

Applied Compositional Thinking for Engineers



Spring 2021

Hello!

Today's plan

► Session 1a: (12:15 - 13:00)

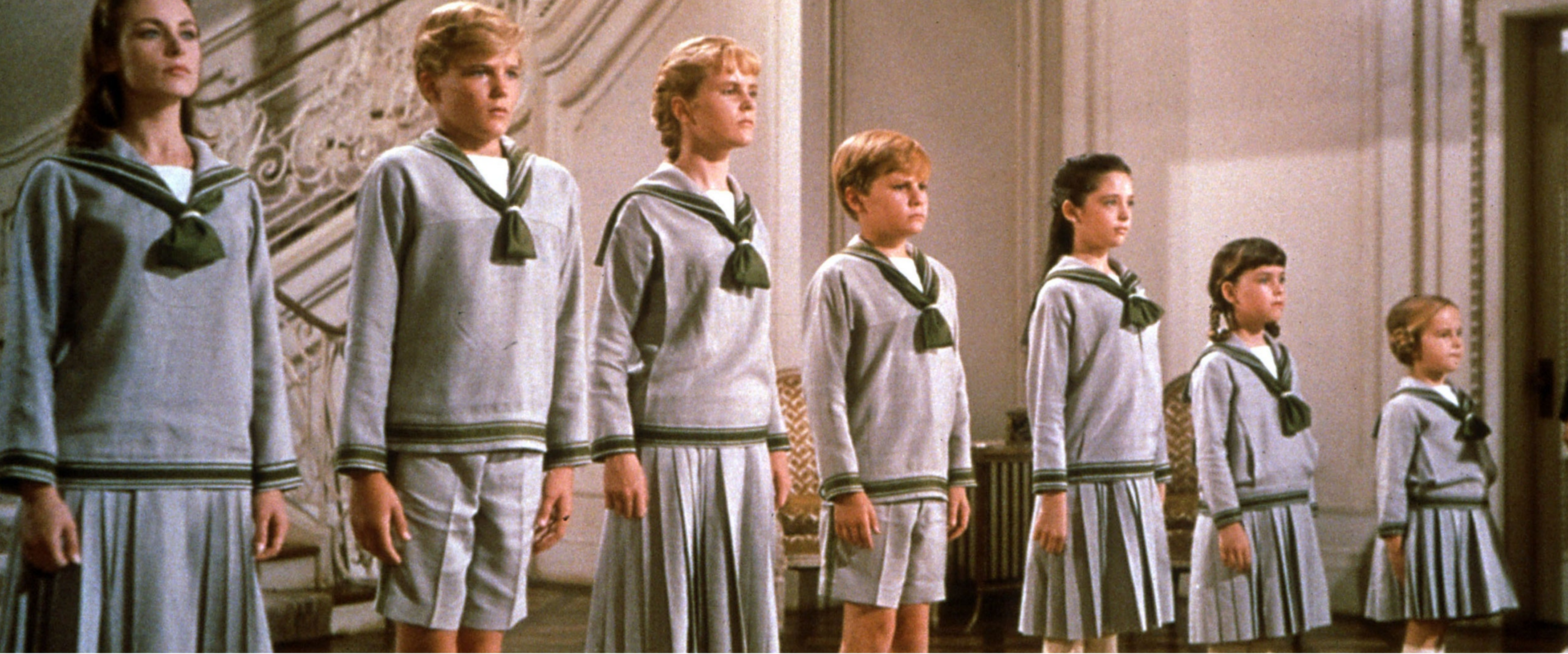
- Hello! Introductions, schedule, materials
- Why this course?
- Compose everything!

► Break

► Session 1b (13:15 - 14:00):

- Semigroups, monoids, groups





Introductions



Who we are

Lecturers:

► **Andrea Censi**

- From Rome, Italy
- Ph.D. in Control & Dynamical Systems, Caltech



► **Jonathan Lorand**

- From California
- Ph.D. in Mathematics, University of Zürich



Head TA:

► **Gioele Zardini**

- From Besazio, Switzerland
- Ph.D. student in Mechanical Engineering, ETH Zürich



Sponsors

- ▶ This course is brought to you by the letter ü in

ETH zürich

(Swiss Federal Institute of Technology Zürich)

- ▶ Partial funding provided by the Swiss National Science Foundation



- ▶ A word from our sponsor, Switzerland:

After COVID, visit Switzerland!



myswitzerland.com

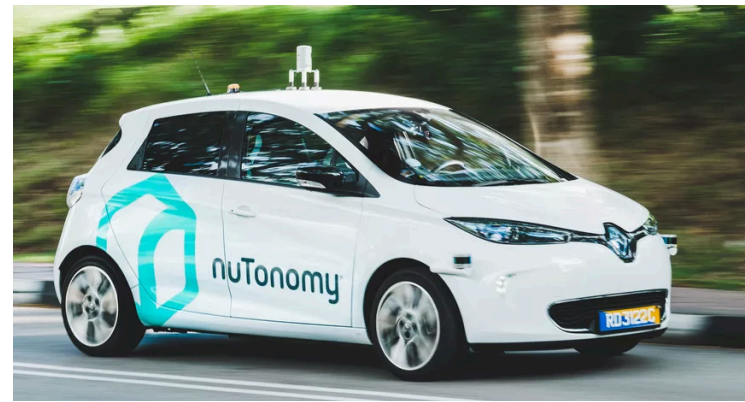


“Come for the chocolate, stay for the low-income-tax business-friendly direct democracy!”



