

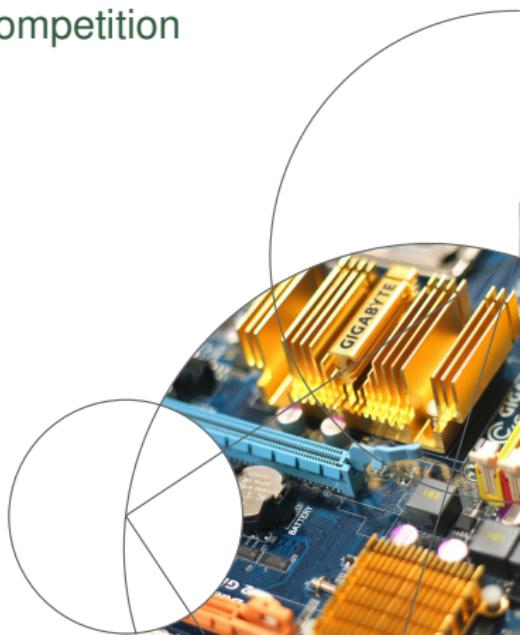
# L1 – Introduction, Organization, and Competition

## Large-Scale Data Analysis

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# Outline

① Big Data

② Organization

③ Competition

④ Summary

# Outline

① Big Data

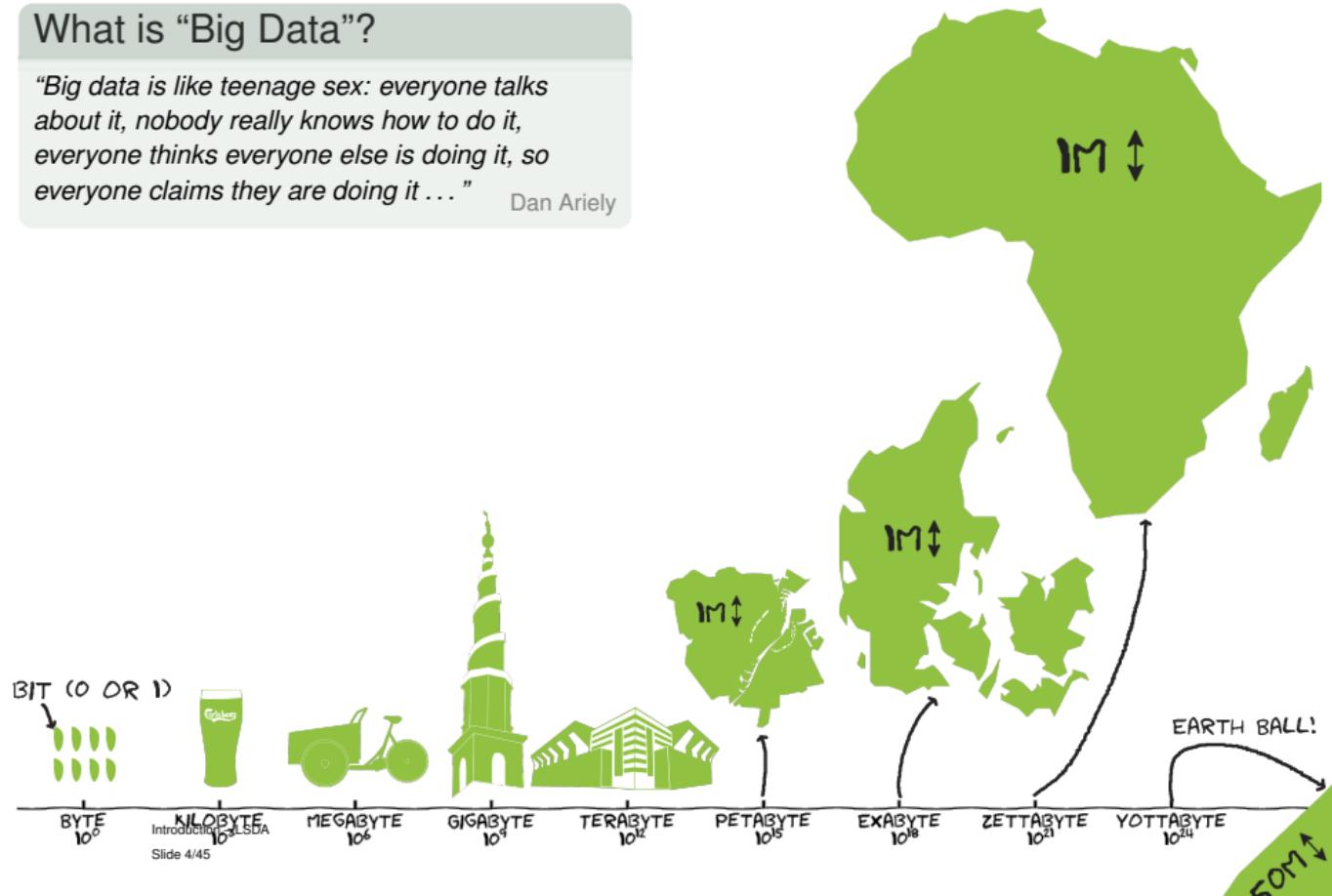
② Organization

③ Competition

④ Summary

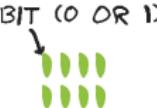
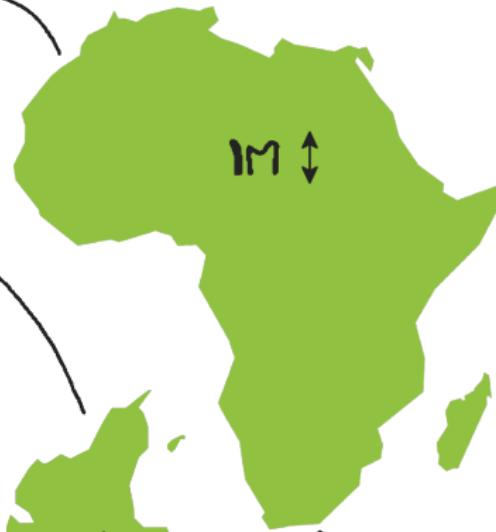
## What is “Big Data”?

*“Big data is like teenage sex: everyone talks about it, nobody really knows how to do it, everyone thinks everyone else is doing it, so everyone claims they are doing it . . . ”* Dan Ariely



## What is “Big Data”?

*“Big data is like teenage sex: everyone talks about it, nobody really knows how to do it, everyone thinks everyone else is doing it, and everyone claims they are doing it ...”*



BYTE  
 $10^0$

KILOBYTE  
 $10^3$

MEGABYTE  
 $10^6$

GIGABYTE  
 $10^9$

TERABYTE  
 $10^{12}$

PETABYTE  
 $10^{15}$

EXABYTE  
 $10^{18}$

ZETTABYTE  
 $10^{21}$

YOTTABYTE  
 $10^{24}$

Introduction  
LSDA

Slide 4/45



EARTH BALL!

50M↑

## Today: Satellites



<http://landsat.gsfc.nasa.gov/landsat-8/>

2 TB  
per day  
(~2 Laptops)

# Today/Tomorrow: Satellites



Sentinel Online

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Google™ Custom Search



Missions

User Guides

Technical Guides

Thematic Areas

Data Access

Toolboxes

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## - Welcome to Sentinel Online

**SENTINEL-1 LENDS A HAND IN POLAND'S WETLANDS**

Poland's Biebrza National Park, protected by the Wetlands Convention, experiences certain disturbances in its water levels and water transfer, which could threaten its biodiversity.

[Read more](#)

[Navigation icons: back, forward, search, etc.]

## - Sentinel Missions



## - Thematic Areas

## - Sentinel News

- Orbiting in sunshine
- Maintenance on the Data Hubs on 7 March 2017
- Second 'colour vision' satellite for Copernicus
- Sentinel-3 SRAL Level-1A NTC/STC available in

