

# Welcome to HAMLET-Physics 2025

How to Apply Machine Learning to Experiment and Theory in Physics





# What is HAMLET-Physics?

HAMLET-Physics is conference / workshop on using Machine Learning in physics research.

The conference / workshop has three main goals:

1. To bring together Danish and international physicists using ML to meet, share ideas, and build community across location and physics specialty.
2. To bring domain scientists into close contact with ML experts, to build community across the theory → application bridge
3. To provide a friendly environment for researchers to share best practices, for students to interact with experts, and for other sciences and industry to understand the state of ML in physics.





# Who Are We?



Daniel Murnane (NBI)  
93 83 89 58



Troels Petersen (NBI)  
26 28 37 39



Inar Timiryasov (NBI)  
50 26 90 72



Katrin Hjorth (NBI)  
93 56 51 32



Troels Haugbølle (NBI)  
29 38 25 88



Jean-Loup Tastet (DIKU)  
40 63 10 25



Oswin Krause (DIKU)  
52 74 18 92



Asbjørn Preuss (NBI)  
50 44 36 96



# Overview

This is Copenhagen with the (potentially) useful places to know for this conference:

1. **Conference Venue.**

Lundbeck Auditorium and H. C. Ørsted Inst.

2. **Niels Bohr Institute.**

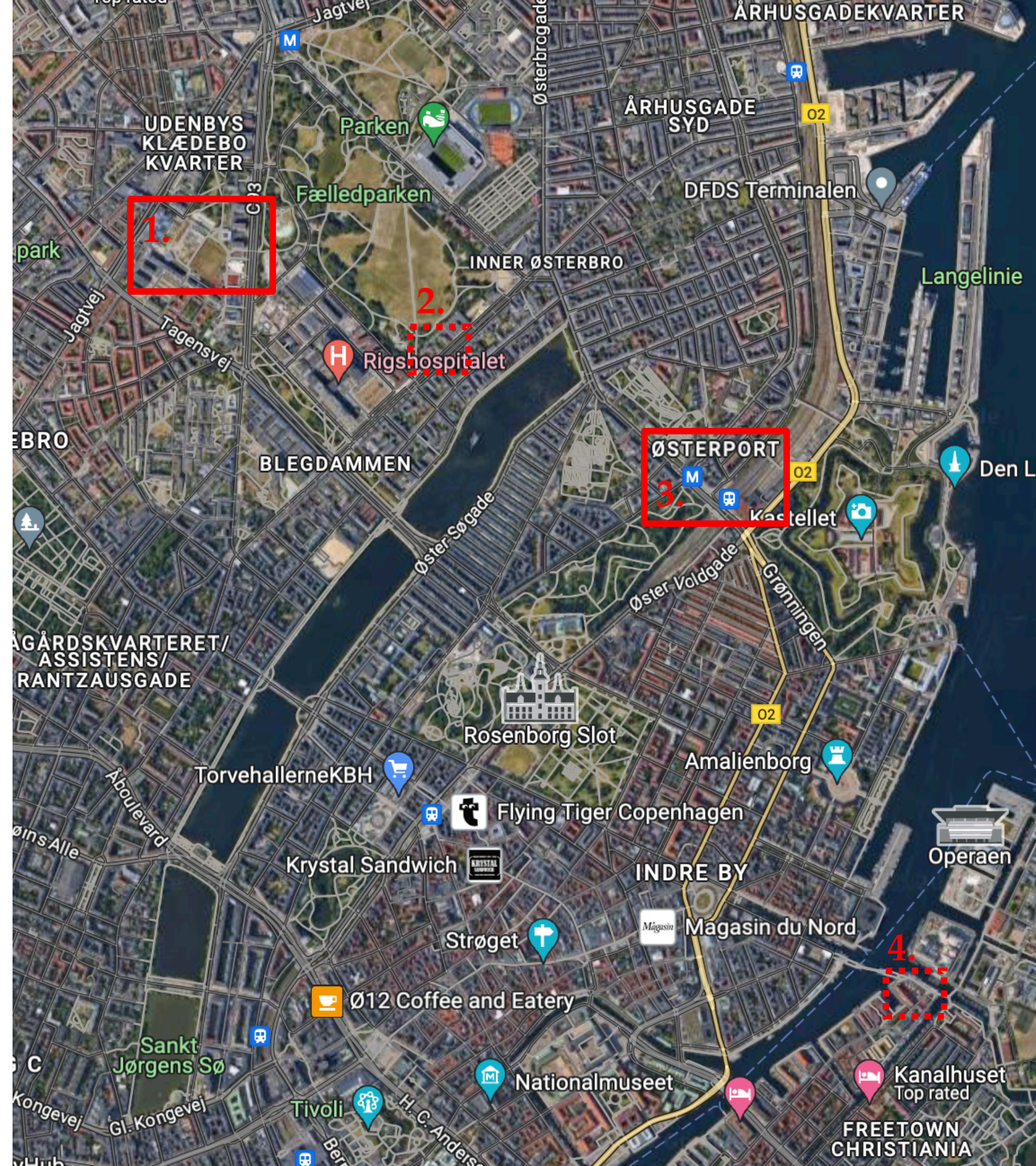
For those who wants to visit Bohr's old lairs.

3. **Østerport Station.**

From where we depart Tuesday at 15:07!

4. **Broens Gadekøkken (street food by Nyhavn).**

Which could be a place to go for dinner tonight.  
(but this is just a suggestion)





# Local area

This is where the conference takes place:

1. **Venue (presentations + posters).**

Lundbeck Auditorium.

2. **Lunch (Bio Canteen).**

BioCenter right next to.

3. **Vibenhushus Metro Station.**

From where we depart Thursday < 14:45!

