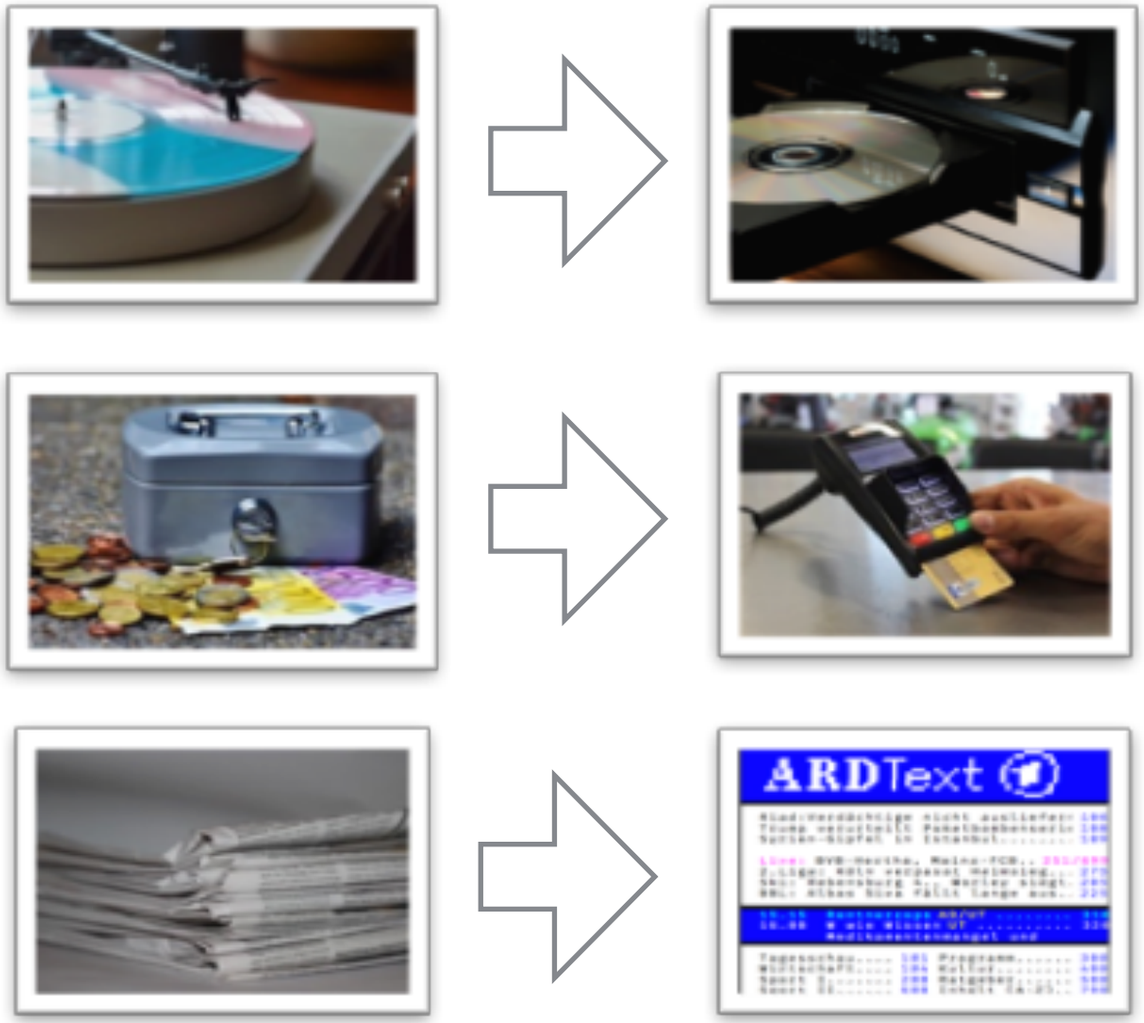
Management & Data Science

Ulf Brefeld

Machine Learning Group

LEUPHANA
UNIVERSITY OF LÜNEBURG

Digitization

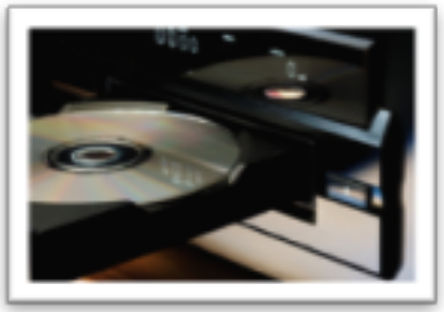


Technology changes media/data by digital products

Thanks to Kim Lauenroth for the slide!

Digitization

Digitalization



Technology changes media/data by digital products

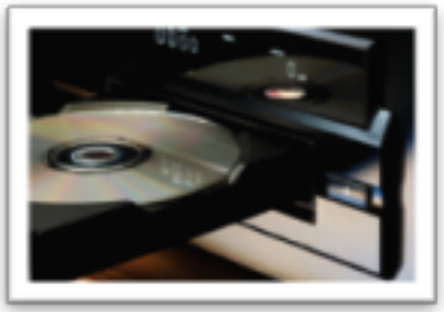
Technology changes industries by digital processes

Thanks to Kim Lauenroth for the slide!

