

Distributed Systems

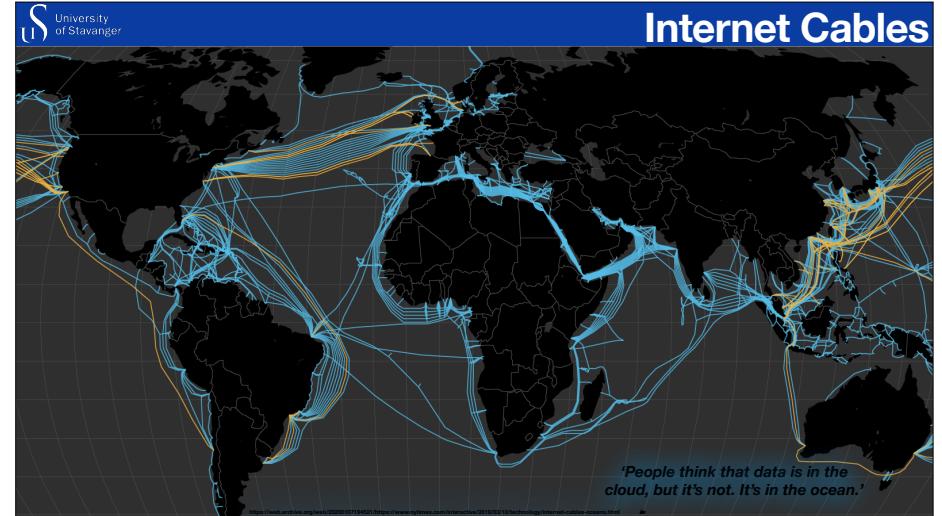
DAT520 - Spring 2024

Course Information

Prof. Hein Meling



1



2



Agenda



3



4

About us

Course Instructor: Prof. Hein Meling

- hein.meling@uis.no
- Office: KE D427 (no office hours)
 - Talk to me between lectures
 - Come by the office — I may be busy ...
 - Send email to book an appointment
- Research interests: Distributed Systems
 - Fault tolerance, availability, reliable storage, blockchain systems, etc...

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5

About us

Teaching Assistants

- Hanish Gogada, PhD student
 - Office KE E404
 - hanish.gogada@uis.no
- Erlend Bygdås, Master student
- Daniel Osmundsen Dirdal, Master student

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6



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INTRODUCTION

7

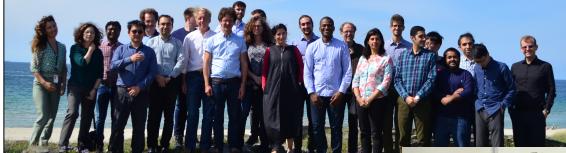
2018-2023	BBChain (UiS & UiT): An Efficient Trustworthy Distributed Document Verification System
2019-2022	Credence (USA, Canada, Brazil, and Norway research institutions); Collaboration Network for Excellent Education and Research in Dependable and Secure Distributed Systems
2021-2022	Leander Sabbatical: Technische Universität Braunschweig
2022-2023	Hein Sabbatical: University of California, Berkeley

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8



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Who are you?

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INTRODUCTION

Learning Outcomes?

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Learning Outcomes

Knowledge

Be familiar with

- important principles for design and implementation of distributed systems.
- the most important system architectures for distributed systems.
- important techniques for solving various problems in distributed systems.

Lectures

Lectures

Lectures

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Learning Outcomes

Skills

Be able to

- develop advanced distributed applications with fault tolerance properties.
- perform independent research in distributed systems.
- reason about problems that involve distributed components.

Labs
Master thesis
Exam

General competency

Know how to

- develop distributed computer systems.

Work

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13

Logistics and Policies

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14

Prerequisites

Recommended prerequisites

- Operating Systems
- Databases
- Computer Networking
- Advanced Programming
- Discrete Mathematics (Logic operators)
 - For all, existence, set operators, ...