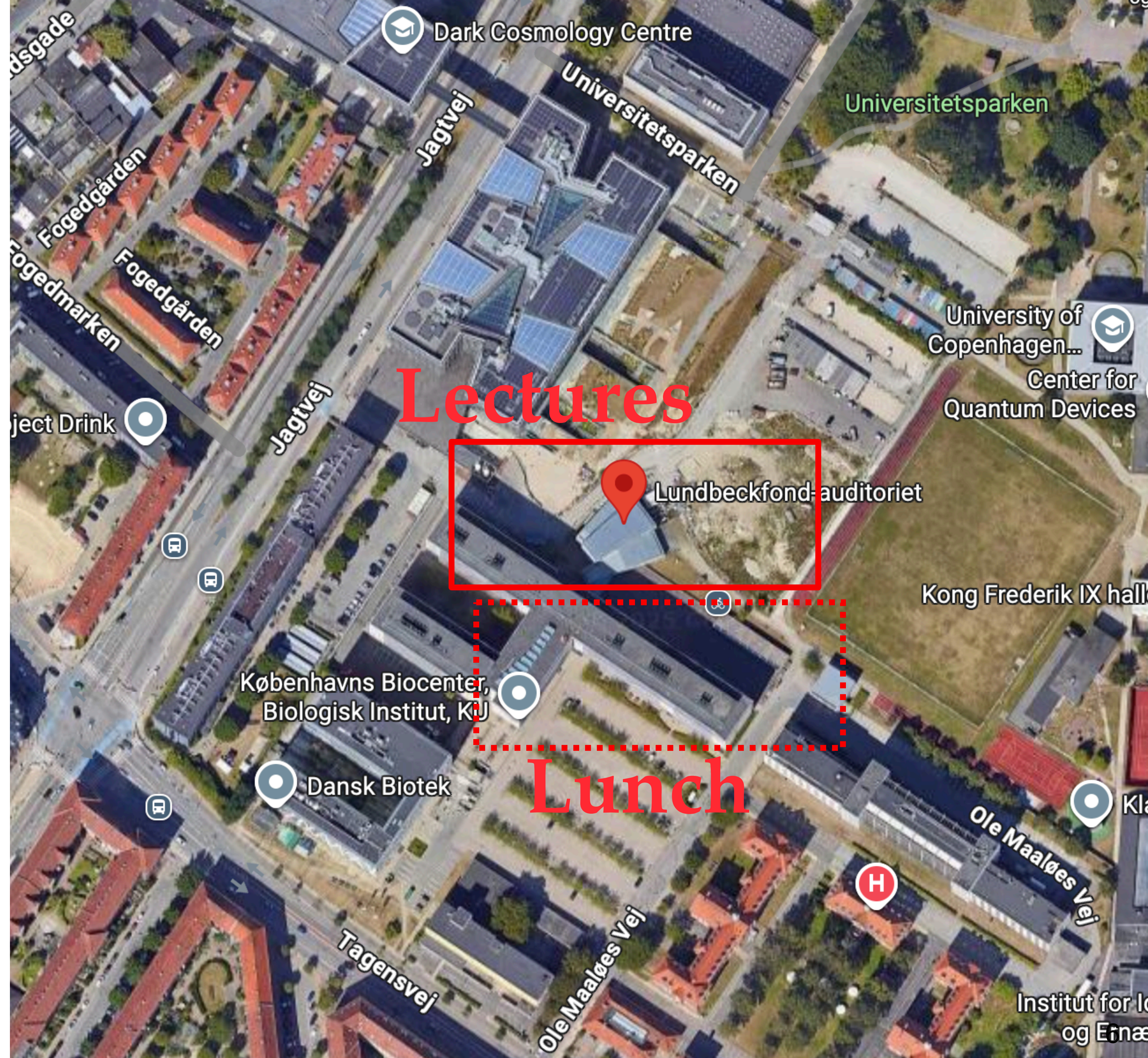




# Very locally

This is our very local area:

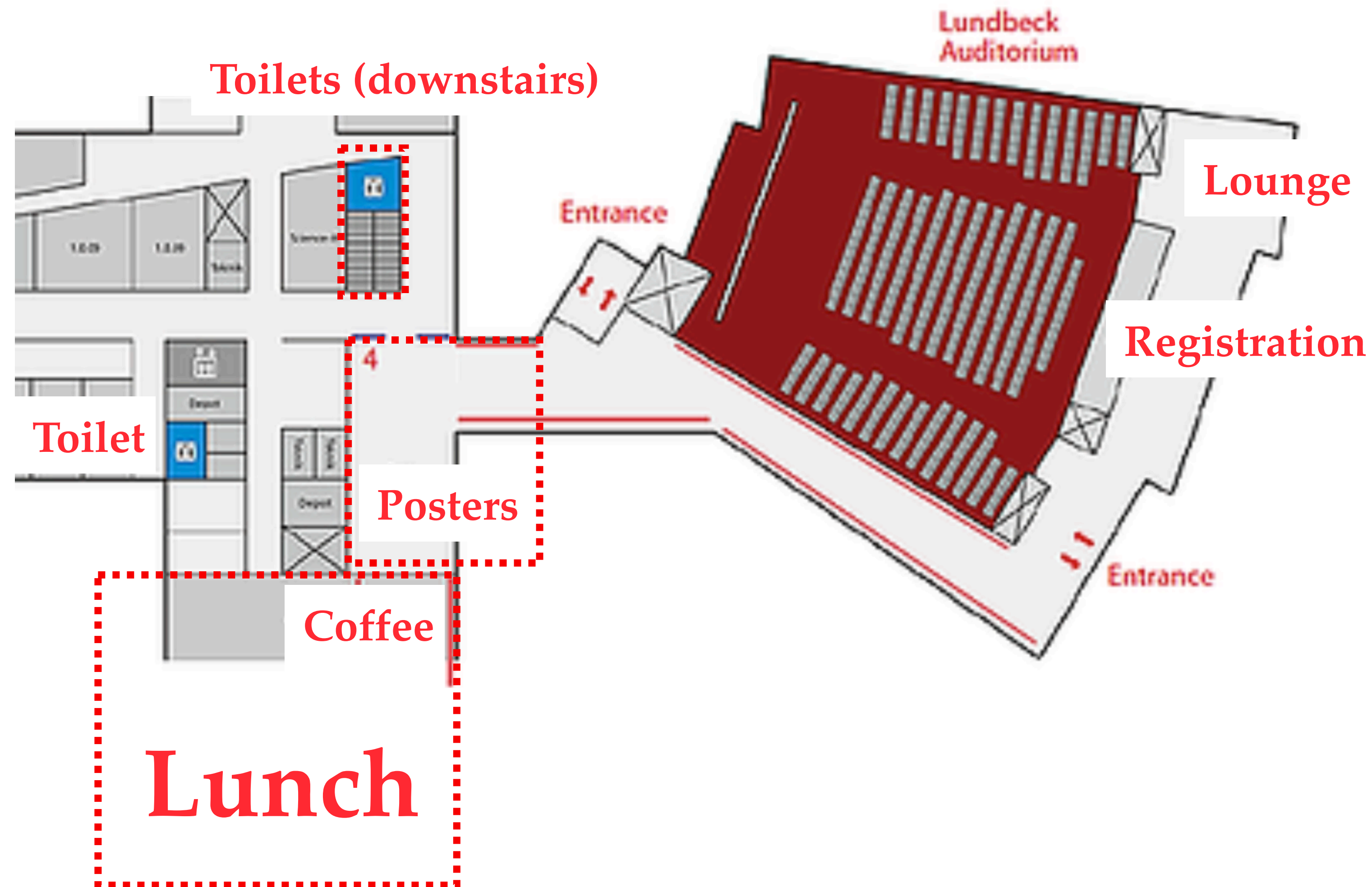
1. **Venue (Lecures).**  
Lundbeck Auditorium.
2. **Daily Lunch.**  
From 12-13 (vegetarian options).