Digitization

Digitalization

Digital Trans-formation



Spotify

INDIEGOGO

twitter

Technology changes media/data by digital products

Technology changes industries by digital processes

Technology changes economy / society by digital systems

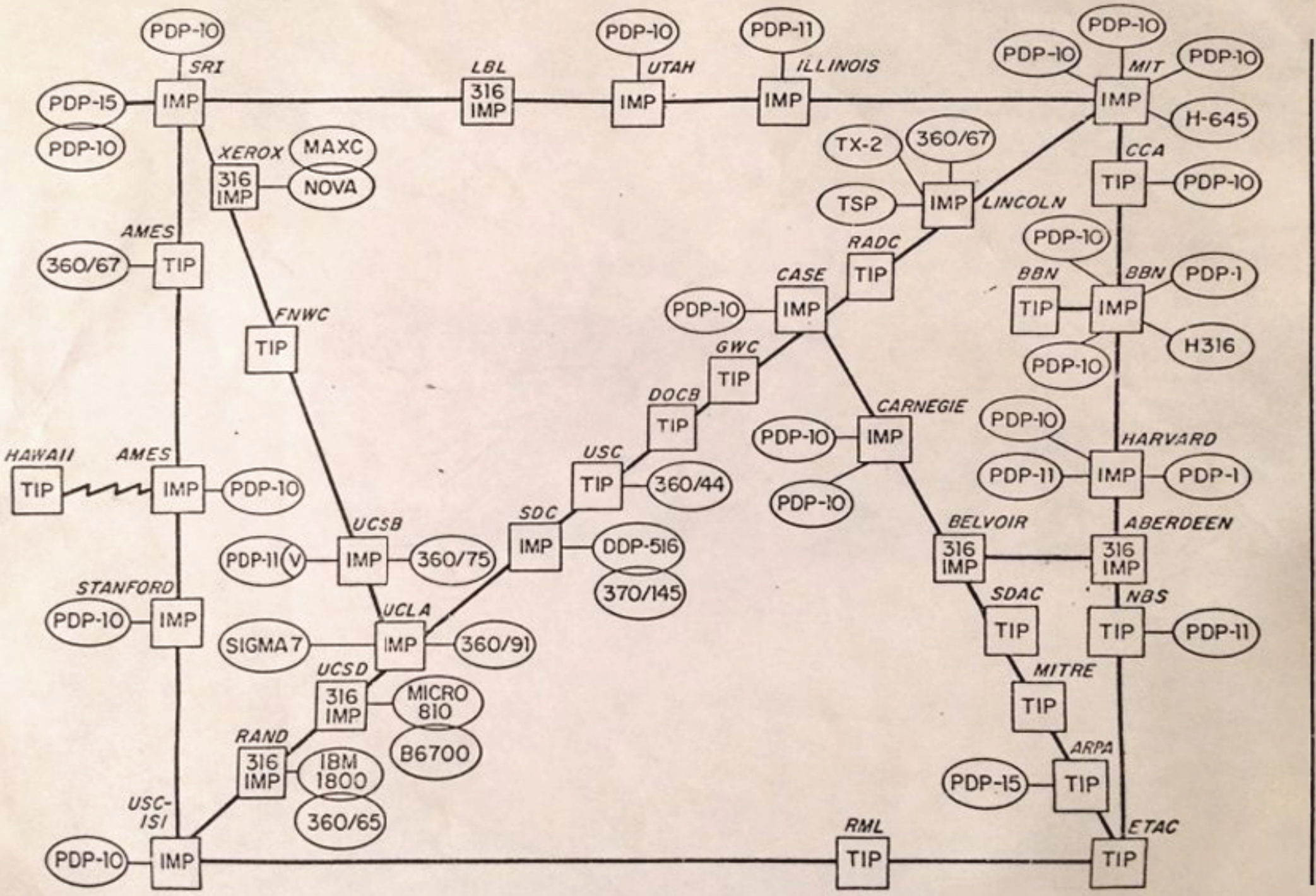
Anecdotal Evidence

“I think there is a world market for about five computers”
(Thomas J.Watson, Chairman of the Board of International Business Machines, 1943)

“...it is very possible that ... one machine would suffice to solve all the problems that are demanded of it from the whole country.”
(Sir Charles Darwin, grandson of the naturalist of the same name, head of Britain's National Physical Laboratory, 1946)

“Originally one thought that if there were a half dozen large computers in this country, hidden away in research laboratories, this would take care of all requirements we had throughout the country.”
(Howard H.Aiken, computer pioneer, IBM Mark I designer, 1952)

ARPA NETWORK, LOGICAL MAP, MAY 1973



INFORMATION

PDP-10

Computer

Locations

HARVARD STANFORD
RAND MIT

Connecting devices

TIP — Terminal Interface Processor

IMP — Interface Message Processor

Phone Lines

Satellite Link

Today

world population	6.3billion	6.8billion	7.2billion	7.6billion
connected devices	500million	12.5billion	25billion	50billion
ratio	0.8	1.84	3.47	6.58
	2003	2010	2015	2020

