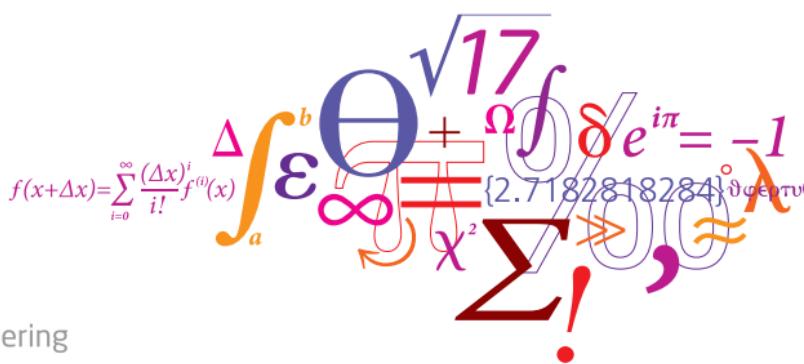


Introduction to Business Analytics

Lecture 1 - Introduction



Team



Filipe Rodrigues
Associate Professor

DTU MANAGEMENT
Department of Technology, Management and Economics

Transport Division
Transport Machine Learning

Technical University of Denmark
Bygningstorvet
Building 116, room 121A
2800 Kgs. Lyngby

Ph. +45 45 25 65 30
E-mail rdr@dtu.dk
ORCID [0000-0001-6979-6498](https://orcid.org/0000-0001-6979-6498)



Ravi Seshadri

Assistant Professor, Department of Technology, Management and Economics
Transport
Network and Route Choice
 <https://orcid.org/0000-0002-9327-9455>

Email
ravse@dtu.dk

Website
<http://www.man.dtu.dk>

Bygningstorvet, 116, 117A
2800 Kgs. Lyngby
Denmark



Guido Cantelmo
Adjunkt

DTU MANAGEMENT
Institut for Teknologi, Ledelse og Økonomi

Division for Transport
Transport Networks

Danmarks Tekniske Universitet
Bygningstorvet
Bygning 116, rum 118A
2800 Kgs. Lyngby

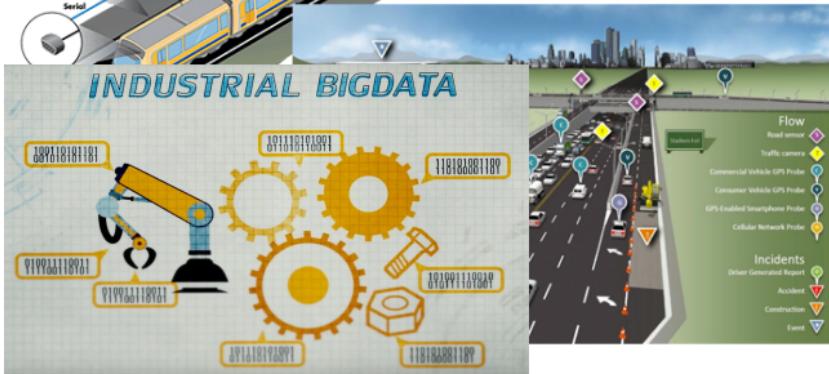
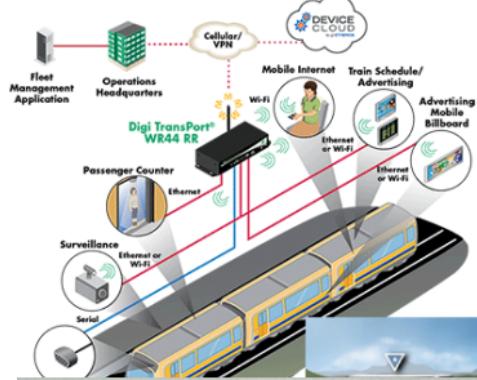
E-mail guica@dtu.dk

TAs:

- Andrew Nguyen <andng@dtu.dk>
- Dimitrios Argyros <diar@dtu.dk>
- Emil Kragh Toft <s233791@student.dtu.dk>
- Izgi Tulunay <s232853@student.dtu.dk>