# The Lundbeck Auditorium

All three days, we will mainly be in and around the Lundbeck Auditorium (see below).





# Daily Lunch 12:00-13:00 (better start early!)

The (vegetarian) lunch is served in the canteen around the corner. You take a plate and **the food you want**, and then put it on **one of the weights**. We will take care of payment (Katrin and Asbjørn will help).

Water can be gotten right after the two freestanding weights (dashed red box).





# The Program

## Wednesday

	Registration & Breakfast: Registration & Breakfast	
09:00	Lundbeck Auditorium	08:30 - 09:20
	Plenary: Intro	
	Lundbeck Auditorium	09:20 - 09:40
10:00	Keynote: Mario Krenn	
	Lundbeck Auditorium	09:40 - 10:40
	Coffee	
11:00	Lundbeck Auditorium	10:40 - 11:05
	Plenary: Physics Theory	
	Lundbeck Auditorium	11:05 - 11:55
12:00	Lunch: Lunch	
13:00	Lundbeck Auditorium	12:00 - 13:30
	Plenary: Foundation Model	
	Lundbeck Auditorium	13:30 - 13:55
14:00	Keynote: Sascha Caron	
	Lundbeck Auditorium	13:55 - 14:55
15:00	Coffee	
	Lundbeck Auditorium	14:55 - 15:25
16:00	Plenary: Particle Physics Applications	
	Lundbeck Auditorium	15:25 - 16:45
17:00	Reception: Poster session	
18:00	Lundbeck Auditorium	16:45 - 18:00

## Thursday

09:00	Organizer Updates	
	Lundbeck Auditorium	09:00 - 09:10
	Plenary: AI for Society	
	Lundbeck Auditorium	09:10 - 09:50
10:00	Keynote: Sune Lehmann	
	Lundbeck Auditorium	09:50 - 10:50
	Coffee	
11:00	Lundbeck Auditorium	10:50 - 11:10
	Plenary: Nuclear & Quantum	
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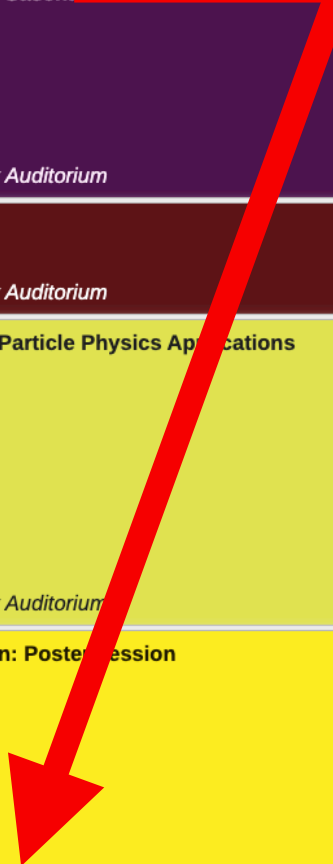


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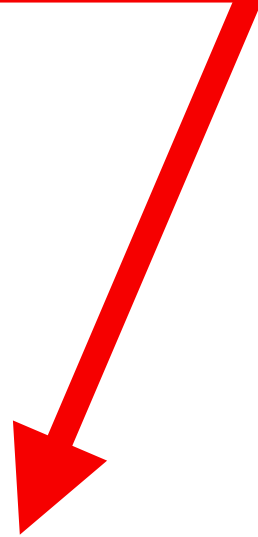
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# Slides, Computers and Zoom

For the sake of everyone (those on Zoom, the near sighted, the organisers, etc.), we request that you kindly **submit your slides in PDF format at least 4 hours before the start of your session**, either by:

- Uploading them on Indico yourself.
- Sending them by (a link on) Email: [inar.timiryasov@nbi.ku.dk](mailto:inar.timiryasov@nbi.ku.dk)

**The speakers are welcome to present on their own laptops** (except the poster lightning talks, Wednesday afternoon).

We have a central laptop, which is connected to Zoom permanently, and which displays the screen in the room.

Zoom Link: <https://cern.zoom.us/j/61397960461>

Passcode: HAMLET

Important Notes:

- Questions will be addressed after each talk.
- If you have questions for the speakers, please use the Q&A feature in Zoom.



# Wednesday



# The Wednesday Keynotes

The two keynotes Wednesday are:

**Mario Krenn (University of Tübingen, DE):**

Towards an artificial muse for new ideas in science

Think: AI for Inspiration



**Sascha Caron (NIKHEF Laboratory, NL):**

AI for fundamental physics: Next Steps

Think: Large Language Physics Models





# The Poster session

The poster session start Monday afternoon 16:45 with introductory lightning talks (2 minutes!) in the Auditorium, following by seeing the posters, discussing them, voting on them, having a drink, and mingling (right) around the corner, when you exit the auditorium.

**Those with posters should hang these on the designated walls ahead of time, and prepare a “one slide, two minutes” lightning talk to introduce the poster subject.**

Everyone can vote for the best posters (please do so). The three best will be transferred to the postal carriage on the train and celebrated on the trip to Kronborg Castle.



**We will serve drinks for the Poster session. Please mingle (see how in a few slides!)**

After the poster session we suggest (but do not organise, and weather permitting) that people take the metro to Kgs. Nytorv, walk down Nyhavn, cross the bridge to “Broens Gadekøkken”, where there is a great outdoors food market.

**Take away message: Wednesday night you are on your own (nothing official planned)!**



# Thursday



# The Thursday Keynote

The keynote Thursday is:

**Sune Lehmann (DTU, DK):**

Life2vec:

Quantitative understanding of  
social systems

Think: Tokenising human data for analysis





# Getting on our train to Helsingør

## Copenhagen part:

**14:25: We depart from Lundbeck Auditorium (at the latest!).**

The metro is 1.0 km away, which is a 14 minute walk.

**14:45: We take the metro line 3 three stops to Østerport metro.**

This takes 1-3 minutes of waiting and 7 minutes of driving.