Our background

- ▶ We all work in the Frazzoli group in the Department of Mechanical and Process Engineering at ETH Zürich.
- ▶ We do **research in autonomous systems**.
- ▶ We have a particular expertise in **autonomous vehicles**:



*industry experience:
nuTonomy (now Motional)*



*academic research:
self-driving go-karts*



*outreach:
Duckietown*

- ▶ We also look at the “**big picture**” in mobility.





Logistics



Format

- ▶ Mondays:
 - **Lecturing slot consisting of two “sessions”** of 45 minutes each
 - 15 minutes break in between.
- ▶ Wednesdays:
 - **Recitation** of 45 minutes
- ▶ Wednesdays (or maybe Friday):
 - **Office hours**
 - Ask questions
- ▶ Formats:
 - Lectures and recitation: Zoom in webinar format.
 - Lectures recorded and posted publicly. Students cannot interact.
 - **Vox populi**: all can write questions in a Google doc, **vox populi** speaks for you.
Session 1a: <http://bit.ly/2PnBLPK>
Session 1b: <http://bit.ly/3b1KjUQ>
 - Office hours: Zoom in regular meeting format. Only ETH. Not recorded.



Schedule

- ▶ See website for up-to-date schedule.

<https://applied-compositional-thinking.engineering>

- ▶ You can subscribe to a calendar

- Google users:

<http://bit.ly/3q59biw>

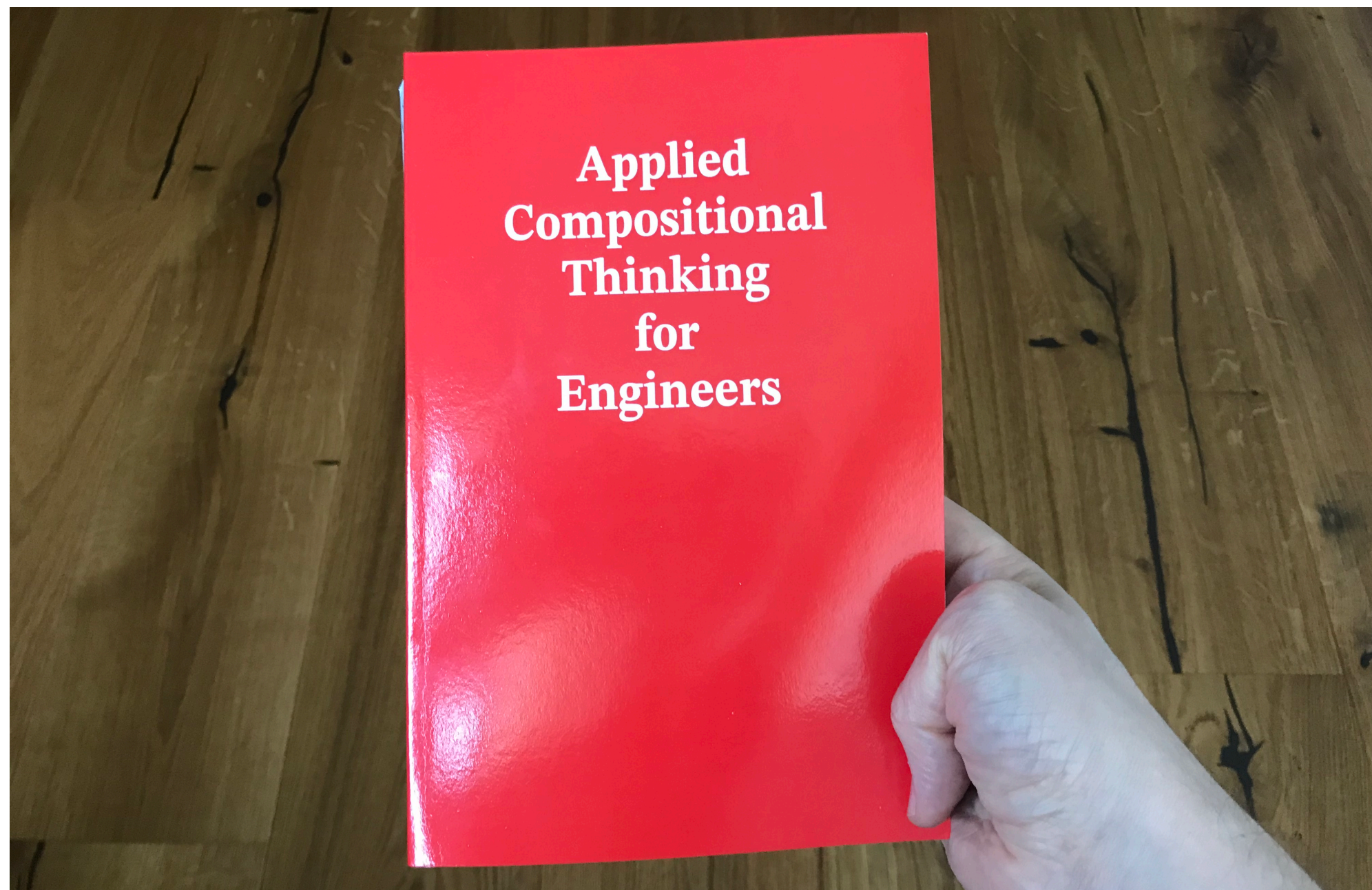
- Non-google users:

<https://bit.ly/3uFMghx>



Materials

- ▶ Website will contain:
 - Recorded videos for each lecture and recitation.
 - Annotated slides (regular slides posted before the lecture)
- ▶ Note: “Season 1” (the first version of this course) is already available but it covers only 50% of what we do this term.
- ▶ We are working on a **book** for the course. More details will follow.



Exercises

- ▶ We are going to have exercises on a weekly basis:
 - Theoretical exercises
 - ▶ Will be published on the webpage on Wednesdays
 - ▶ Due on the Friday of the week after
 - Programming exercises in Python, autograded with GitHub Classroom
 - ▶ Instructions will follow



Grading

- ▶ To get the credits, you will need to pass the session exam (“Sessionsprüfung”)
- ▶ You have the chance to **improve your final grade by 0.25** by solving a certain percentage of the exercises:
 - Not mandatory: you can still get the maximum grade without solving the exercises;
 - However, if you do you will be better prepared for the **final exam**;
 - Details on modalities will follow.



Zulip

- ▶ We will use Zulip for communication, which is similar to Slack.
- ▶ We have sent invites to ETH students via email.
- ▶ If you haven't already, please join:

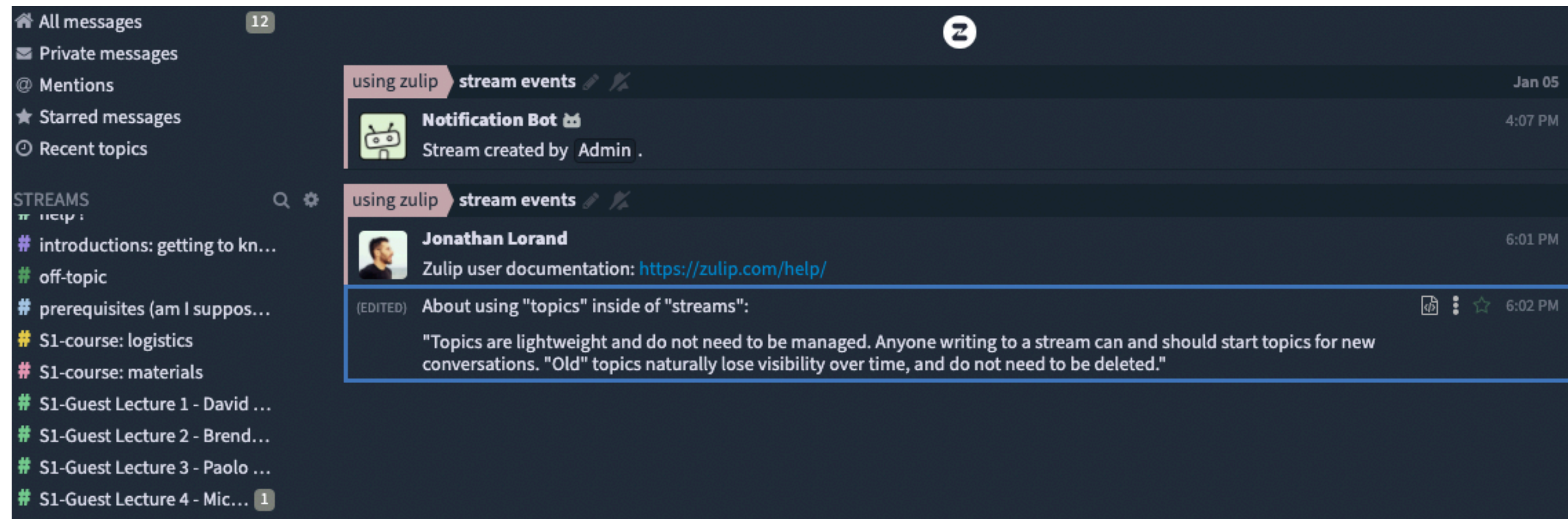
<http://bit.ly/3bPJ75X>

- ▶ This is a *friendly* space for *learning*, connecting people with different levels of knowledge in different areas: be patient, positive, and open-minded.
- ▶ Zulip is open to a large community. It was used already for “Season 1”.
- ▶ There is going to be one private channel for ETH logistics.
- ▶ One channel per lecturing session.
- ▶ Reminder: for important administrative questions, write to our @ethz.ch emails.



Zulip

- ▶ Information is organized into *streams* and streams are structured via *topics*



- ▶ Note that you can write mathematics via LaTeX in Zulip:
 - Inline: x^3
 - Displayed:
$$\int_a^b f(t) dt$$