Outline

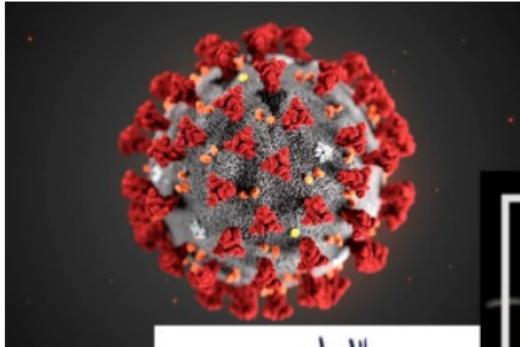
- Introduction to the Course
 - Motivation
 - Syllabus
 - Requirements
 - Evaluation
- ...start the show!



Motivation: real problems to solve



Motivation: real problems to solve



Motivation: real problems to solve



Click on an occupation name to see the full occupational profile.

| OCCUPATION | GROWTH RATE, 2019-29 | 2020 MEDIAN PAY |
|---|----------------------|--------------------|
| Physician assistants | 31% | \$115,390 per year |
| Nurse practitioners | 52% | \$111,680 per year |
| Medical and health services managers | 32% | \$104,280 per year |
| Information security analysts | 31% | \$103,590 per year |
| Data scientists and mathematical science occupations, all other | 31% | \$98,230 per year |

CAREER OF A DATA SCIENTIST

\$113,736

Average yearly salary
Glassdoor, 2021

BEST COLLEGES

- University of California, Berkeley
- Massachusetts Institute of Technology (MIT)
- Carnegie Mellon University

U.S. News, 2021



TOP SKILLS

- Communication
- Project Management
- Mathematical Modeling
- Programming
- Databases
- Machine Learning
- Business Acumen

CAREER OUTLOOK

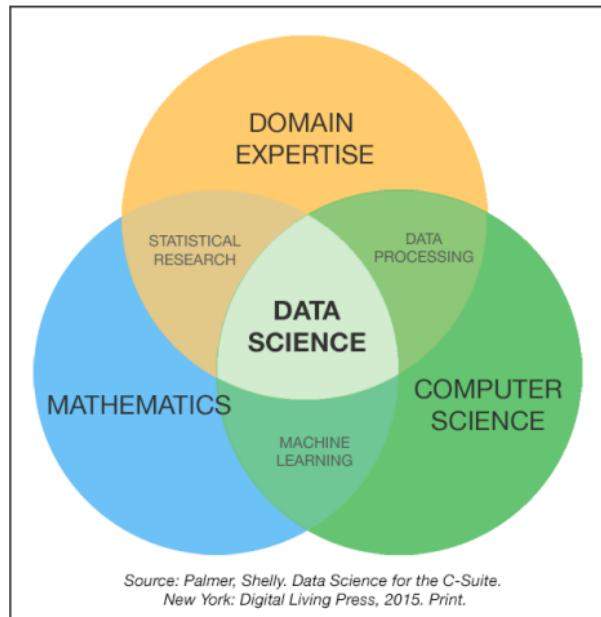
15% Growth Forecast

Between 2019 and 2029
U.S. Bureau of Labor Statistics, 2021

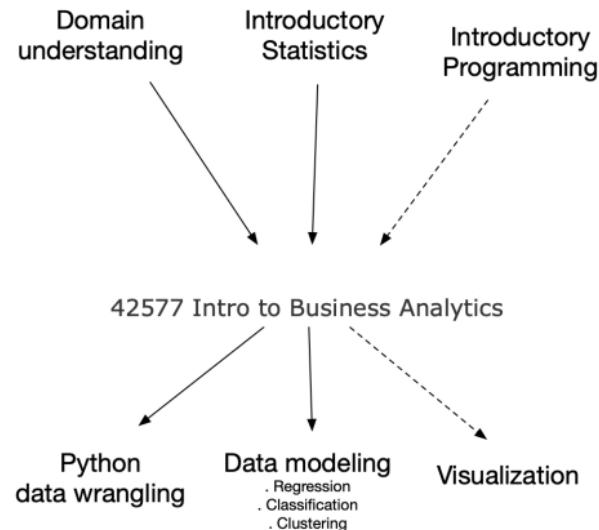
"The Sexiest Job of the 21st Century"

- Harvard Business Review, 2012

Motivation



Motivation: concept of this course



Motivation: our wish

- from basic programming background to data geek
- transmit good intuition on data opportunities
- desire to learn more!