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15

Course Information

GitHub

github.com/dat520-2024/info

- Course information
- Syllabus
- Lecture Plan
- Lab project information
- Reading material (links)

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16

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Discord (Helpbot)

- Announcements (Canvas also?)
- Get help during labs
- Queue management
- Lab approval

<https://discord.gg/xFnZUUcvkE>

Register with Helpbot using your GitHub username: /register

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17

Weekly Schedule



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19

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QuickFeed

- Submit assignments to GitHub
- Tested by QuickFeed
- View results of lab
- Lab approval

<https://uis.itest.run/>

Sign up using your GitHub account

Enroll in DAT520

Consider creating a separate GitHub account for course work

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18

Lecture Plan Spring 2024

W	M	Wednesday 14:15 - 16:00	Thursday 12:15 - 14:00	Comment
2	Jan	Course Introduction	Ch 1 Introduction	Bring laptop
3	Jan	No Lecture	Live coding: Go / gRPC	Bring laptop
4	Jan	Ch 2 Basic Abstractions	Live coding: Gorums	
5	Feb	Ch 2 Basic Abstractions	Ch 2 Basic Abstractions	
6	Feb	Ch 3 Reliable Broadcast	Ch 3 Reliable Broadcast	
7	Feb	Paxos	Paxos	
8	Feb	Ch 5 Consensus	Live coding	Bring laptop
9	Mar	Ch 6 Consensus Variants	Ch 6 Consensus Variants	
10	Mar	Ch 4 Shared Memory	Ch 4 Shared Memory	
11	Mar	Consistent Global States	Consistent Global States	
12	Mar	Consistent Global States	Consistent Global States	
13	Mar	No Lecture	No Lecture	Easter
14	Apr	Blockchain / Bitcoin	Guest Lecture	
15	Apr			
16	Apr			
17	Apr		No Lecture (Only Lab)	
18	May			
22	Jun	Written exam: TBD		

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20

“I love deadlines. I like the whooshing sound they make as they fly by.”

— Douglas Adams, *The Salmon of Doubt*

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21

Lab Assignments

Lab	Topic	Estimated Effort	Grading	Approval	Submission	Deadline
1	Getting Started	10 h	Pass/fail	Automatic	Individually	January 25
2	Network Programming in Go	20 h	Pass/fail	TA Approval	Individually	February 8
3	Failure Detector and Leader Election	20 h	Pass/fail	TA Approval	Group	February 22
4	Single-decree Paxos and Multi-Paxos	30 h	Pass/fail	TA Approval	Group	March 14
5	Multi-Paxos with Gorums and Performance Evaluation	40 h	Pass/fail	TA Approval	Group	April 25
6	Bank Application with Reconfiguration	30 h	No Grading	No Approval	Group	April 25

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22

Course Policies

Deadlines and Slip days

<dat520-2024/info/policy.md>

- If you cannot make a deadline, you can use up to a total of **15 slip days** throughout the semester, including weekends and holidays.
- It is the **date on your lab's submission** as viewed **on GitHub** that counts towards the slip days.
- Slip days **cannot be used extend** the final submission deadline.
- All submissions must be approved before the last deadline.

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23

Course Policies

Collaboration

<dat520-2024/info/policy.md>

- Talk to each other or the teaching staff about any of the assignment. Assistance is limited to general discussion of the problem. Each student/group must write out their own solutions.
- Consulting another student's/group's solution is prohibited. Submitted solutions must not be copied from any source.
- You **shall not** supply your work to other students in future instances of this course.



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24

Course Policies

Generative Models

[dat520-2024/info/policy.md](#)

- May use generative models such as ChatGPT or GitHub Copilot to generate code.
- Must be able to explain the code as if you had written it yourself.
- The code must obviously **solve the assignment** and pass sufficient number of tests on QuickFeed.



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25

Course Policies

Contributions

[dat520-2024/info/policy.md](#)

- Group members must **contribute equally** to code
 - *Implies that group members should commit a similar amount of code on GitHub.*
- Each group member must **individually present** and explain their work to a TA for approval.
 - Group members expected to be able to explain the code written by other group members.