## - Events

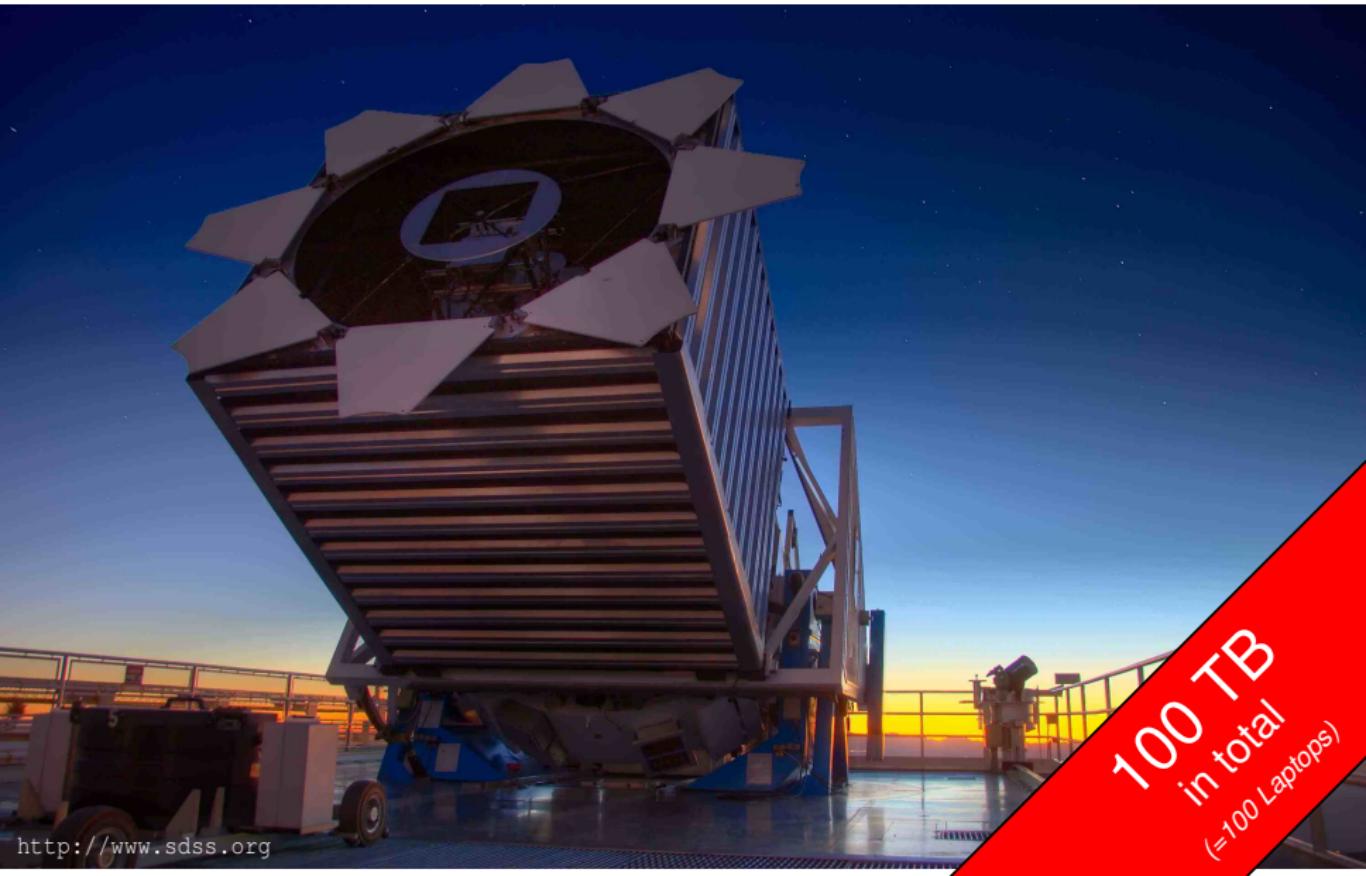
- Sentinel-3 Validation Team Meeting
- See all Sentinel Events

## - Browse to Oth

- EU Copernicus
- ESA Copernicus
- Observing the P
- Earth Online
- CSCDA
- Cop
- 100 TB  
per day  
(Data Products)

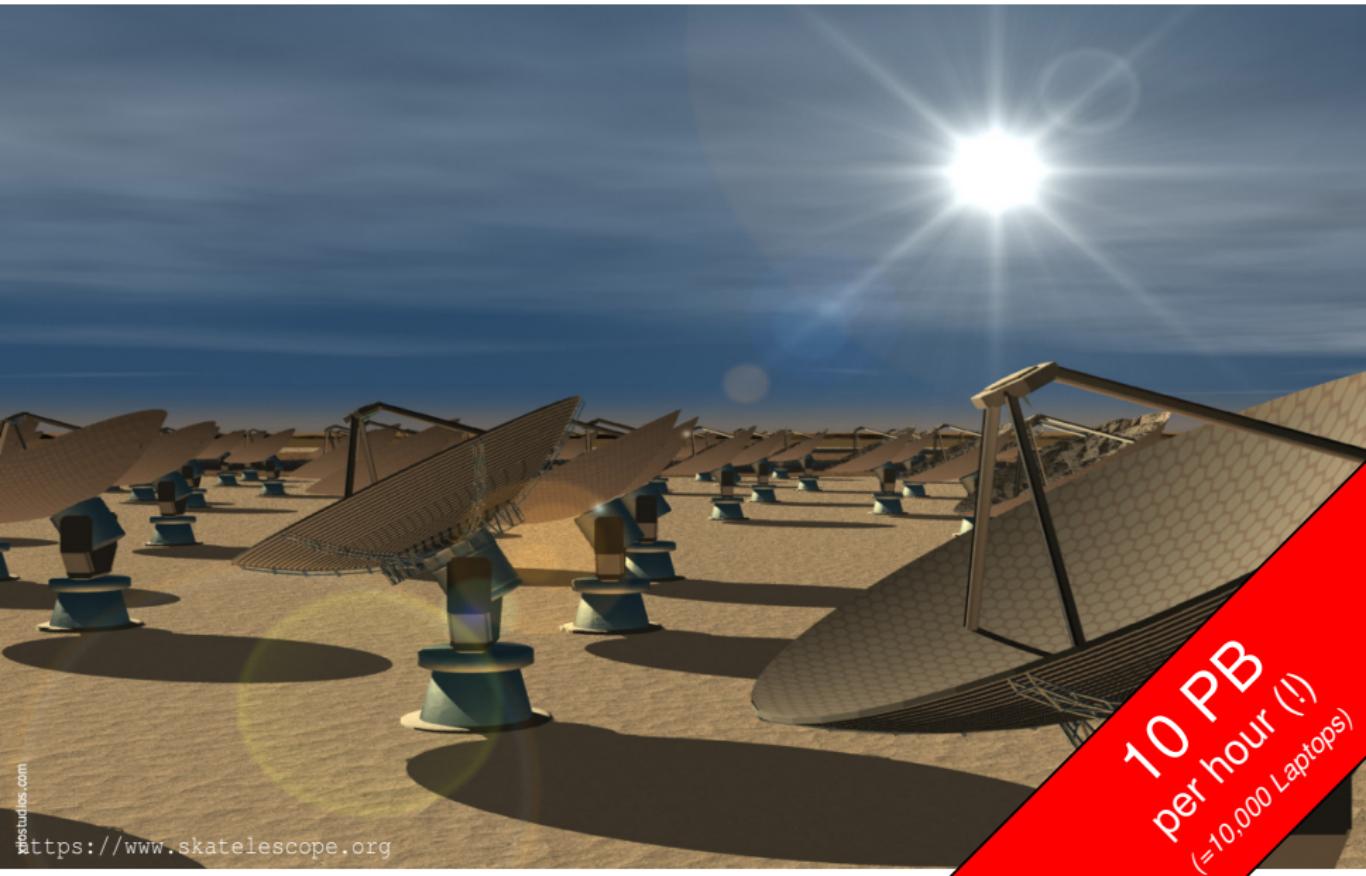
> 100 TB  
per day  
(Data Products)

# Today: Telescopes



100 TB  
in total  
(=100 Laptops)

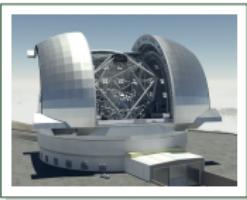
# Tomorrow: Telescopes



# Data Analysis: Example I



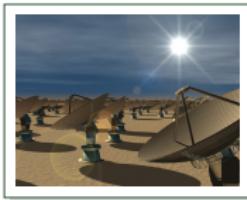
2015 → SDSS  
(in total: 100TB)



2024 → EELT  
(per night: 2TB)



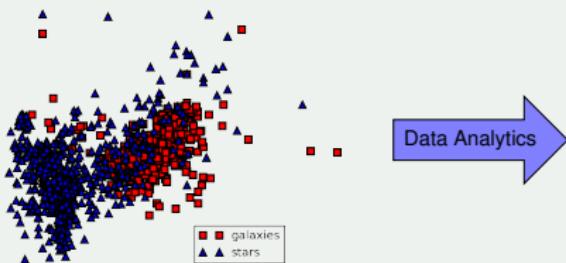
2021 → LSST  
(per night: 30TB)



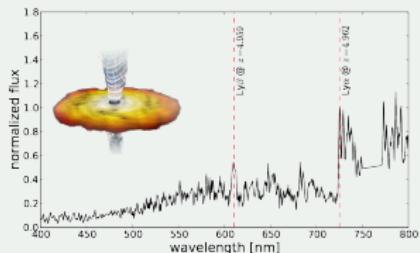
2025 → SKA  
(per hour: 10PB)

## Challenges

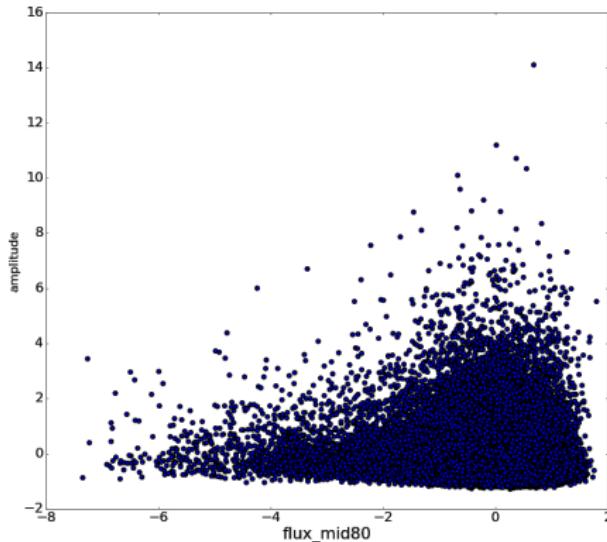
*Find interesting objects such as distant galaxies or very rare stars! Combine various data sources! Handle billions of objects per night → Process and analyze all the data efficiently and at low cost!*