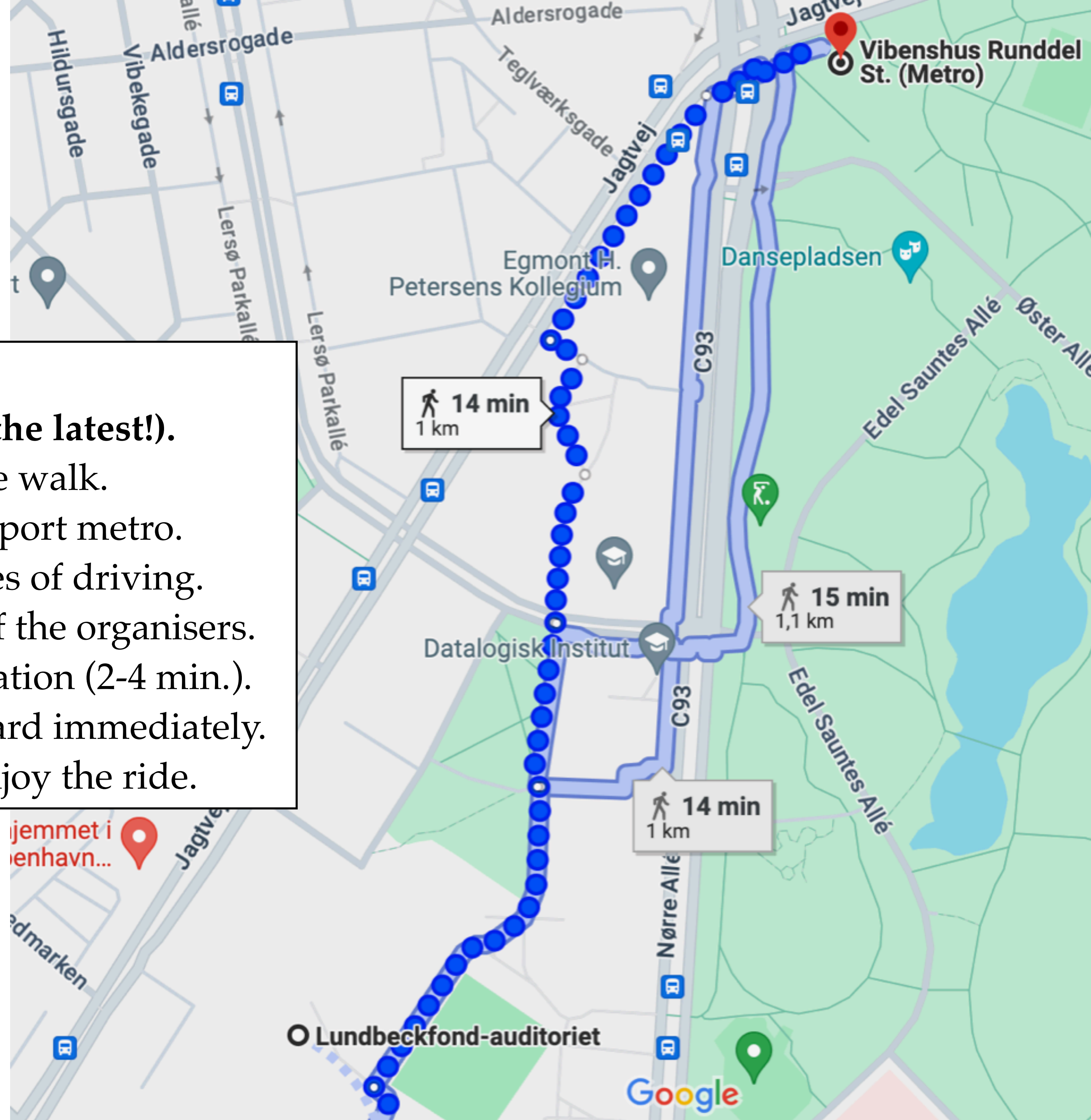
We will check you in, so please report to one of the organisers.

**14:58: We transfer from metro to Østerport train station (2-4 min.).**

**15:02: Train arrives at track 1 / 2, and we all go aboard immediately.**

**15:07: Train departs. We all mingle, discuss, and enjoy the ride.**

The “locals” can of course take their bike and use their own “Rejsekort”. Please help non-locals to find the way.





Hopefully a ride like this!



**Train departs from Østerport 15:07!!!**



# Plan for Helsingør

## Helsingør part:

15:50: Planned arrival at Helsingør, where we leave the train.

Walk to Kronborg (1.4km, 19 minutes). We paid your ticket.

Enjoy this wonderful place until Kronborg closes at 18:00.

17:30: We (slowly) assemble on the northern ramparts.

Purpose: Great view, conference photo (18:00), and a drink.

18:30: Walk to Værftets Madmarket (0.7km, 9 minutes).

Here you will find 20+ different kitchens to choose from.

We will hand out tickets to buy the food.

22:28 and 22:58: Recommended direct trains back to Copenhagen.

Later, trains also exists (23:28 and 23:58), but we start at 9:00!

Sorry... no fancy train home!





# Værftets Madmarked (dinner!)



We will provide 250 Kr. “cards” at the entrance for buying food and drinks. After that, you are on your own!  
Note: Let us try to get a few common tables, so that we can eat together in groups.



# Friday



# Panel Discussion



Hopefully from a younger, sleeker, and more ML savvy panel - and with significant audience participation.