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26

Course Policies

Two Working Styles

[dat520-2024/info/policy.md](#)

- Pair programming
 - Alternate between coding vs watching
 - Make sure to switch user that writes and commits code to GitHub
- Code Review
 - Each group member creates a branch
 - Create Pull Request
 - Partner reviews your code before it is merged into the main branch

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27

Course Policies

When to Commit

[dat520-2024/info/policy.md](#)

- Commits should represent a **logical unit of work**.
 - A bug fix, a new feature, a refactoring, etc.
 - It is up to you to decide what constitutes a unit of work, but it should not be too large.
- *Unacceptable to commit an entire lab assignment in one commit.*

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28

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Commit Messages

<dat520-2024/info/policy.md>

- Describe the changes you have made.
- Must follow the Conventional Commits format.

```
93fa221 Hein Meling Mon Jan 8 13:53:59 2024 +0100 fix(lab1): fixed doc format issue in errors task
90509b3 Hein Meling Mon Jan 8 13:51:13 2024 +0100 feat(lab1): implemented fibonacci sequence task
43a353c Hein Meling Mon Jan 8 13:49:57 2024 +0100 feat(lab1): implemented multiwriter task
9d5d0bf Hein Meling Mon Jan 8 13:49:39 2024 +0100 feat(lab1): implemented errors task
2693212 Hein Meling Mon Jan 8 13:44:50 2024 +0100 feat(lab1): implemented the cipher task
f6d8a83 Hein Meling Mon Jan 8 13:43:12 2024 +0100 feat(lab1): implemented stringer task
1f9a64a Hein Meling Mon Jan 8 13:40:55 2024 +0100 mc-go(lab1): answered go questions
88da89b Hein Meling Mon Jan 8 13:38:25 2024 +0100 token(lab1): ran generate_token on go1
23e522c Hein Meling Mon Jan 8 13:20:26 2024 +0100 mc-missing(lab1): answered missing semester questions
24cf9ac Hein Meling Mon Jan 8 13:19:01 2024 +0100 mc-shell(lab1): answered shell questions
31c4fa8 Hein Meling Mon Jan 8 13:17:54 2024 +0100 mc-git(lab1): fixed git answers
ce0027e Hein Meling Mon Jan 8 11:19:53 2024 +0100 mc-git(lab1): answered git questions
8133f91 Hein Meling Mon Jan 8 09:52:23 2024 +0100 lab1: first commit
```

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29

Group Registration on QuickFeed

- Groups of two (max three)
- If you cannot find a group partner
 - Sign up for group on QuickFeed
 - We will combine groups arbitrarily

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30

Course Policies

Partner Problems

<dat520-2024/info/policy.md>

- Please **tell us** and **your partner** early
 - decide to drop out of the course
 - want to dissolve the group and work alone
- To avoid problems, we suggest to organize regular
 - joint work sessions



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31

Study Resources

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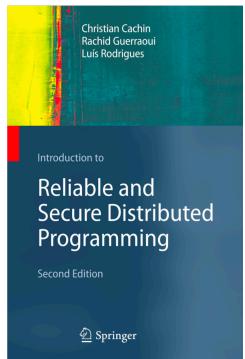
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32

Text Books

Official Book



<https://link.springer.com/book/10.1007%2F978-3-642-15260-3>

- Available for free download when on UiS campus
- Available in print in the bookstore
- RSDP

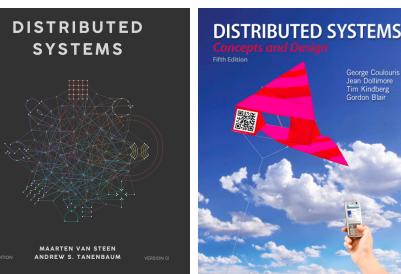
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33

Other Books



Available free online

Print copy available
at UiS library

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34

Syllabus

- Chapters from RSDP
- Additional papers
- Lab project
- Lecture slides

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35

Theory Exercises

- Lab exercises includes some theory
- Theory exercises and solutions in textbook
 - Recommended practice
 - Exam questions may be picked from textbook exercises
- Previous exams
- Will post on Canvas

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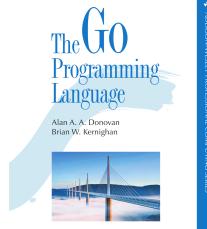
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36

Go Programming

Links

- Official web page: go.dev
- [A Tour of Go](#)
- [Effective Go](#)
- Other [Learning resources](#)
- [Standard library and Style guide](#)
- Video: [Go Tutorial](#) from freeCodeCamp.org (7 hours)
 - Beware: some information may be outdated!!



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37

Questions?

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38