more connected devices than people

2018 : Every minute of the day…

users send
187,000,000
emails

users issue
3,700,000
queries

users stream
266,000
hours of video

users watch
4,400,000
videos

users send
481,000
tweets

973,000
users login

users send
38,000,000 text
messages

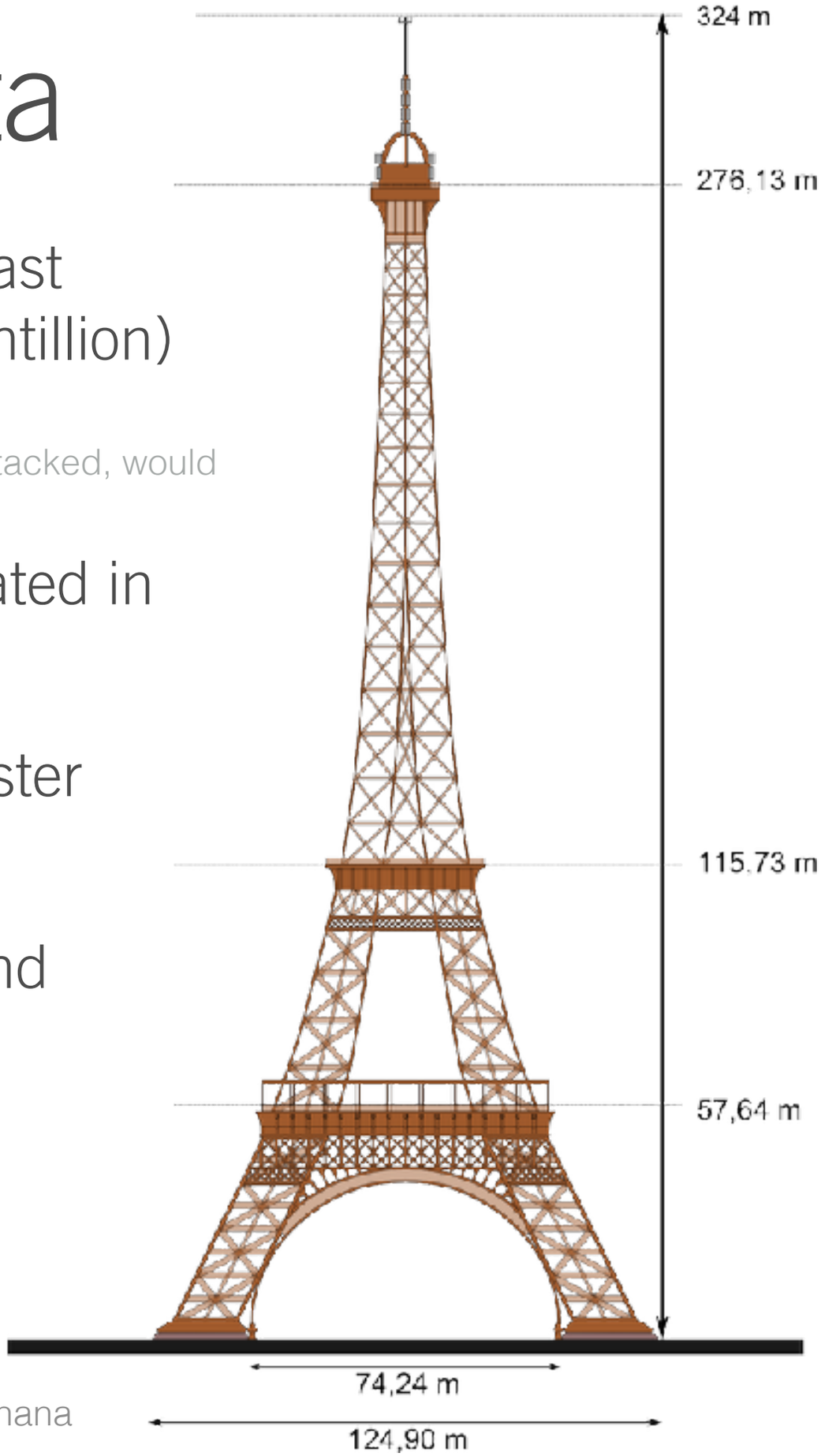
users share
2,400,000
snaps

users spend
$862,823
online

The Data

- Every day in 2020, we generated at least 2,500,000,000,000,000,000 (2.5 quintillion) bytes of new data*
  This would fill 10 million blue-ray discs, the height of which stacked, would measure the height of 4 Eiffel Towers on top of one another
- 90% of the world's data has been created in the last 2 years
- Amount of stored data grows much faster than world economy
- Substantial shift in economic power and source of economic value
- Data have become an asset

*everything from data collected by the Curiosity Rover on Mars, to your Facebook photos from your latest vacation



http://www.vcloudnews.com/every-day-big-data-statistics-2-5-quintillion-bytes-of-data-created-daily/

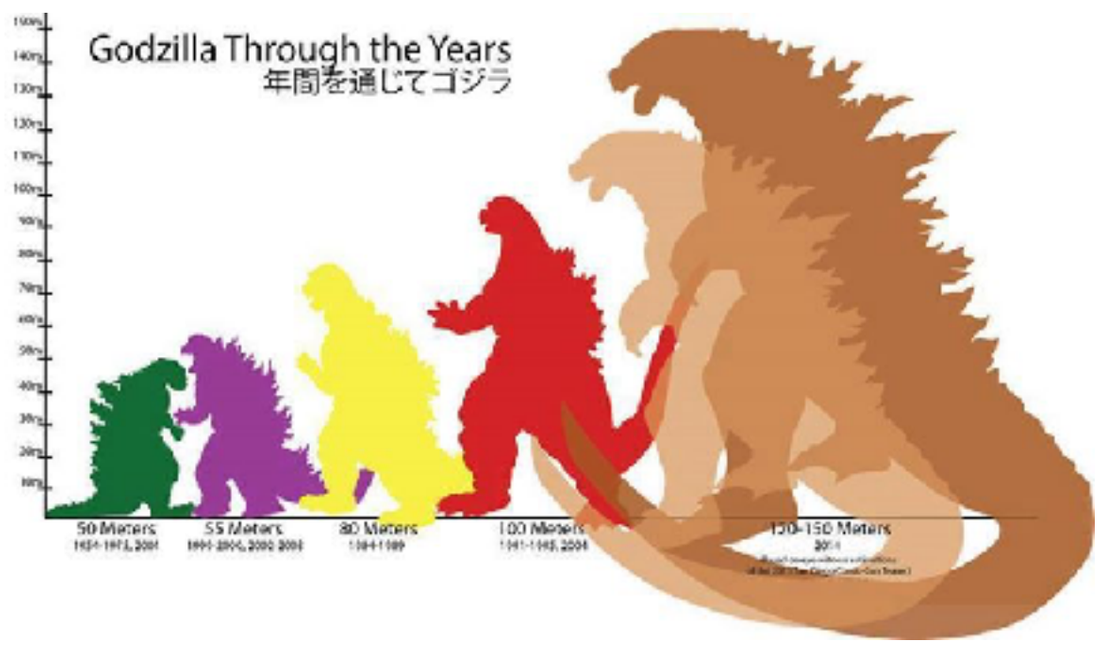
The Future

- There is an exponential growth

- In 2012, the entire WWW contained about 500 exabytes which is 5 billion gigabytes

- 1k terabyte = 1 petabyte
  1k petabyte = 1 exabyte
  1k exabyte = 1 zettabyte

- In 2025, we expect about 175 zettabytes of data in existence



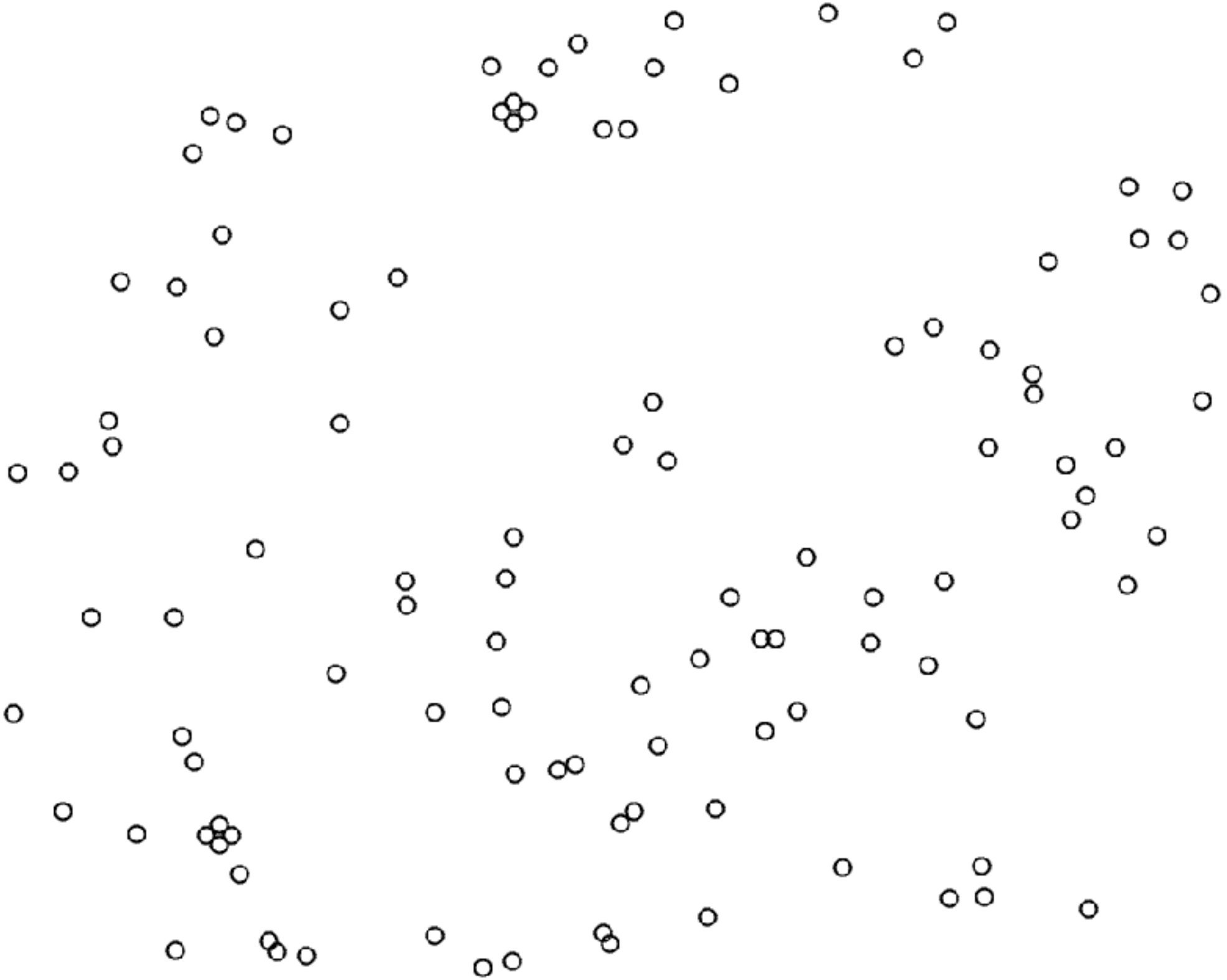
Storing 175 zettabytes on DVDs would yield a stack of DVDs that circles Earth 222 times.
Downloading 175 zettabytes at the average current internet connection speed, would take 1.8 billion years.