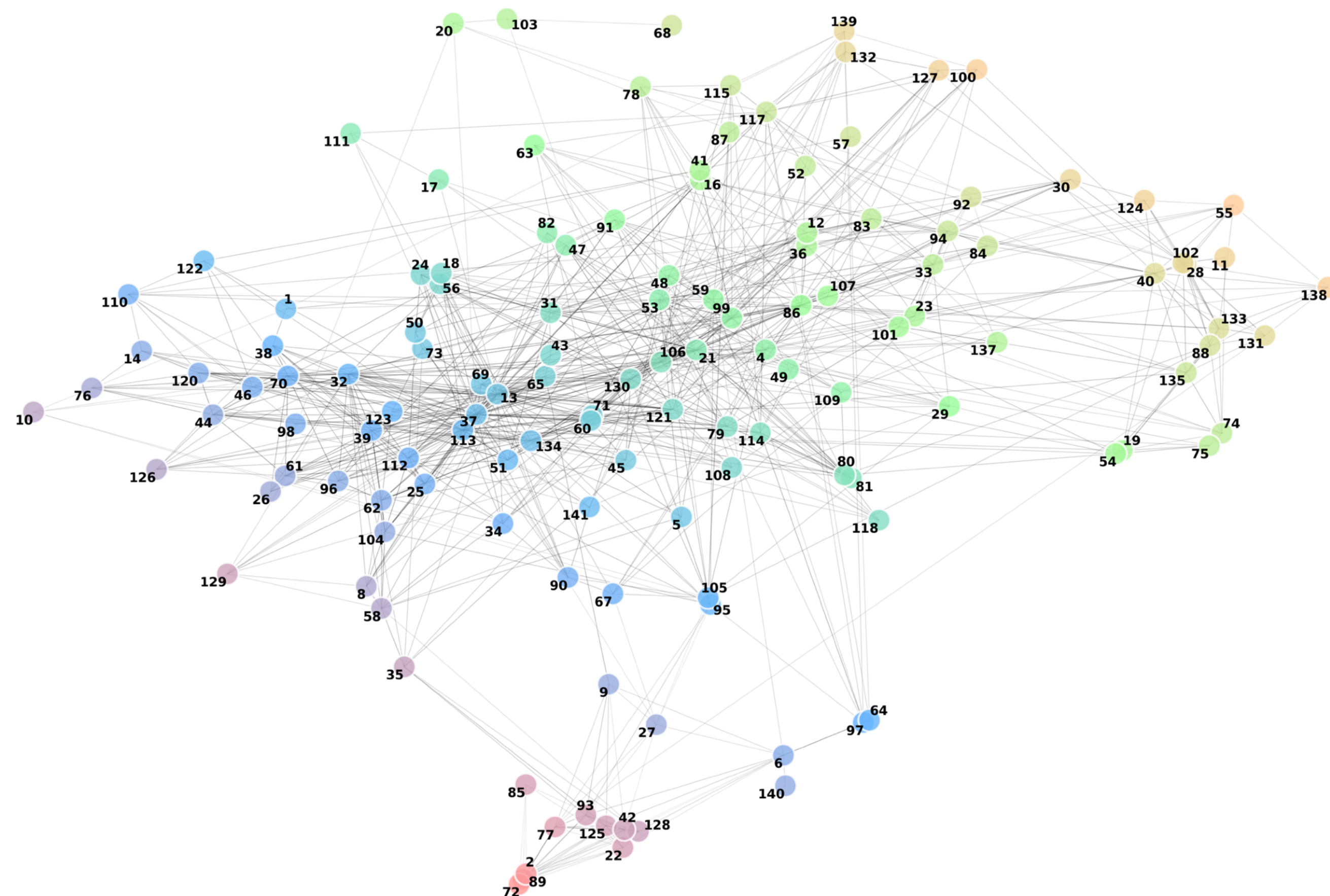
# **“Participant Proximity” & HAMLET Meet App**



# Who are you alike? Dislike?

In order to let everyone get an idea of who is who at the HAMLET-Physics conference, we wanted to try to find out, who were alike/ dislike. Using your registration information, the following pattern came out:

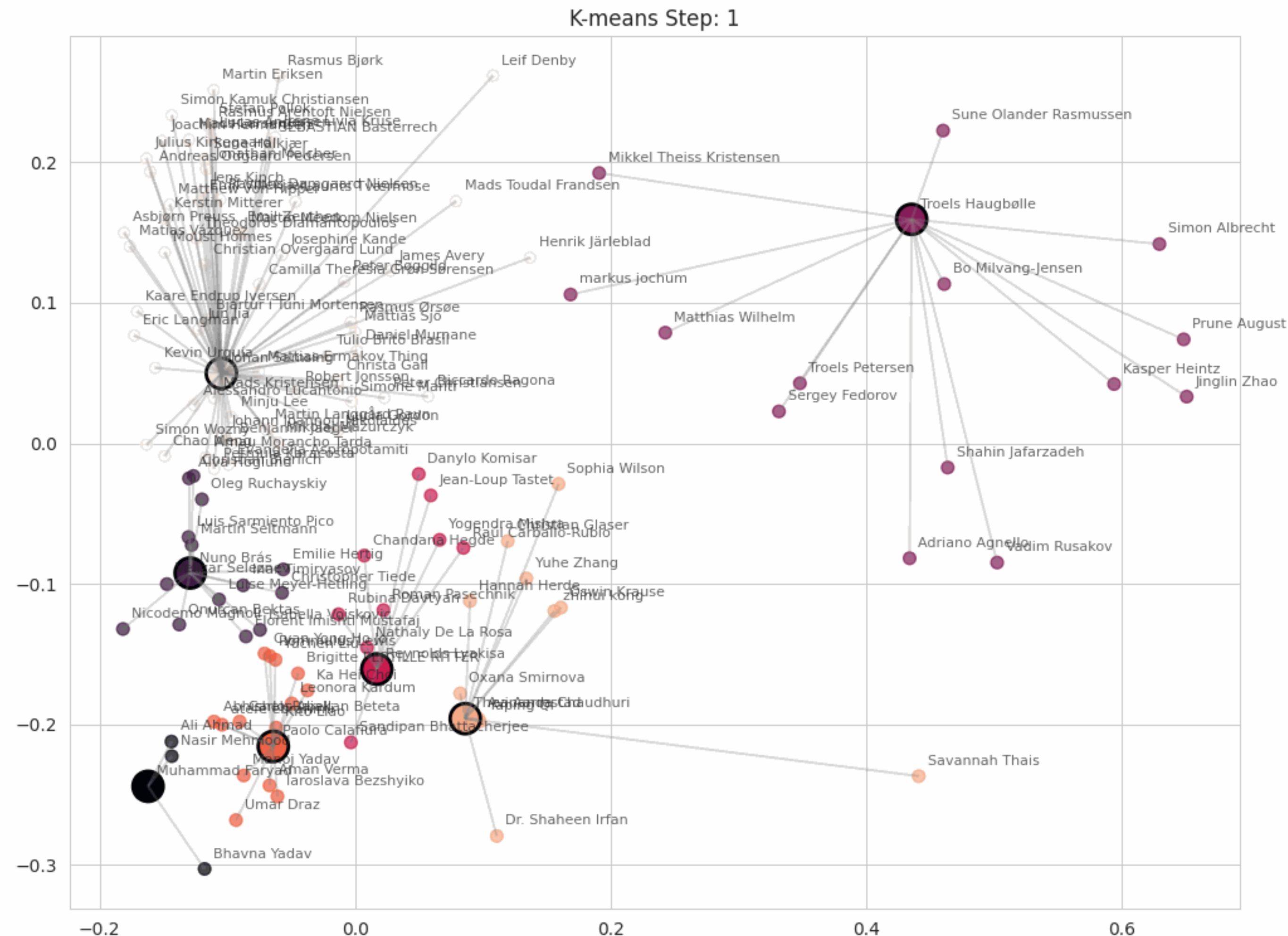
**Attendee Similarity Network (t-SNE)**





# Who are you alike? Dislike?

But that of course does not tell you, who you are really alike. Nor did it involve any ML... so... Using similar information, we used t-SNE to map us all into a 2D space, which we then applied clustering to:

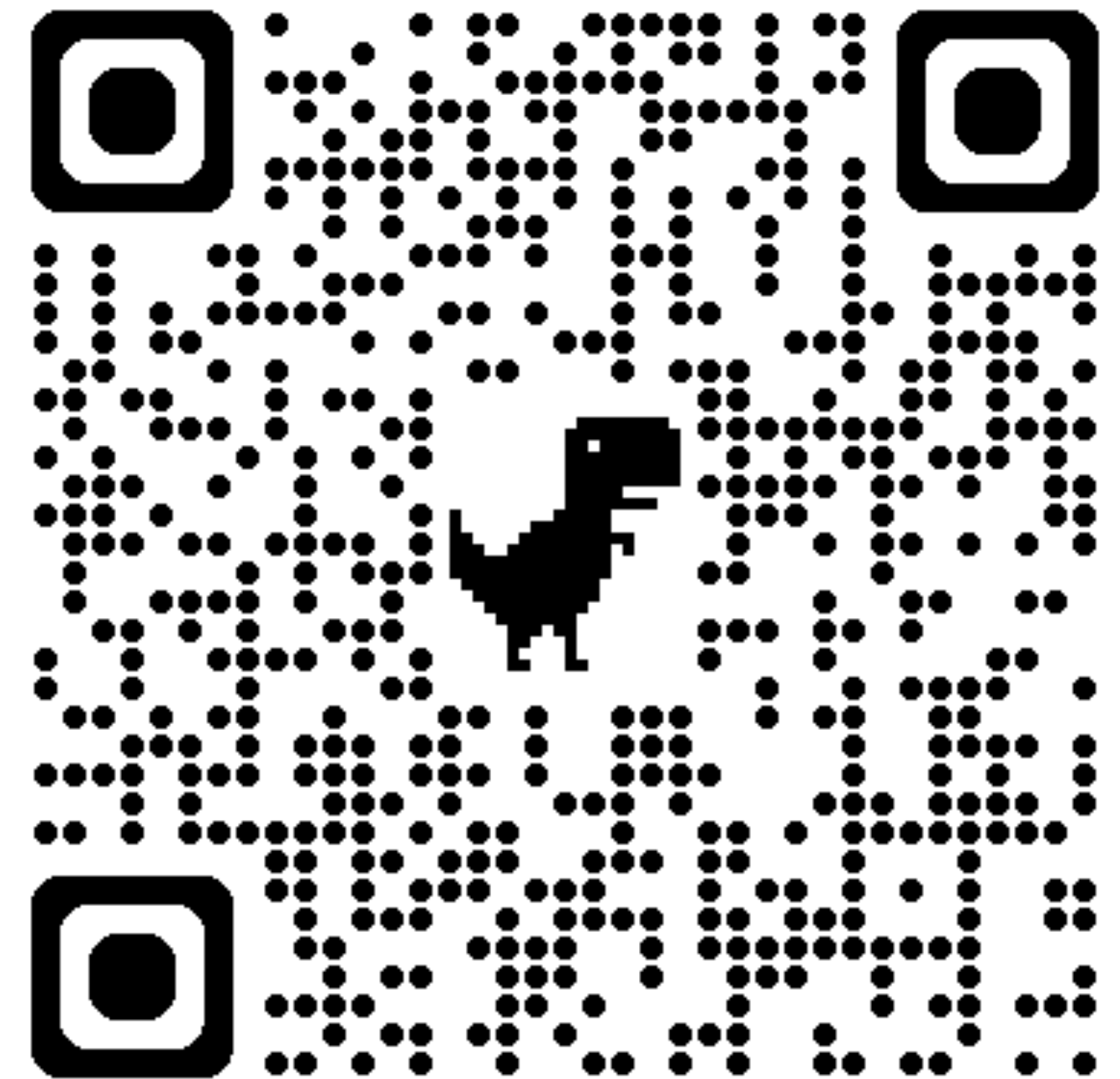




# The HAMLET MeetUp App

Using ChatGPT, Daniel put together a short Physics-ML Bio of everyone, which can be found using the conference numbers here: <https://hamlet-conf.github.io/hamlet-meet/>

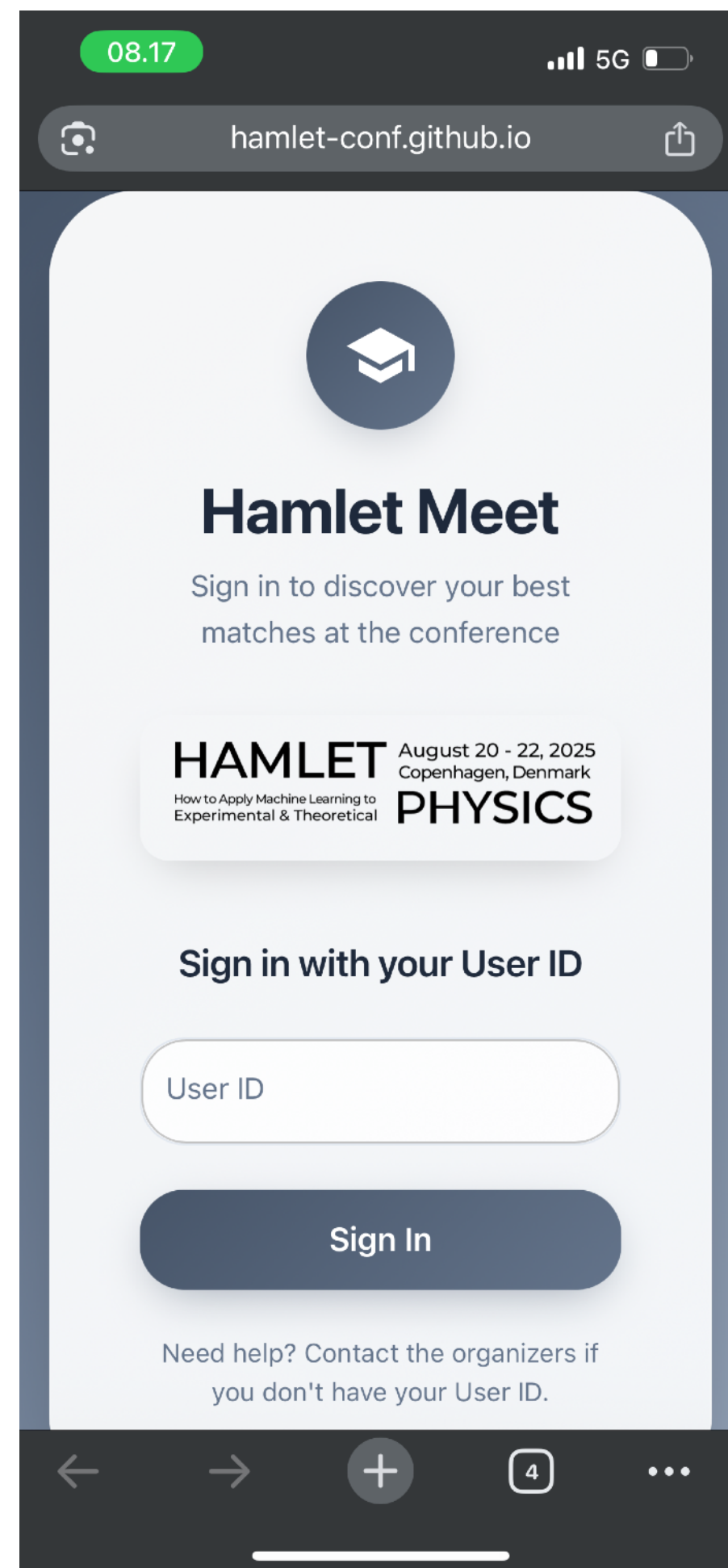
Try to look up yourself...