Data Analytics



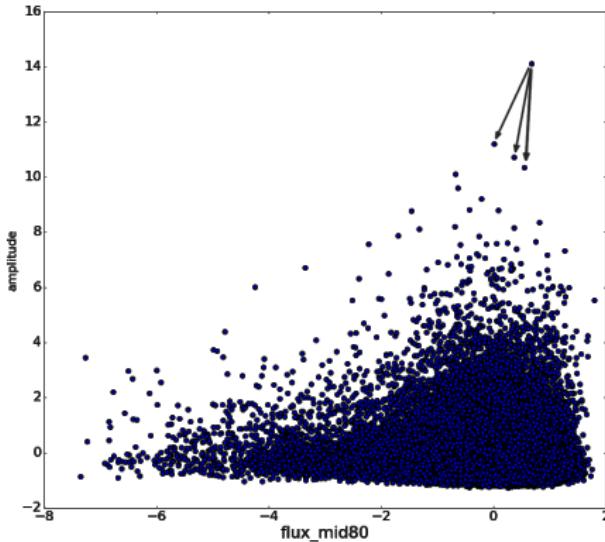
# Data Analysis: Example II



## Outlier Detection

*"I have one billion objects and each of them is described via 10 values (features). Can you find the outliers for me, i.e., objects that are somehow different from the other ones?"*

# Data Analysis: Example II

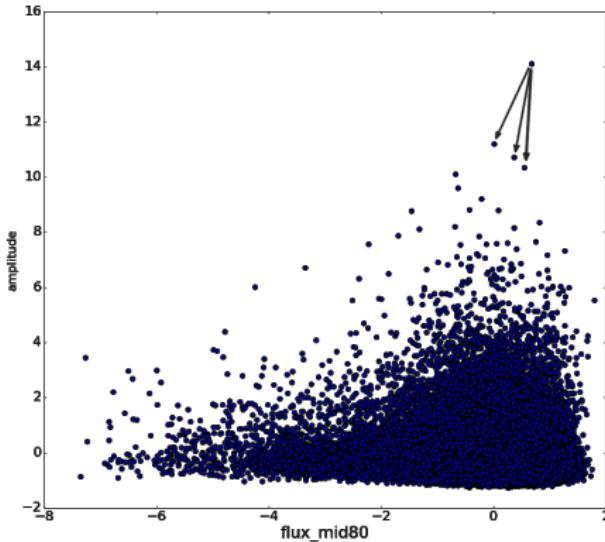


## Outlier Detection

*"I have one billion objects and each of them is described via 10 values (features). Can you find the outliers for me, i.e., objects that are somehow different from the other ones?"*

→ Compute, for each point, the distance to its nearest neighbors!

## Data Analysis: Example II

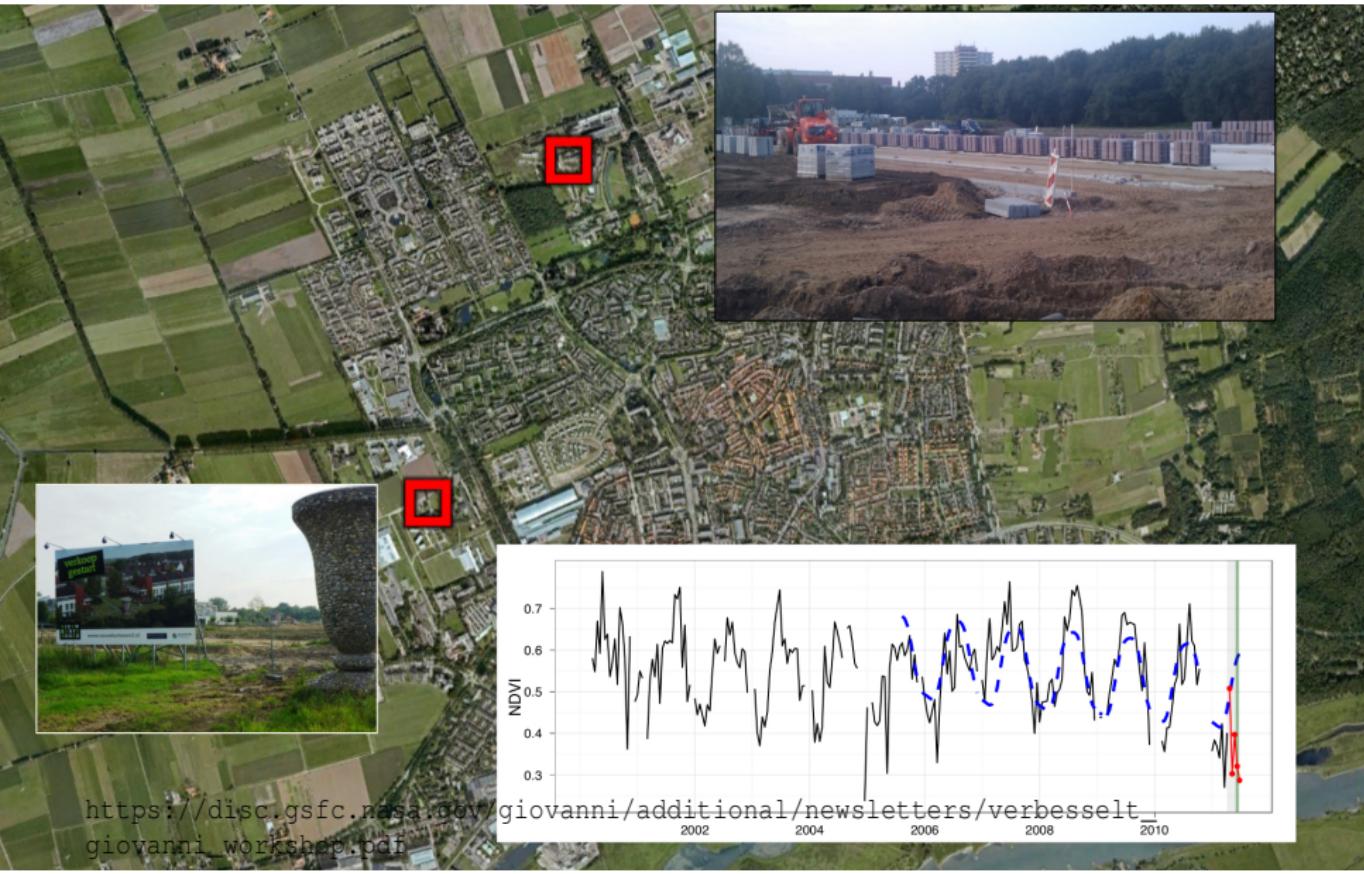


### Computing All Nearest Neighbors

```
1  for p in all_points:  
2      for q in all_points:  
3          d = distance(p, q)  
4          ...
```

Takes Forever!

## Data Analysis: Example III



# Data Analysis: Example III

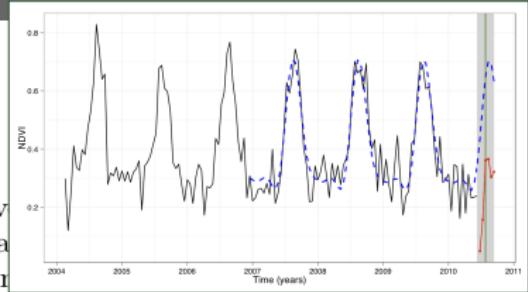
## 2.2. Season-trend model

The method proposed here is based on a similar additive model by Verbesselt *et al.* (2010b) to account for seasonal and nonseasonal variations within climate-driven biophysical indicators derived from MODIS imagery (Verbesselt *et al.* 2008; Geerken and Henebry 2005). For the observations  $y_t$  at time  $t$ , a season-trend model is assumed with linear trend and harmonic season:

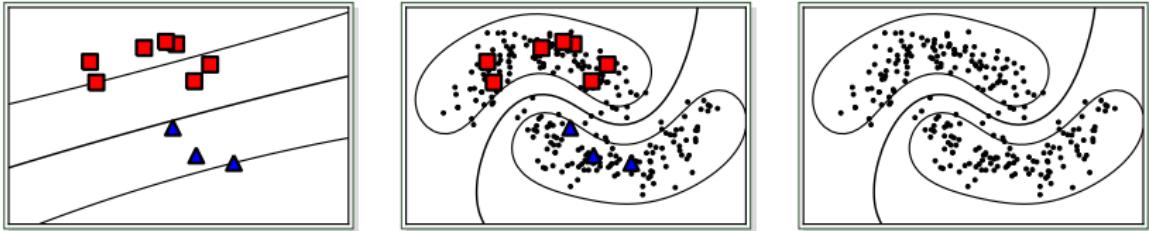
$$y_t = \alpha_1 + \alpha_2 t + \sum_{j=1}^k \gamma_j \sin\left(\frac{2\pi j t}{f} + \delta_j\right) + \varepsilon_t, \quad (1)$$

where the intercept  $\alpha_1$ , slope  $\alpha_2$  (i.e., trend), amplitudes  $\gamma_1, \dots, \gamma_k$ , and phases  $\delta_1, \dots, \delta_k$  (i.e., season) are the unknown parameters,  $f$  is the known frequency (e.g.,  $f = 23$  annual observations for a 16-day time series), and  $\varepsilon_t$  is the unobservable error term at time  $t$  (with standard deviation  $\sigma$ ). In the applications below, we employ three harmonic terms (i.e.,  $k = 3$ ) to robustly detect disturbances within MODIS NDVI time series, as components four and higher represent variations that occur on a three-month cycle or less (Geerken 2009; Julien and Sobrino 2010). The model (Equation 1) can be written as a standard linear regression model (see e.g. Cryer and Chan 2008, Chapter 3.3):

$$\begin{aligned} y_t &= x_t^\top \beta + \varepsilon_t, \\ x_t &= \{1, t, \sin(2\pi 1t/f), \cos(2\pi 1t/f), \dots, \sin(2\pi kt/f), \cos(2\pi kt/f)\}^\top, \\ \beta &= \{\alpha_1, \alpha_2, \gamma_1 \cos(\delta_1), \gamma_1 \sin(\delta_1), \dots, \gamma_k \cos(\delta_k), \gamma_k \sin(\delta_k)\}^\top, \end{aligned}$$