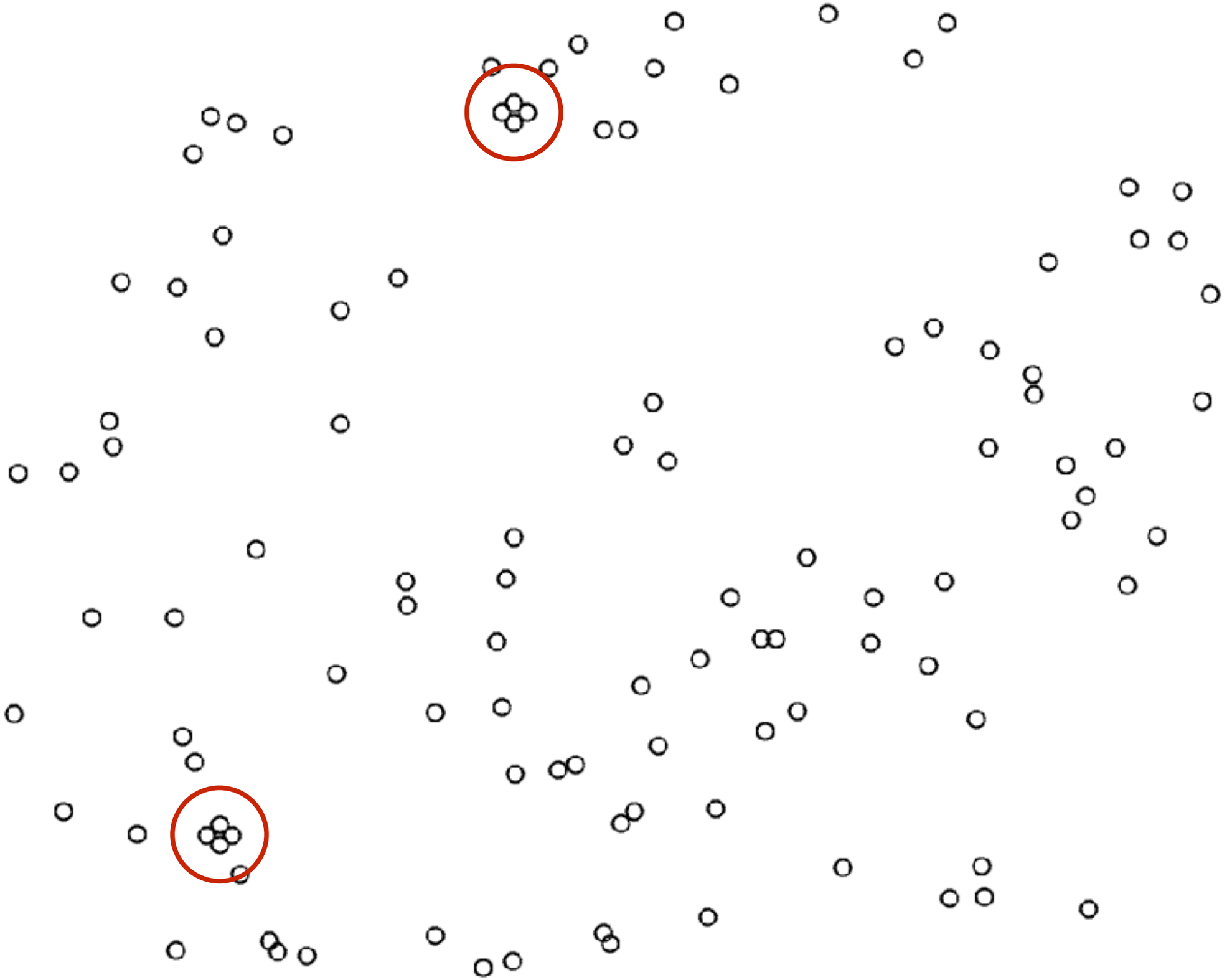
What to make of all that data?