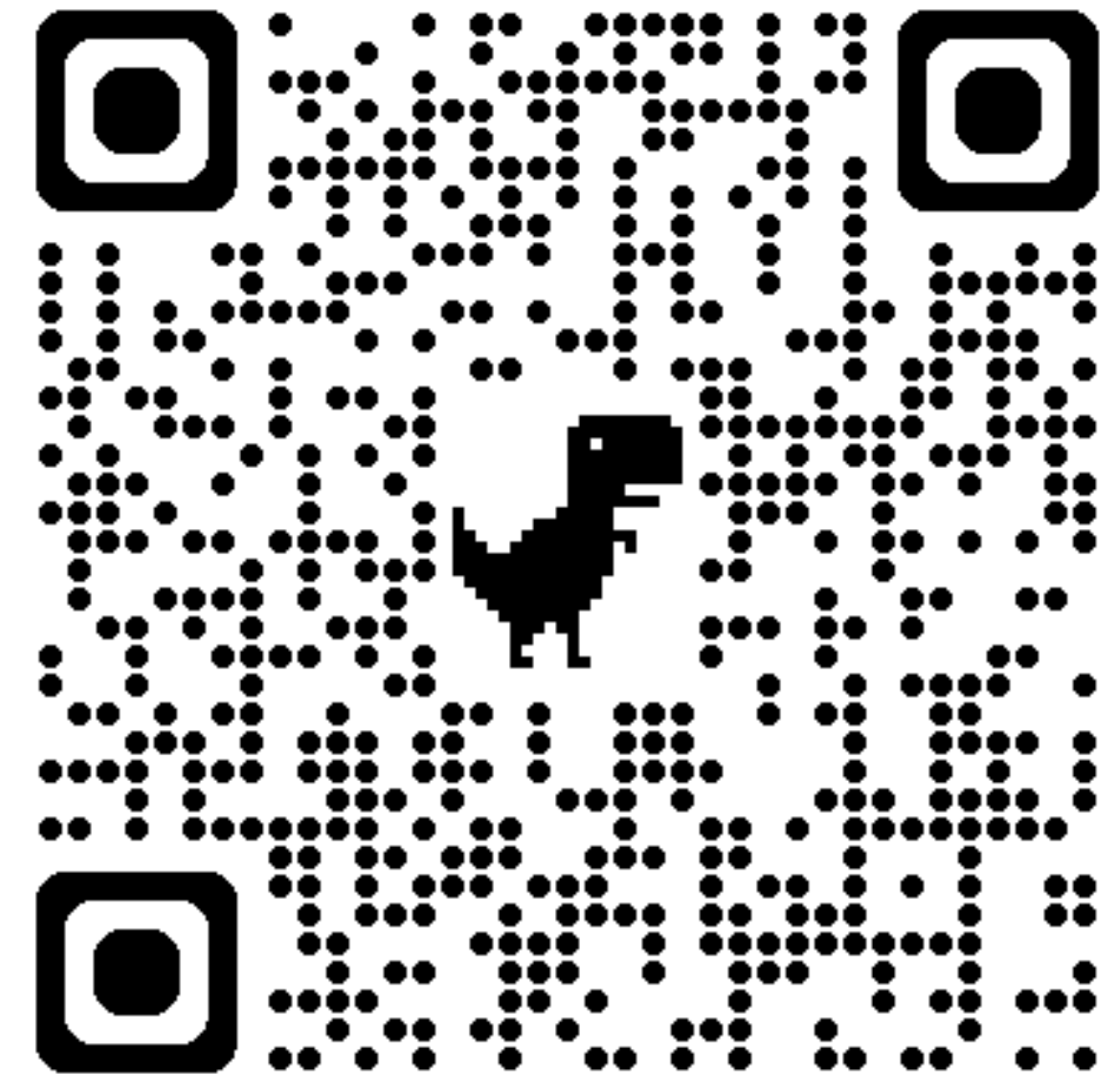


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