# Data Analysis: Example IV



## Combinatorial Optimization Task

$$\begin{aligned}
 & \underset{\mathbf{w} \in \mathcal{H}, b \in \mathbb{R}, \xi' \in \mathbb{R}^l, \xi \in \mathbb{R}^u}{\text{minimize}} && \frac{1}{2} \|\mathbf{w}\|^2 + C' \sum_{i=1}^l \xi'_i + C \sum_{i=1}^u \xi_i \\
 & \text{s.t. } y'_i (\langle \mathbf{w}, \Phi(\mathbf{x}_i) \rangle + b) \geq 1 - \xi'_i, \quad \xi'_i \geq 0, \\
 & \text{and } y_i (\langle \mathbf{w}, \Phi(\mathbf{x}_{l+i}) \rangle + b) \geq 1 - \xi_i, \quad \xi_i \geq 0
 \end{aligned}$$

# Data Analysis: Example V



<https://www.nvidia.com/en-us/deep-learning-ai/>

DEEP LEARNING AI

WHAT'S NEW

INDUSTRIES ▾

DEVELOPER

SOLUTIONS

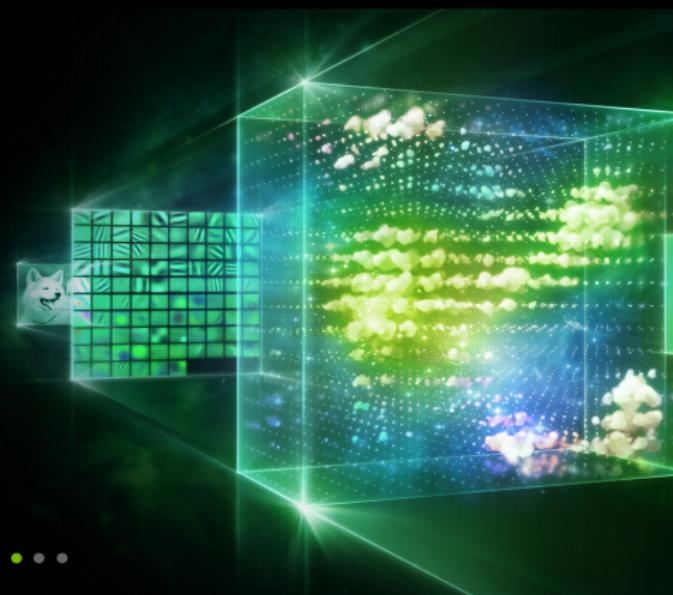
EDUCATION

AI STARTUPS

## EVERY INDUSTRY IS AWAKENING TO AI.

Deep learning is already being used in the automotive industry, healthcare, and many more.

[LEARN MORE](#)



• • •

## SEE YOUR LIFE'S WORK REALIZED, WITH AI.

Preventing disease. Building smart cities. Revolutionizing analytics. These are just a few things

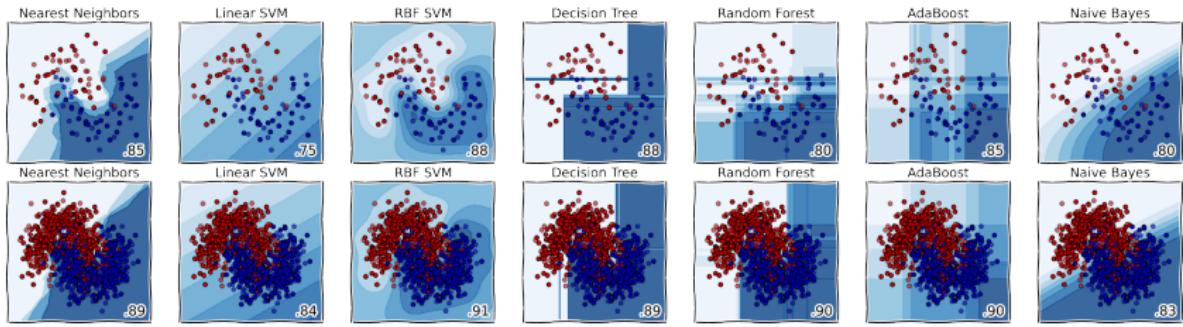
# Data Science Workflow



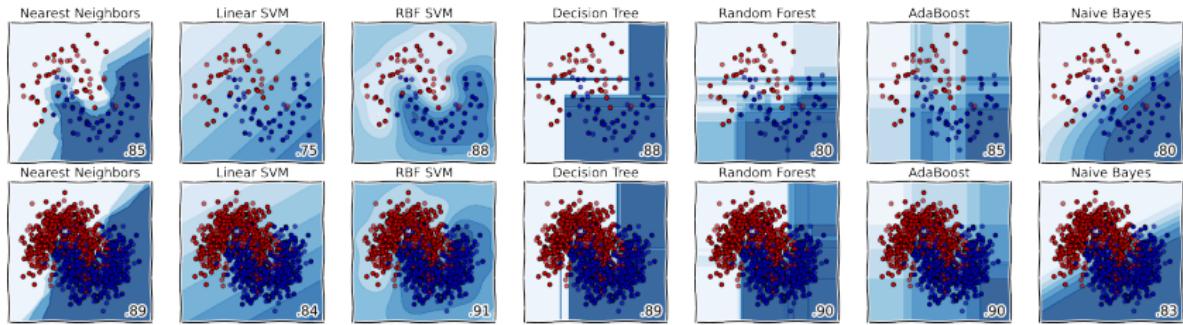
# Data Science Workflow



# Why Big Data?



# Why Big Data?



## Large-Scale Data Analysis

- 1 Interface: Machine Learning + Data Structures + Optimization + HPC + ...  
(often depends on the particular application domain!)
- 2 Key Question: How can we analyze all the data efficiently and at low cost?

# Outline

① Big Data

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# About Us



Fabian Gieseke  
fabian.gieseke@di.ku.dk

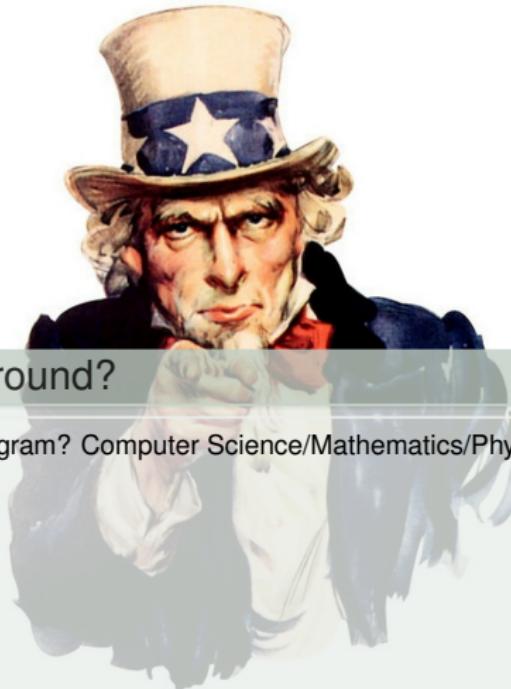


Christian Igel  
igel@di.ku.dk

## Teaching Assistants

- Frederik Faye (pft556@alumni.ku.dk)
- Mihai Popovici (mtf422@alumni.ku.dk)
- Haining Tong (znr113@alumni.ku.dk)

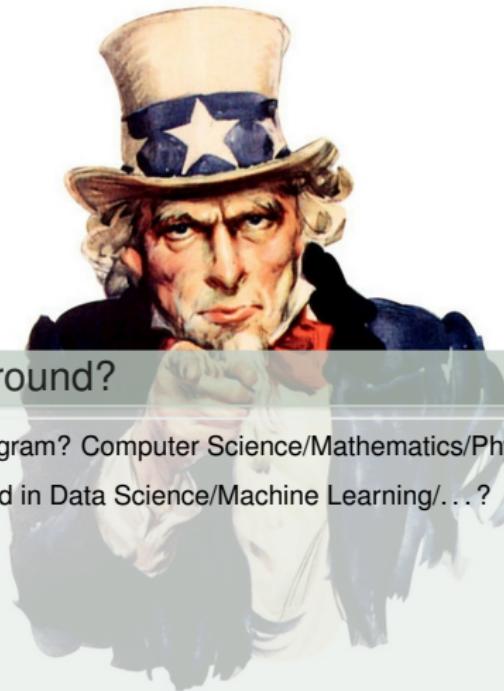
# About You



What's your background?