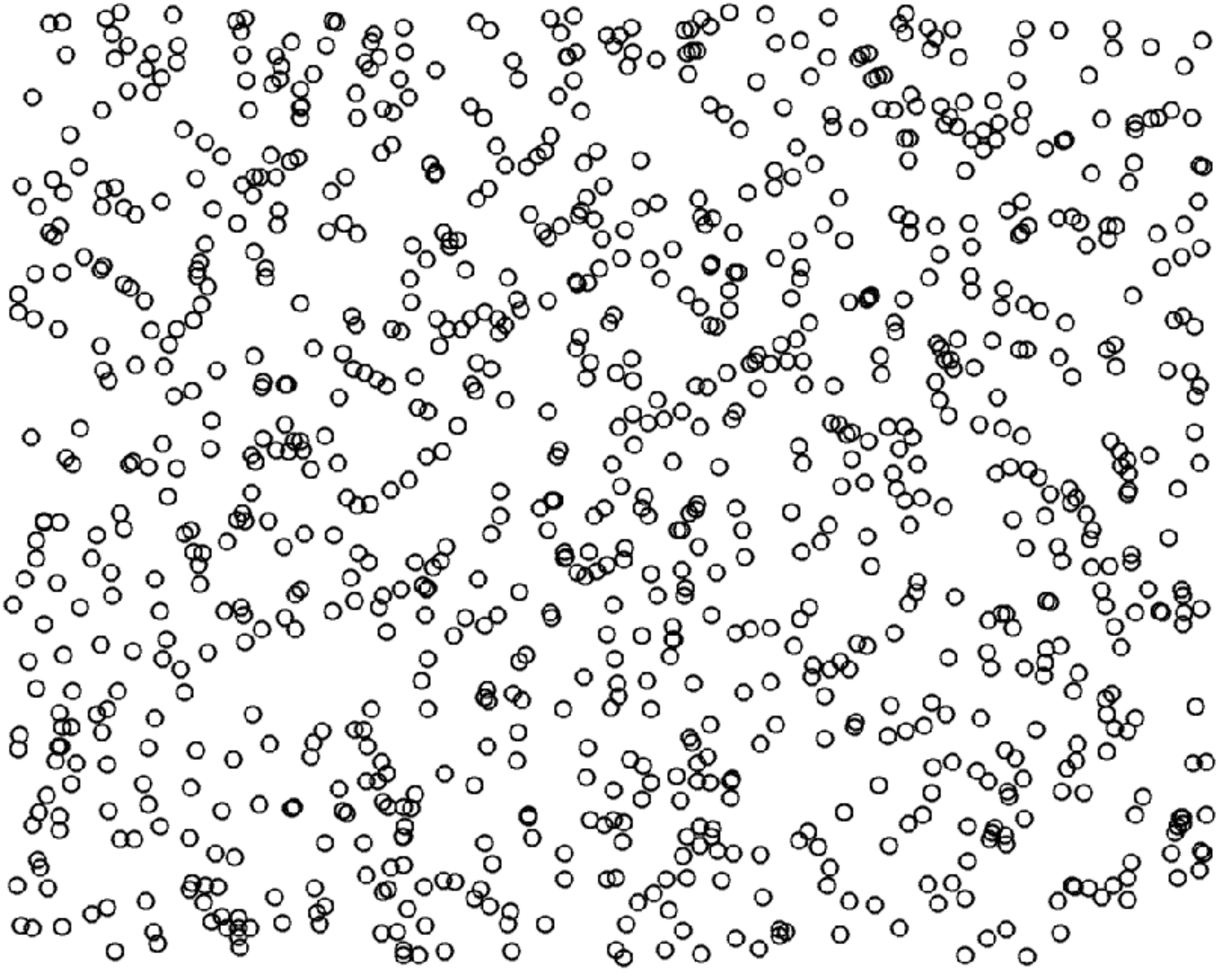
- Straight forward ideas are already in place, e.g., data base operations (linking objects with same keys,…)

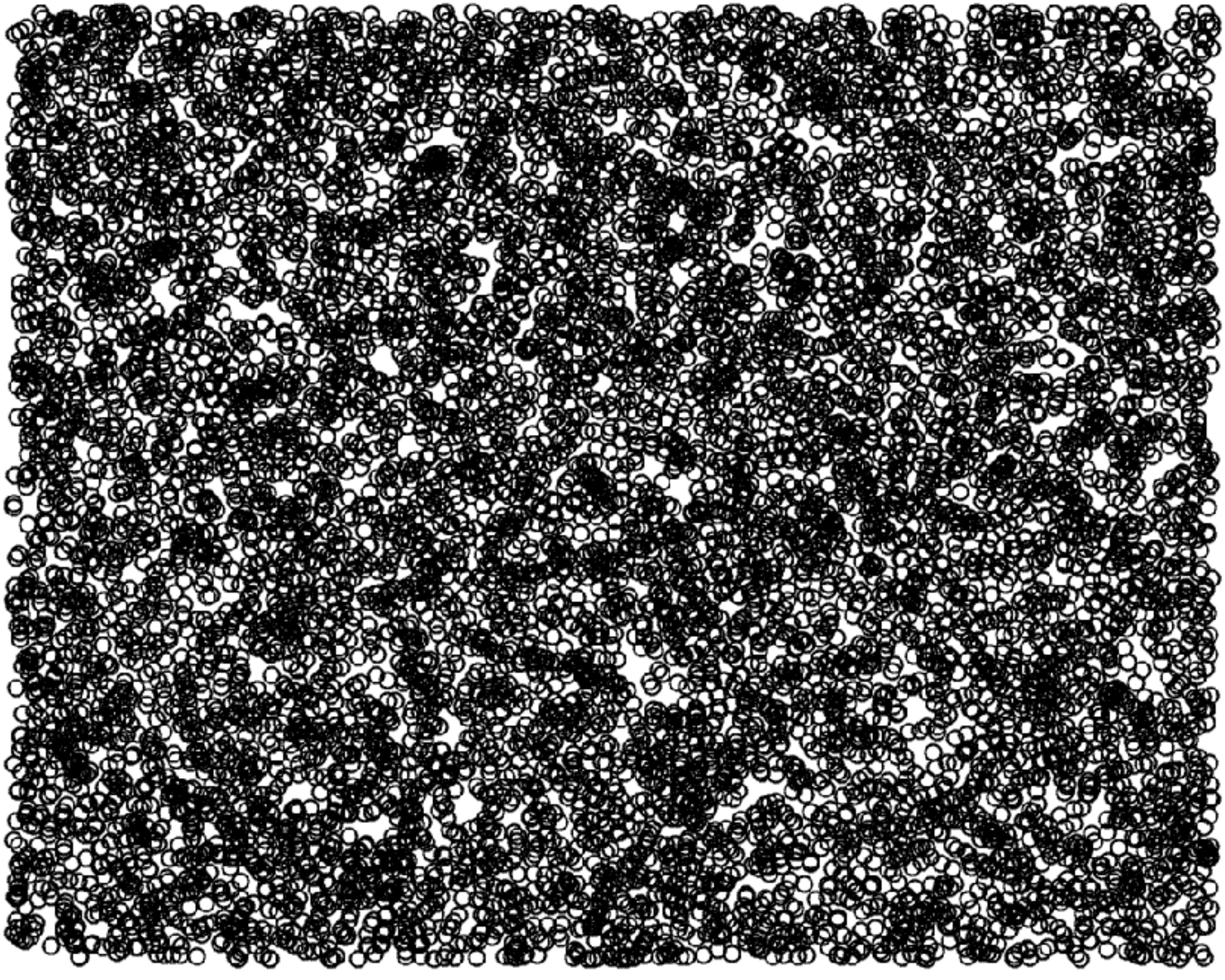
- BUT: There is a great need for intelligent data analyses and prediction models