Motivation: what this course is NOT

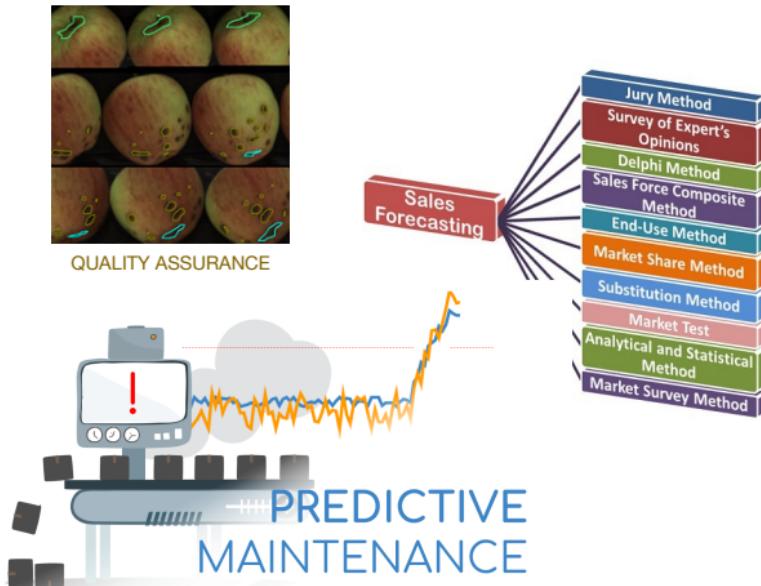
- programming course
- advanced ML course (no Deep Learning, PGM, NLP)

Example - Bike sharing

| | hubway_id | duration | start_date | strt_statn | end_date | end_statn | bike_nr | subsc_type | zip_code | birth_date | gender |
|----|-----------|----------|---------------------|------------|---------------------|-----------|---------|------------|----------|------------|--------|
| 9 | 17 | 1108 | 2011-07-28 11:55:00 | 47 | 2011-07-28 12:13:00 | 40 | B00550 | Registered | '01867 | 1994 | Male |
| 10 | 18 | 1055 | 2011-07-28 11:55:00 | 47 | 2011-07-28 12:13:00 | 40 | B00580 | Registered | '01867 | 1956 | Male |
| 11 | 19 | 1042 | 2011-07-28 11:55:00 | 47 | 2011-07-28 12:12:00 | 40 | B00539 | Registered | '01867 | 1959 | Female |
| 12 | 23 | 994 | 2011-07-28 12:00:00 | 40 | 2011-07-28 12:16:00 | 47 | B00368 | Casual | NaN | NaN | NaN |
| 14 | 27 | 952 | 2011-07-28 12:00:00 | 40 | 2011-07-28 12:16:00 | 23 | B00556 | Registered | '02128 | 1944 | Male |
| 16 | 29 | 1261 | 2011-07-28 12:00:00 | 22 | 2011-07-28 12:21:00 | 45 | B00454 | Registered | '02492 | 1975 | Male |

- Predict *duration, number of rides/hour, gender, time of rental...*

Example - Production engineering



**Breakdown of
use cases by
applicable
techniques, %**

Full value can
be captured
using non-AI
techniques

15

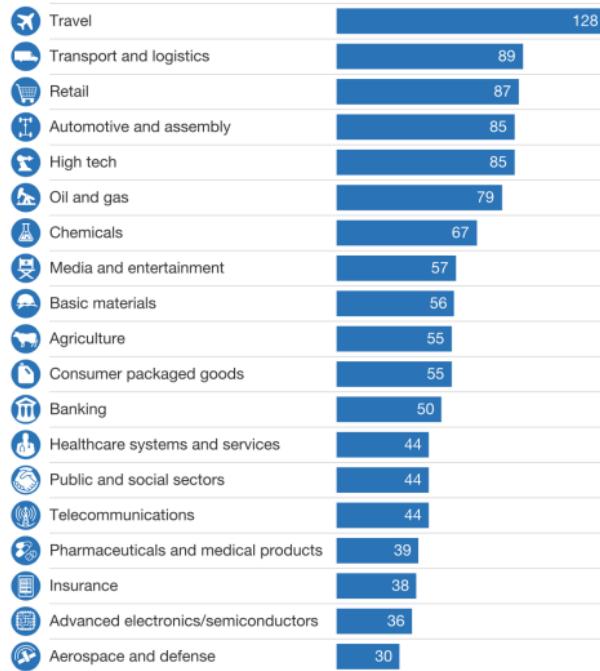
AI necessary
to capture
value
("greenfield")