- 1 What's your study program? Computer Science/Mathematics/Physics/... ?

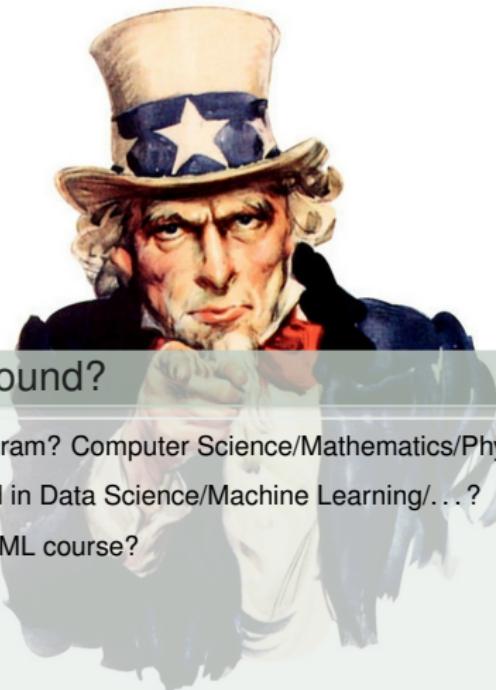
# About You



What's your background?

- 1** What's your study program? Computer Science/Mathematics/Physics/...?
- 2** Who has a background in Data Science/Machine Learning/...?

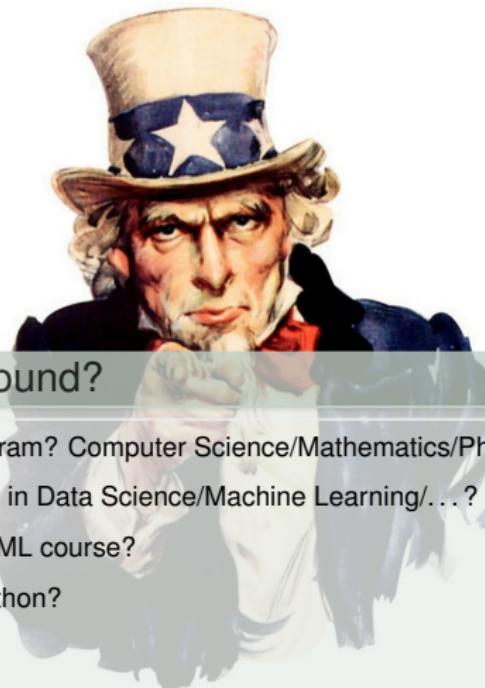
# About You



What's your background?

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- 3** Who has attended the ML course?

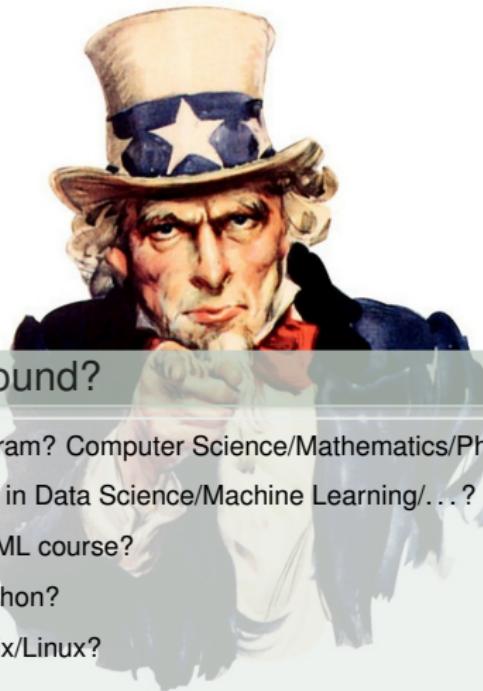
# About You



## What's your background?

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- 4** Who is familiar with Python?

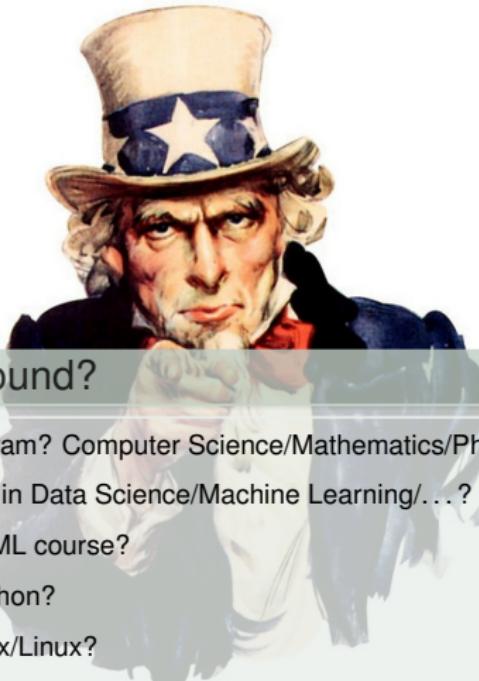
# About You



## What's your background?

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- 5** Who is familiar with Unix/Linux?

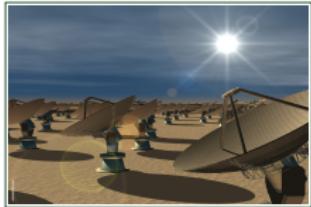
# About You



## What's your background?

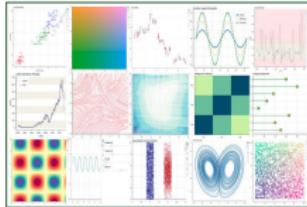
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- 2** Who has a background in Data Science/Machine Learning/...?
- 3** Who has attended the ML course?
- 4** Who is familiar with Python?
- 5** Who is familiar with Unix/Linux?
- 6** What did you have in mind when you signed up for the course?

# This Course



(1) Big Data

- Big Data: Applications, Goals?
- Computer Architectures
- Fundamentals of Data Mining



(2) DA &amp; Little Resources

- Streaming & Online Learning
- Large-Scale Machine Learning
- Parallel Machine Learning



(3) DA &amp; Big Resources

- Deep Learning
- Cloud Computing
- Hadoop & Spark

## What you should bring along (or be willing to learn)?

- 1 Algorithms & Math: Basic concepts (pseudocode,  $O$ -notation, calculus, probability, ...)
- 2 Programming: Basic knowledge (Python → main language), C, ...
- 3 Other: Linux/Unix (ssh, terminal, compiling code, ...), git, ...
- 4 Machine Learning: Some background in ML (e.g., local course)



# Tentative Schedule

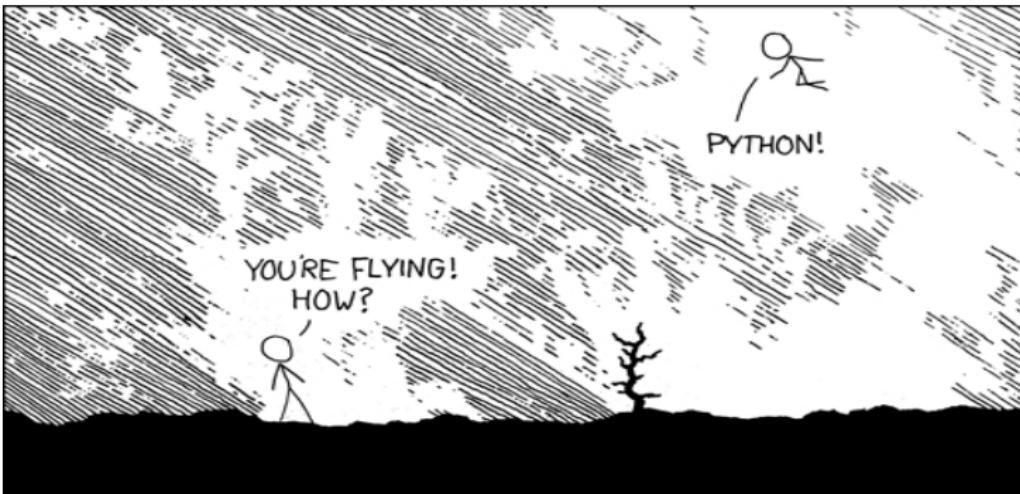
- 1 Introduction, Big Data, and Competitions (FG)
- 2 Fundamentals Computing & Large-Scale Nearest Neighbors (FG)
- 3 Neural Networks I & Tensorflow (CI)
- 4 Large-Scale Least-Squares & Large-Scale Random Forests (FG)
- 5 Boosted Trees & XGBoost (FG)
- 6 Neural Networks II (CI)
- 7 Neural Networks III (CI)
- 8 Neural Networks IV (CI)
- 9 Neural Networks V (CI)
- 10 Hadoop & Map Reduce (FG)
- 11 Apache Spark (FG)
- 12 Distributed Data Analysis with Apache Spark I (FG)
- 13 Distributed Data Analysis with Apache Spark II (FG)
- 14 Flash Talks (you) + Wrap-Up (FG)

# Tentative Schedule

- 1 Introduction, Big Data, and Competitions (FG)
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- 11 Apache Spark (FG)
- 12 Distributed Data Analysis with Apache Spark I (FG)
- 13 Distributed Data Analysis with Apache Spark II (FG)
- 14 **Flash Talks (you) + Wrap-Up (FG)**

# This course will teach you how to ...

- 1 ... speed up some well-known data science techniques.
- 2 ... make use of modern deep learning models.
- 3 ... conduct large-scale distributed analysis.
- 4 ... approach real-world data science problems.
- 5 ... do most of this using Python!