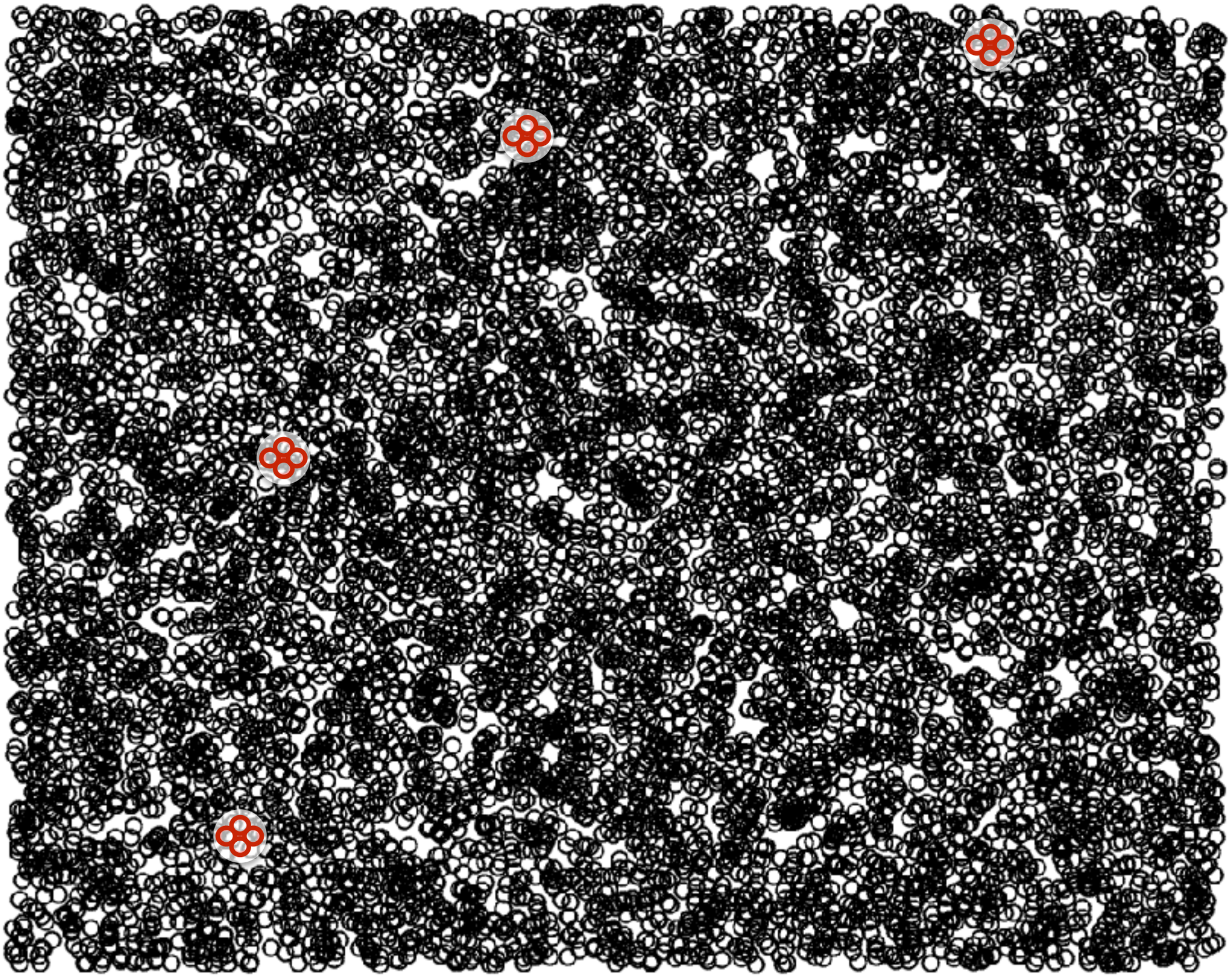
  - forecasting the future / future objects / items / …
  - automatic decision making
  - pattern mining











Data Science @ Leuphana

- Competitive selection process
- 546 applications from all over the world
- 25 students admitted (=YOU?)
- 4 term (2 year) Master program
- 120 CPs according to ECTS
- Admission test