16

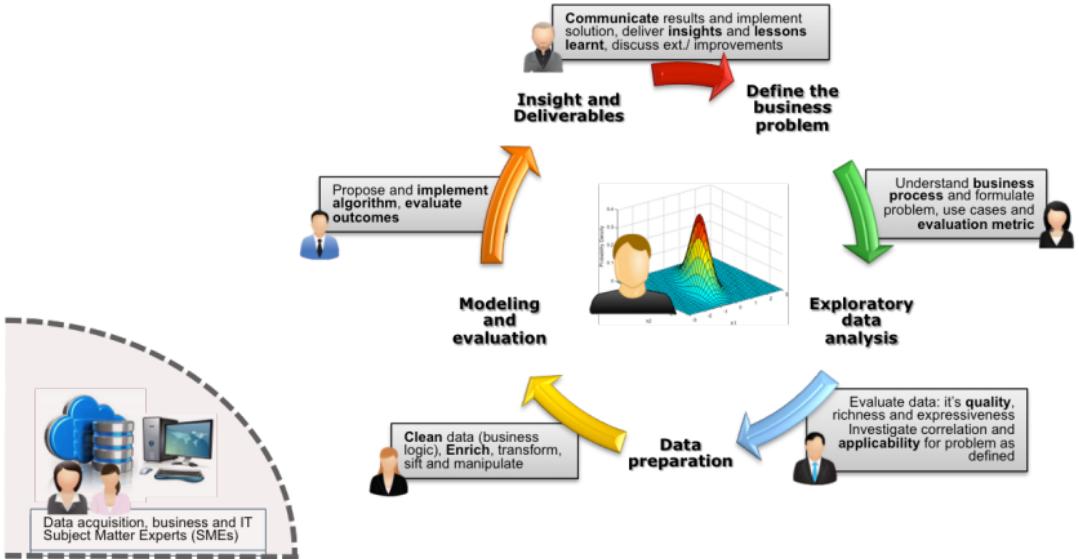
AI can
improve
performance
over that
provided
by other
analytics
techniques

69

Potential incremental value from AI over other analytics techniques, %



from McKinsey: <https://tinyurl.com/ycbglugp>



Method

① Highly interactive

- Jupyter notebooks
- Theory->practice->theory->practice
- Focus on applications (strongly on transport and business analytics) to "get hands dirty"
- Materials to do at home
- Challenge

Syllabus: Lectures

This is tentative!

- ① Intro to the course (1 lecture)
- ② Statistical learning + Regression (1 lecture, Ravi)
- ③ Classification (2 lectures, Ravi+Guido)
- ④ Performance metrics (1 lecture, Guido)
- ⑤ Neural Networks (1 lecture, Filipe)
- ⑥ Clustering (1 lecture, Guido)
- ⑦ Dimensionality reduction (1 lecture, Guido)
- ⑧ Time series (1 lecture, Ravi+Filipe)
- ⑨ Best practices in ML (1 lecture, Filipe)
- ⑩ Guest Lecture (1 lecture)
- ⑪ Project support (2 lectures)

Evaluation

① Group project with single report (individualized) - 50%

- Groups of exactly 4 members (smaller groups will be merged)
- Description available: October 21
- Group formation deadline: October 28
- Deadline: December 6

② 2 in-class written test (September 30 and November 18) - 50%

- ① No exceptions (unless medical emergencies)!
Save the dates in your calendar already!

③ Keep an eye on DTU Learn for the latest information - this will be our only communication channel

Some materials

- Introduction to Statistical Learning (free: <https://www.statlearning.com>)
- Jupyter notebooks provided (mandatory and optional ones)
- Each lecture may recommend additional materials (provided online)