## This course will ...

- 1 ... not be an introduction to programming and Python.
- 2 ... not be an introduction to Linux.
- 3 ... not be an introduction to machine learning/data science.
- 4 ... not cover too many theoretical aspects of machine learning.

# This course overlaps with ...

- 1 Machine Learning
- 2 Introduction to Data Science
- 3 Algorithms and Data Structures
- 4 High Performance Computing
- 5 Computer Architectures
- 6 Information Retrieval
- 7 Databases
- 8 Linux and Python Programming
- 9 ...

# Tools!

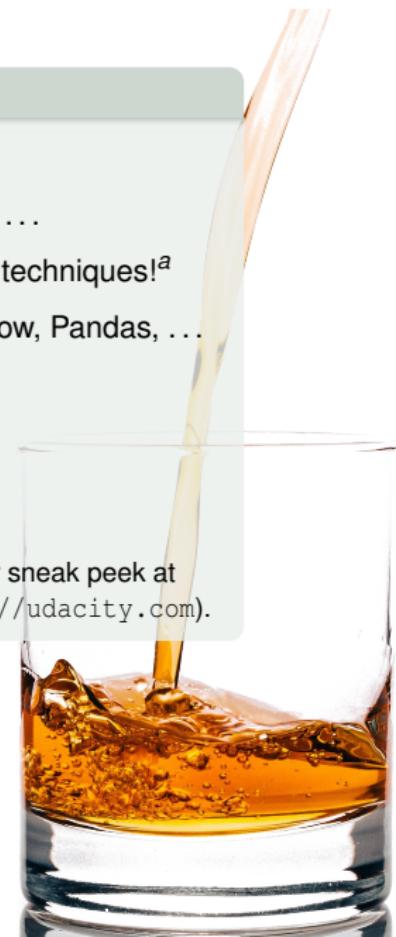
We will make use of ...

- 1 Algorithms: Pseudocode,  $O$ -notation, ...
- 2 Mathematics: Basic calculus, basic probability theory, ...
- 3 Machine Learning/Data Science: Basic concepts and techniques!<sup>a</sup>
- 4 Programming (Python): Numpy, Scikit-Learn, Tensorflow, Pandas, ...
- 5 VirtualBox & Linux: VirtualBox, SSH, Terminal, ...
- 6 Hadoop & Spark: HDFS, PySpark, Jupyter, ...
- 7 ...

---

<sup>a</sup>Maybe: Have a look at corresponding DIKU courses (slides) or sneak peek at online courses (e.g. "Introduction to Machine Learning" on <https://udacity.com>).

Note: Getting familiar with these tools can be **very** time-consuming. The homework assignments also aim at overcoming potential technical difficulties and at learning how to use new tools/techniques!



# Homework and Assessment (Tentative!)

## Continuous Assessment

*"4-6 weekly take-home exercises. The final grade will be the average over all assignments except the one with the lowest score."*

- 1** 3 individual take-home assignments (2 weeks for handing in)
  - ▶ HW2: Nearest Neighbors, Tree Ensembles, and Least-Squares
  - ▶ HW3: Neural Networks
  - ▶ HW4: Hadoop and Spark
- 2** 1 competition assignment (HW1, in parallel to HW2–HW4)
  - ▶ Team work: 3-4 students per team
  - ▶ Individual assessment!

# Assessment

## Correction & Grading

Feedback and tentative grades via Absalon on a regular basis. The **final grade** will be the average over

- 1 your **3 individual assignments** and
- 2 your **contribution to the competition assignment** (you will have to point out your individual contribution in the report),

except the one with the lowest score.

# Assessment

## Correction & Grading

Feedback and **tentative grades** via Absalon on a regular basis. The **final grade** will be the average over

- 1 your **3 individual assignments** and
- 2 your **contribution to the competition assignment** (you will have to point out your individual contribution in the report),

except the one with the lowest score.

If you have some concerns regarding the feedback/grading:

- 1 Assignments: Please let us/the TAs know in case you think that there is a **serious flaw** in the correction of an assignment (e.g., missing points, ...).
- 2 Note: We will **double check the scores** at the end when determining the final grades (especially the borderline cases!).

# Absalon

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## Course Schedule

This is a **tentative** course schedule. We might change both the ordering as well as the content. You can find the corresponding class rooms [here](#).

Week 17

- (L1) April 23, 8:15-10:00: Introduction, Big Data, and Competitions [FG]

- (L2) April 25, 9:15-11:00: Fundamentals Computing & Large-Scale Nearest Neighbors [FG]

## Course Content and Questions

Week 18

**1 Schedule, announcements, lectures, homework assignments, ...**

- (L3) May 2, 9:15-11:00: Large-Scale Least-Squares & Large-Scale Random Forests [FG]

**2 Use discussions board to ask and answer questions!**

(We will also answer questions via email/in person, but general questions shall be asked via Absalon)

- (L5) May 9, 9:15-11:00: Neural Networks II [CI]

**3 Help each other (e.g., Google Colab, Virtualbox, ...)!**

Week 20

Syllabus [Introduction – LSDA](#)

- (L7) May 14, 8:15-10:00: Neural Networks III [CI]

Slide 28/45

- (L8) May 16, 9:15-11:00: Neural Networks IV [CI]

Settings

- (P4) May 16, 12:15-14:00: Help HW

# Where and When?

5100-B4-4F19; Large-Scale Data Analysis > Pages > Course Schedule

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## Course Schedule

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- (L1) April 23, 8:15-10:00: Introduction, Big Data, and Competitions [FG]

- (L2) April 25, 9:15-11:00: Fundamentals Computing & Large-Scale Nearest Neighbors [FG]

## Class Rooms

(15-14:00: Getting Started with HW1/Competition (e.g., Google Colab)

**Week 18**

### 1 Lectures:

- (L3) April 30, 8:15-10:00: Neural Networks & Tensorflow [C]

- (L4) May 2, 9:15-11:00: Large-Scale Least-Squares & Large-Scale Random Forests [FG]

► **Tuesday: 8:15-10:00: Aud 06, Universitetsparken 5, HCO**

► **Thursday: 9:15-11:00: Lille UP1, Universitetsparken 1-3, HCO**

### 2 Practical Sessions:

- (P1) April 30, 12:15-14:00: Decision Trees & XGBoost [FG]

- (L5) May 9, 9:15-11:00: Neural Networks II [C]

1 **Thursday: 12:15-14:00: Bib 4-0-17, Universitetsparken 1-3, HCO**

**Week 20**

- (L7) May 14, 8:15-10:00: Neural Networks III [C]

- (L8) May 16, 9:15-11:00: Neural Networks IV [C]

- (P4) May 16, 12:15-14:00: Help HW4

# Where and When?

Monday 23 Apr	Tuesday 24 Apr	Wednesday 25 Apr	Thursday 26 Apr	Friday 27 Apr	Saturday 28 Apr	Sunday 29 Apr
06:00						
07:00	<b>1 Week 1 (17)</b>					
08:00	April 23, 10:00: HW1 (deadline: June 11, 23:59)					
09:00	April 23: L1 – Introduction, Big Data, and Competitions (FG)					
10:00	April 25: L2 – Fundamentals Computing & Large-Scale Nearest Neighbors (FG)					
11:00	April 25: P1 – Tutorial VirtualBox & Google Colab (Competition)					
12:00	<b>2 Week 2 (18)</b>					
13:00	April 30, 10:00: HW2 (deadline: May 14, 23:59)					
14:00	April 30: L3 – Neural Networks & Tensorflow (CI)					
15:00	May 2: L4 – Large-Scale Least-Squares & Large-Scale Random Forests (FG)					
16:00	May 2: P2 – Hints HW & Help VirtualBox/Competition					
17:00	<b>3 Week 3 (19)</b>					
18:00	May 7: L5 – Boosted Trees & XGBoost (FG)					
19:00	May 9: L6 – Neural Networks II (CI)					
20:00	May 9: P3 – Hints HW/Competition					
21:00	<b>4 Week 4 (20)</b>					
22:00	May 14, 10:00: HW3 (deadline: May 28, 23:59)					
23:00	May 14: L7 – Neural Networks III (CI)					
	May 16: L8 – Neural Networks IV (CI)					
	May 16: P4 – Hints HW/Competition					

# Where and When?

## Overview (Tentative!) Course Schedule



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Discussions



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Calendars



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Collaborations



Files



Peer feedback



Evaluation



Chat



Outcomes



Conferences

Study info

### 5 Week 5 (21)

May 21: L9 – Neural Networks V (CI)

May 23: L10 – Hadoop, Map Reduce, and Spark I (FG)

May 23: P5 – Hints HW/Competition

 Published

 Edit

⋮

### 6 Week 6 (22)

May 28, 10:00: HW3 (deadline June 11, 23:59)

**May 28:** L11 – Hadoop, Map Reduce, and Spark II (FG)

May 30: Ascension Day

• (L1) April 23, 8:15-10:00: Introduction, Big Data, and Competitions [FG]

### 7 Week 7 (23)

June 4: L12 – Distributed Data Analysis with Apache Spark I (FG)

June 6: L13 – Distributed Data Analysis with Apache Spark II (FG)

June 6: P6 – Hints HW/Competition

• (L4) May 2, 9:15-11:00: Large-Scale Least-Squares & Large-Scale Random Forests [FG]