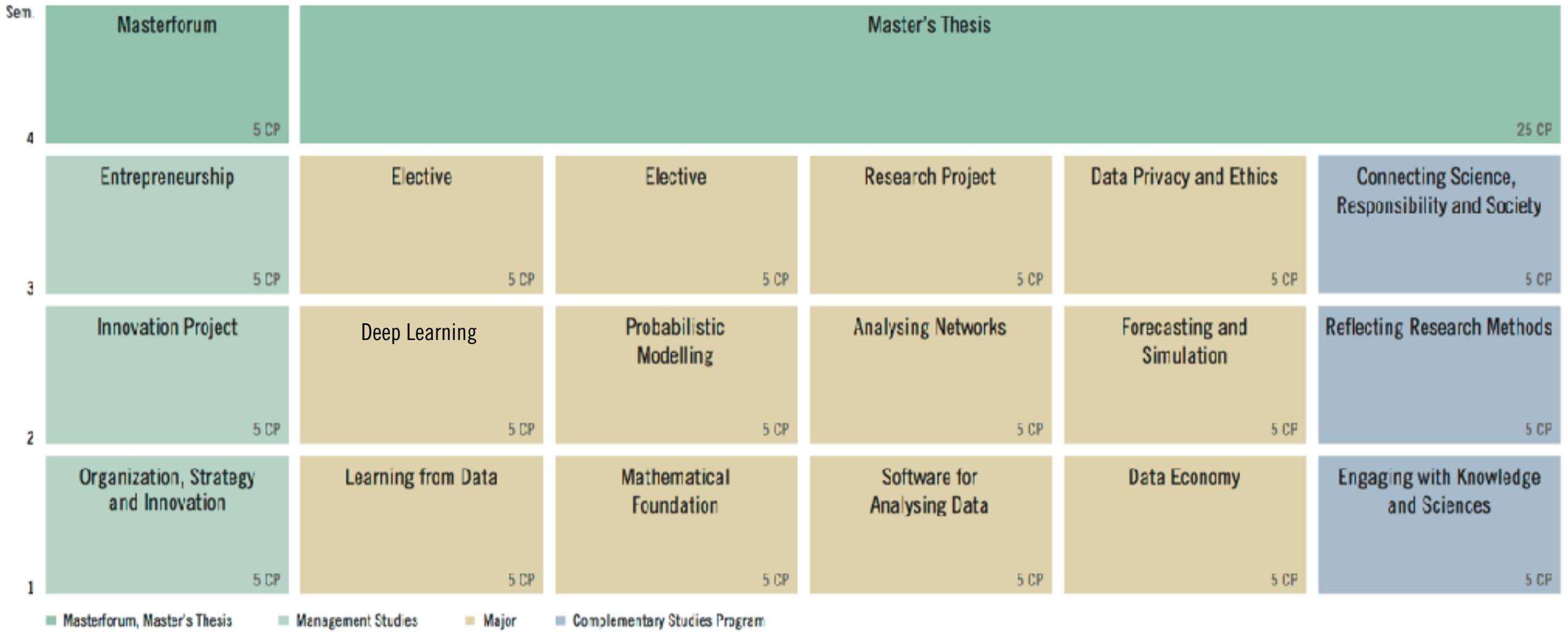
Goals

- Assess the value of data in different practical settings
- Learn about technology stacks and current trends
- Focus on Machine Leaning and AI (Deep Neural Networks)
- Identify/derive methods for a problem at-hand
- Scale methods to “big data”
- Understand societal impact of a data-driven world
- Learn about risks/benefits of privacy

Career Perspective

- Graduates obtain a Master of Science (M.Sc.) degree
- Take on responsibilities involving hands-on data, theoretical, analytical, conceptual, and consulting work
- Graduates have a wide range of career options, ranging from data scientists in (multi-national) organizations to corporate leadership positions (couldn’t be better these days…) or pursue an academic career and become a PhD

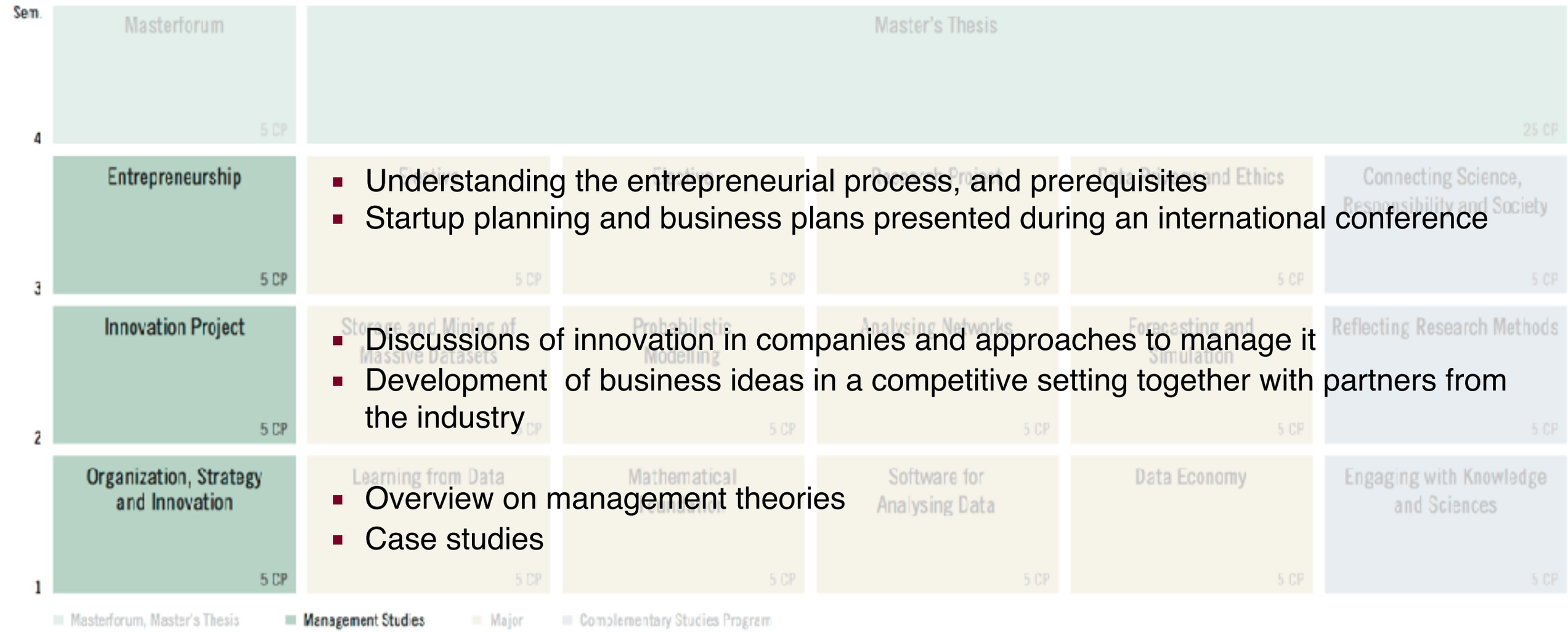
Module Overview



Electives (3rd term):

- Data Science Seminar & Lecture
- (alternatively: up to 2 elective models from one other Major of the Management & Entrepreneurship Master Program)

Management



- Understanding the entrepreneurial process, and prerequisites
- Startup planning and business plans presented during an international conference