### 8 Week 8 (24)

June 11: (no lecture)

June 13: L14 – Flash Talks & Wrap Up (you, FG)

• (L5) May 7, 8:15-10:00: Hosted Flash & Wrap Up

• (L6) May 9, 9:15-11:00: Neural Networks II [CI]

• (P3) May 9, 12:15-14:00: Help HW3

### Week 20

• (L7) May 14, 8:15-10:00: Neural Networks III [CI]

• (L8) May 16, 9:15-11:00: Neural Networks IV [CI]

• (P4) May 16, 12:15-14:00: Help HW4

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Syllabus **Introduction – LSDA**

Slide 31/45

Settings

# HW1 (Competition) → Suggestion

The screenshot shows the Google Colaboratory interface. At the top, there's a navigation bar with 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', and 'Help'. Below the navigation bar are buttons for 'CODE', 'TEXT', 'CELL', 'COPY TO DRIVE', 'CONNECT', and 'EDITING'. On the left, there's a sidebar with 'Table of contents', 'Code snippets', and 'Files' sections. The main area has tabs for 'EXAMPLES', 'RECENT', 'GOOGLE DRIVE', 'GITHUB', and 'UPLOAD'. The 'EXAMPLES' tab is active. It displays a list of notebooks with titles like 'Overview of Colaboratory Features', 'Markdown Guide', 'Charts in Colaboratory', 'External data: Drive, Sheets, and Cloud Storage', and 'Getting started with BigQuery'. Each notebook entry has a small icon and a checkbox. At the bottom right of the main area, there are buttons for 'NEW PYTHON 3 NOTEBOOK' and 'CANCEL'.

▼ Getting Started

<https://colab.research.google.com/>  
This week, Thursday: Help

The document you are reading is a [Jupyter notebook](#), hosted in Colaboratory. It is not a static page, but an interactive environment that lets you write and execute

# Compute Environment → HW2–HW4



# VirtualBox

## Welcome to VirtualBox.org!

VirtualBox is a powerful x86 and AMD64/Intel64 [virtualization](#) product for enterprise as well as home use. Not only is VirtualBox an extremely feature rich, high performance product for enterprise customers, it is also the only professional solution that is freely available as Open Source Software under the terms of the GNU General Public License (GPL) version 2. See "[About VirtualBox](#)" for an introduction.

Presently, VirtualBox runs on Windows, Linux, Macintosh, and Solaris hosts and supports a large number of [guest operating systems](#) including but not limited to Windows (NT 4.0, 2000, XP, Server 2003, Vista, Windows 7, Windows 8, Windows 10), DOS/Windows 3.x, Linux (2.4, 2.6, 3.x and 4.x), Solaris and OpenSolaris, OS/2, and OpenBSD.

VirtualBox is being actively developed with frequent releases and has an ever growing list of features, supported guest operating systems and platforms it runs on. VirtualBox is a community effort backed by a dedicated company: everyone is encouraged to contribute while Oracle ensures the product always meets professional quality criteria.

**Download  
VirtualBox 6.0**

### Hot picks:

- Pre-built virtual machines for developers at [Oracle Tech Network](#)
- [Hyperbox](#) Open-source Virtual Infrastructure Manager [project site](#)
- [phpVirtualBox](#) AJAX web interface [project site](#)

search...  
Login Preferences

### News Flash

- **New April 16th, 2019**  
[VirtualBox 6.0.6 released!](#)  
Oracle today released a 6.0 maintenance release which improves stability and fixes regressions. See the [Changelog](#) for details.

- **New April 16th, 2019**  
[VirtualBox 5.2.28 released!](#)  
Oracle today released a 5.2 maintenance release which improves stability and fixes regressions. See the [Changelog](#) for details.

- **New December 18th, 2018**  
[VirtualBox 6.0 released!](#)  
Oracle today shipped a new major release, VirtualBox 6.0. See the [Changelog](#) for details.

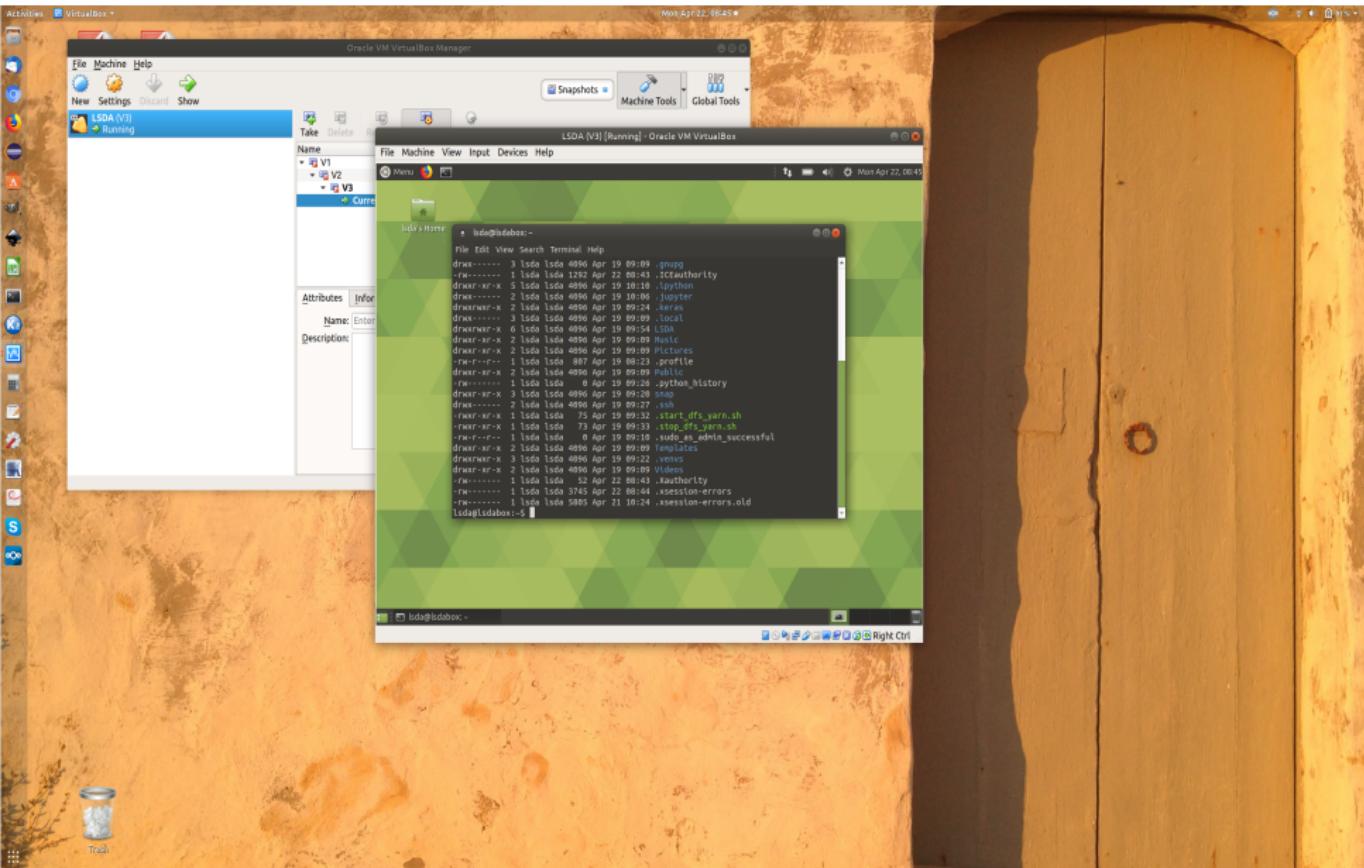
[More information...](#)

ORACLE

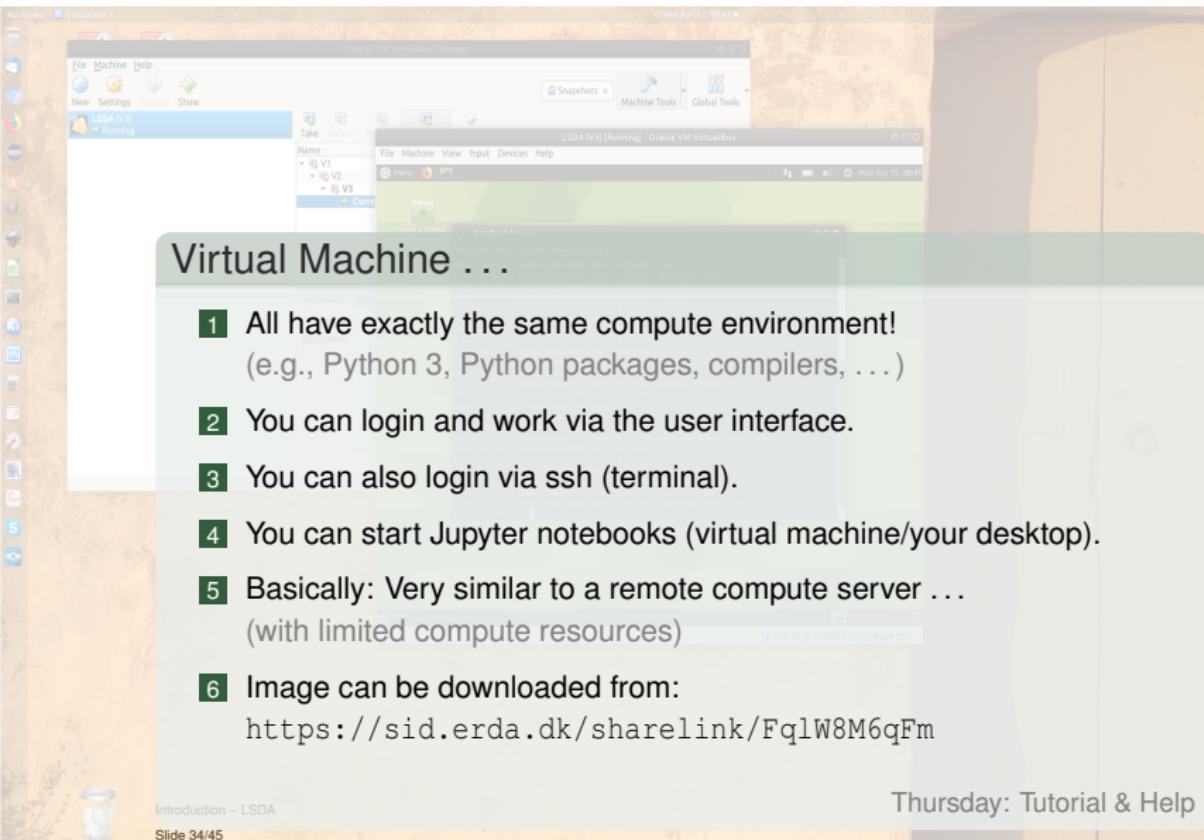
[Contact](#) – [Privacy policy](#) – [Terms of Use](#)

<https://www.virtualbox.org/>

# Compute Environment → HW2–HW4



# Compute Environment → HW2–HW4



Virtual Machine ...

- 1** All have exactly the same compute environment!  
(e.g., Python 3, Python packages, compilers, ...)
- 2** You can login and work via the user interface.
- 3** You can also login via ssh (terminal).
- 4** You can start Jupyter notebooks (virtual machine/your desktop).
- 5** Basically: Very similar to a remote compute server ...  
(with limited compute resources)
- 6** Image can be downloaded from:  
<https://sid.elda.dk/sharelink/FqlW8M6qFm>

Introduction – LSDA  
Slide 34/45

Thursday: Tutorial & Help

# Outline

① Big Data

② Organization

③ Competition

④ Summary

# HW1: Competition Assignment

InClass Prediction Competition

## BigData Cup Challenge 2019: Flare Prediction

Solar Flare Prediction from Time Series of Solar Magnetic Field Parameters

GSU DMLab · 1 teams · 4 months to go

Overview Data Kernels Discussion Leaderboard Rules Join Competition



### Overview

#### Introduction

#### Evaluation

#### Description

#### Working With Kaggle

### Introduction

This competition is part of the [Solar Flare Prediction from Time Series of Solar Magnetic Field Parameters](#) in the IEEE Big Data 2019 big Data Cup

#### Important Dates

- **April 29, 2019:** Competition Opens (team submission is open to any interested individual(s))
- **September 1, 2019:** Phase 1 Ends: Result submission used for ranking closes.
- **September 2, 2019:** Phase 2 Begins: Top participants invited to submit an academic paper.
- **October 1, 2019:** Phase 2 Ends: Academic paper submissions due.
- **November 1, 2019:** Notification of paper acceptance [https://www.kaggle.com/bigdata2019-flare-prediction/overview](#)
- **November 15, 2019:** Camera-ready of accepted papers.
- **December 9-12, 2019:** Conference & Workshop date TBA

# HW1: Competition Assignment

InClass Prediction Competition

## Basic Idea

- 1 Work together (teams of 3-4 students)**  
(you team up on your own; get in touch with us in case you do not find a team!)
- 2 Enter a machine learning competition**
- 3 Beat the crap out of everyone else! :-)**

### Introduction

### Evaluation

### Description

### Working With Kaggle

### Introduction

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- <https://www.kaggle.com/c/bigdata2019-flare-prediction/overview>
- November 15, 2019: Camera-ready of accepted papers.
- December 8-12, 2019: Conference @Madden data TBC

# HW1: Remark 1

For participating in the competition, at least one of the team members will have to create a Kaggle account. You might also need a Google account in order to use Google Colabs. If no member of a team is willing to do so, please get in touch with us!

# HW1: Remark 2

## IEEE BigData 2019

*Solar Flare Prediction from Time Series  
of Solar Magnetic Field Parameters*

IEEE BigData 2019

Los Angeles, CA, USA

Overview

Important Dates

Data

Submissions

Leaderboard

Organizers

Sign Up

## Solar Flare Prediction from Time Series of Solar Magnetic Field Parameters

### A Track in the IEEE Big Data 2019 Big Data Cup

#### Submissions

The data competition is hosted through Kaggle and the participants classification results are submitted through their platform. Teams will be limited to 2 submissions a day.

<https://www.kaggle.com/c/bigdata2019-flare-prediction/submissions>

#### Evaluation of Results

The competition will utilize the built-in FBeta-Score of Kaggle, with Beta set to one, as a way to evaluate the performance of each submission. There are both public and private leaderboards that are based on different partitions of the testing dataset, so participants are encouraged to keep this fact in mind and not overtrain their model for achieving the best results on the public leaderboard. The winning prediction method(s) will be evaluated on the following: (1) 30% coming from their rank on the private leaderboard, (2) 10% from their rank on the public leaderboard, and (3) 60% from the quality of the accompanying paper describing their methods and results. As this task is intended to help identify physical mechanisms that indicate the possible occurrence of or are the cause of solar flares, interpretability of results shall be given extra weight in the evaluation of the accompanying paper.

#### Your Code

Source code will also be required to be submitted, either through a publicly available repository on a Git based version control hosting service such as GitHub or BitBucket, or as code directly shared on Kaggle as a Kernel. Since our work is publicly funded, all source code is expected to be released as open-source software, utilizing some generally accepted licensing such as Apache License 2.0, GNU General Public License, MIT license, or others of similar acceptance by the Open Source Initiative.

<http://dmilab.cs.gsu.edu/bigdata19/flare-comp/index.html>

#### Your Paper

# HW1: Assessment

The assessment of the competition assignment will be based on:

- 1 **Report:** Short report (max 4 pages), **one** report per team  
(point out individual contributions, make use of Latex template <https://www.ieee.org/conferences/publishing/templates.html>)
- 2 **Presentation:** **One** “flash talk” per team (1-2 minutes)  
(each team member has to participate in the presentation)
- 3 **Kaggle rank:** Internal comparison between all LSDA teams.

## Important: Individual scores!

- Team score as basis
- Individual contributions to report/presentation/code
- We might invite teams for a personal discussion.
- Again: We will double check the scores at the end! In particular, we will have another look at the team score and the individual contributions.

# Workflow & Hints → See HW1

- 1 Start as soon as possible!!!
- 2 Find a team and enter one of the groups on Absalon ("Competition (HW1) X")
- 3 Decide for a **Kaggle team name**. Use "LSDA\_" as prefix (e.g., LSDA\_CoolTeam).
- 4 **Send one e-mail per team to me until Friday, April 26, 12:00:**
  - 1 Subject: "Kaggle Details"
  - 2 Content: (1) Kaggle team name, (2) Absalon group name/number ("Competition (HW1) X"), and (3) team members (KU ids)
- 5 Get acquainted with competition task and data.
  - ▶ <https://www.kaggle.com/c/bigdata2019-flare-prediction/kernels>
- 6 You **are allowed** to use any programming language/tools! Also, you can use publicly available code! Check competition rules.
- 7 Advice: Make use of Google Colab!
- 8 Advice: Try to come up with a **simple (!)** baseline method
- 9 **Advice: Make your first submission on Kaggle! This week?**
- 10 Try, evaluate, improve, repeat
- 11

## Some Links ...

- <https://www.kaggle.com/c/bigdata2019-flare-prediction/kernels>
- <http://colab.research.google.com/>
- <https://towardsdatascience.com/setting-up-kaggle-in-google-colab-ebb281b61463>
- <https://www.kaggle.com/c/bigdata2019-flare-prediction/overview/working-with-kaggle>

# Next Steps

## What you have to do next ...

- 1** HW1: We have created slots for teams for up to 4 students on Absalon. Find a team and enter one of the slots!  
(let us know if you cannot find any team mates asap)
- 2** Get started with the assignments:
  - ▶ Team work: Get started with HW1  
(Hint: Start as soon as possible!)
  - ▶ Individually: Get started with HW2 (next week)
- 3** Install VirtualBox and LSDA image (see Absalon)
  - ▶ Help: Tutorial on Thursday, April 25 (12:15 – 14:00)
- 4** Check Absalon regularly!
- 5** Next lecture: Thursday, 9:15 (Lille UP1)

# Questions?



# Outline

① Big Data

② Organization

③ Competition

④ Summary

# Summary & Outlook

## Today

- 1 Big Data
- 2 Organization
- 3 Competition

## Next Steps

- 1 Get started with HW1. Get in touch with me if you cannot find a team until Thursday (come to me during the break).

## Outlook

- Thursday (9:15-11:00): Fundamentals Computing & Large-Scale Nearest Neighbors (FG)
- Thursday (12:15-14:00): Practical sessions  
(Help Google Colab, ...)