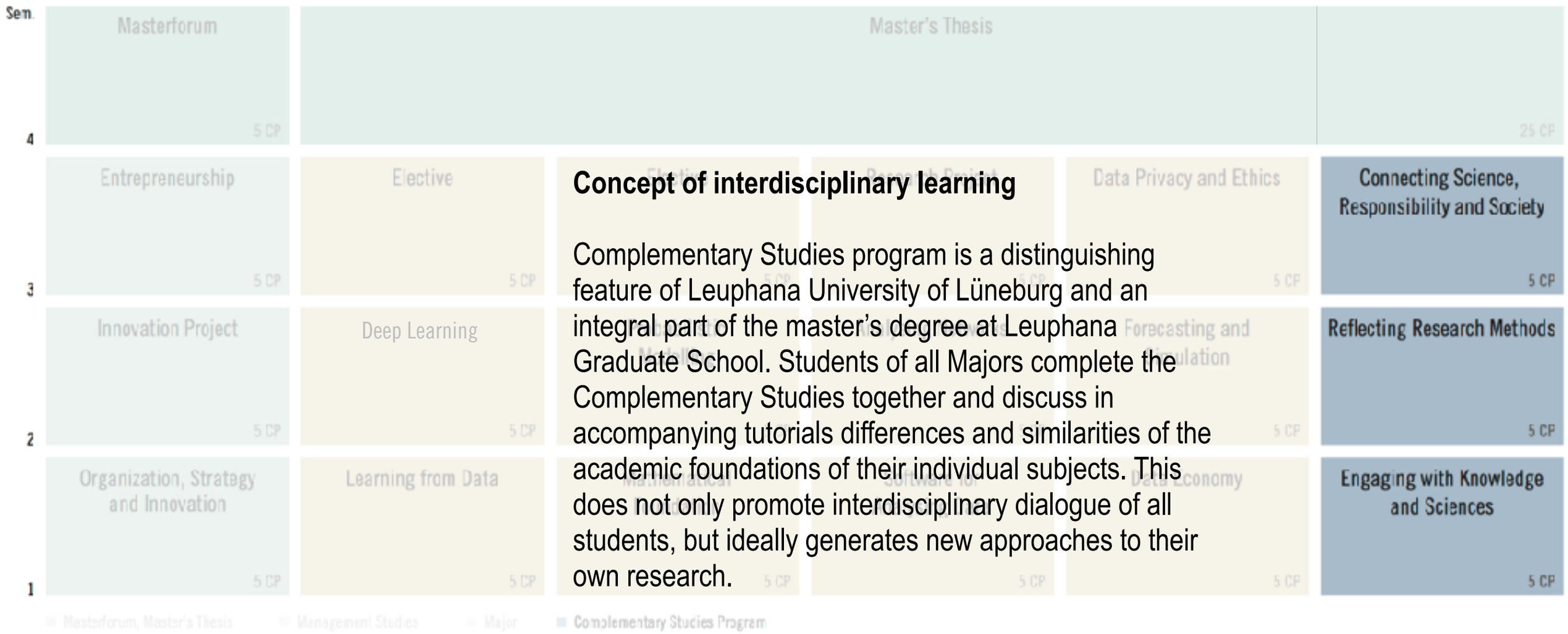
- Discussions of innovation in companies and approaches to manage it
- Development of business ideas in a competitive setting together with partners from the industry

- Overview on management theories
- Case studies

Electives (3rd term):

- Data Science Seminar
- Research Seminar
- (alternatively: up to 2 elective models from one other Major of the Management & Entrepreneurship Master Program)

Complementary Studies



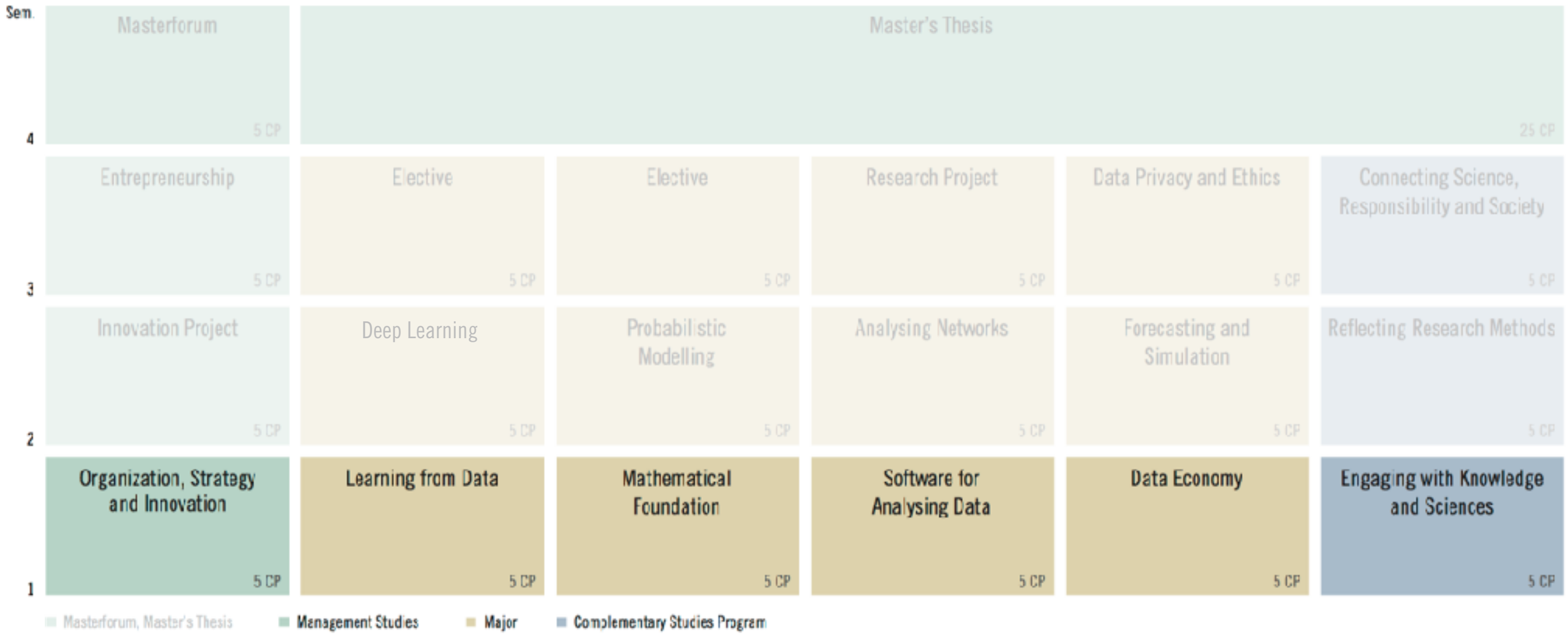
Concept of interdisciplinary learning

Complementary Studies program is a distinguishing feature of Leuphana University of Lüneburg and an integral part of the master's degree at Leuphana Graduate School. Students of all Majors complete the Complementary Studies together and discuss in accompanying tutorials differences and similarities of the academic foundations of their individual subjects. This does not only promote interdisciplinary dialogue of all students, but ideally generates new approaches to their own research.

Electives (3rd term):

- Data Science Seminar
- Research Seminar
- (alternatively: up to 2 elective models from one other Major of the Management & Entrepreneurship Master Program)

The 1st Term



Electives (3rd term):

- Data Science Seminar
- Research Seminar
- (alternatively: up to 2 elective models from one other Major of the Management & Entrepreneurship Master Program)

The Faculty

Ulf Brefeld

Paul Drews

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Andreas Möller

Peter Niemeyer

Kathrin Padberg-Gehle

Henrik von Wehrden

2xTBA