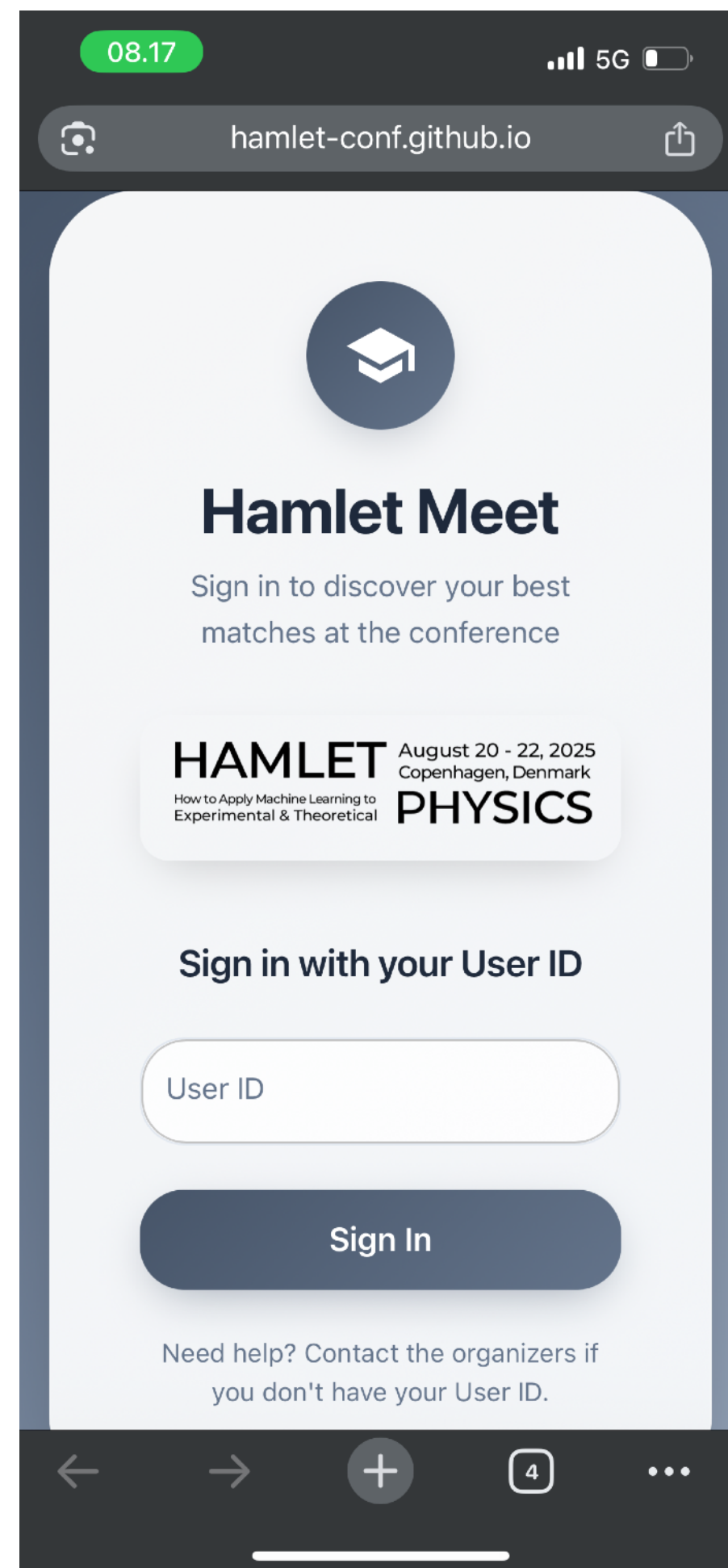
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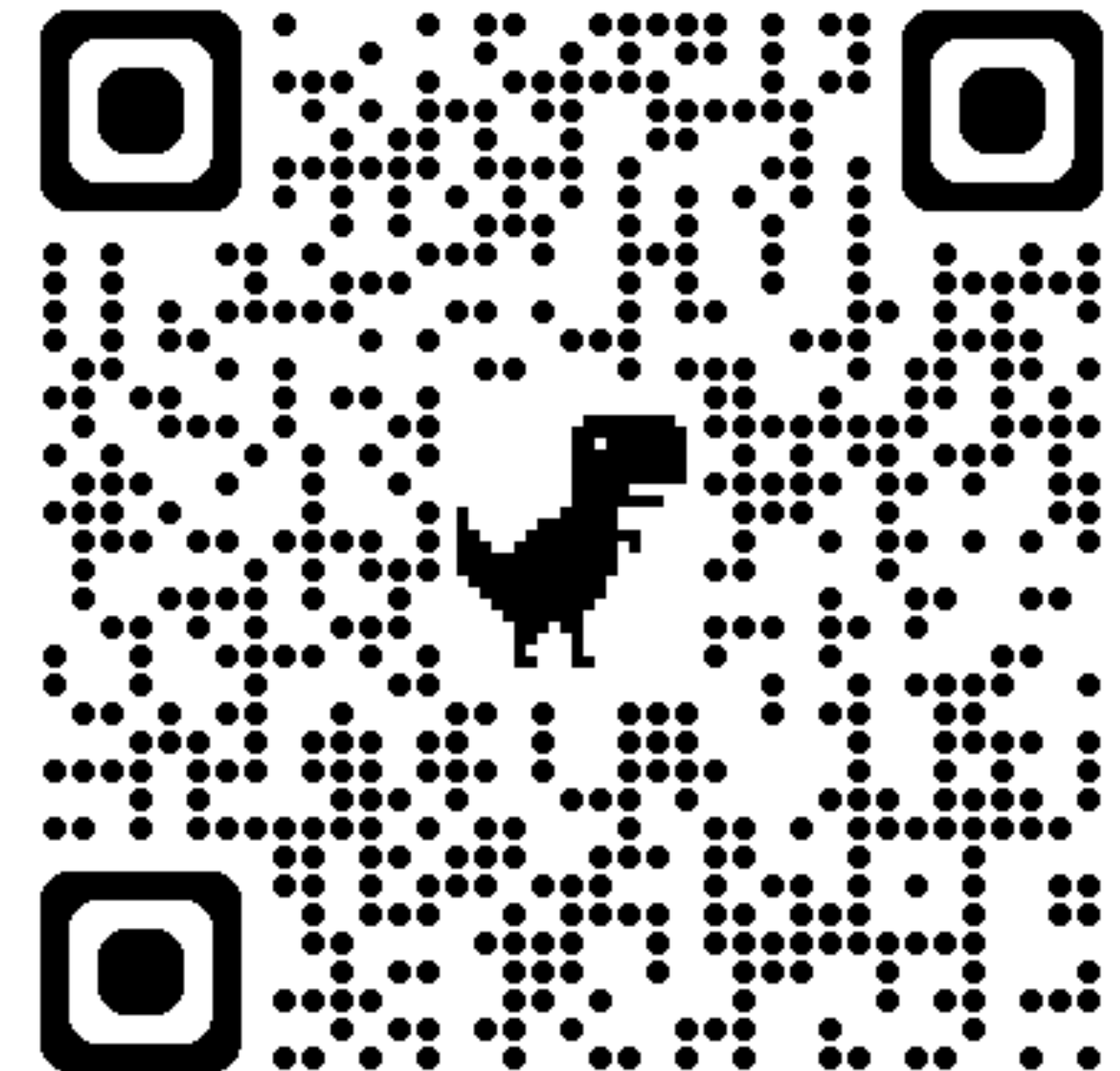
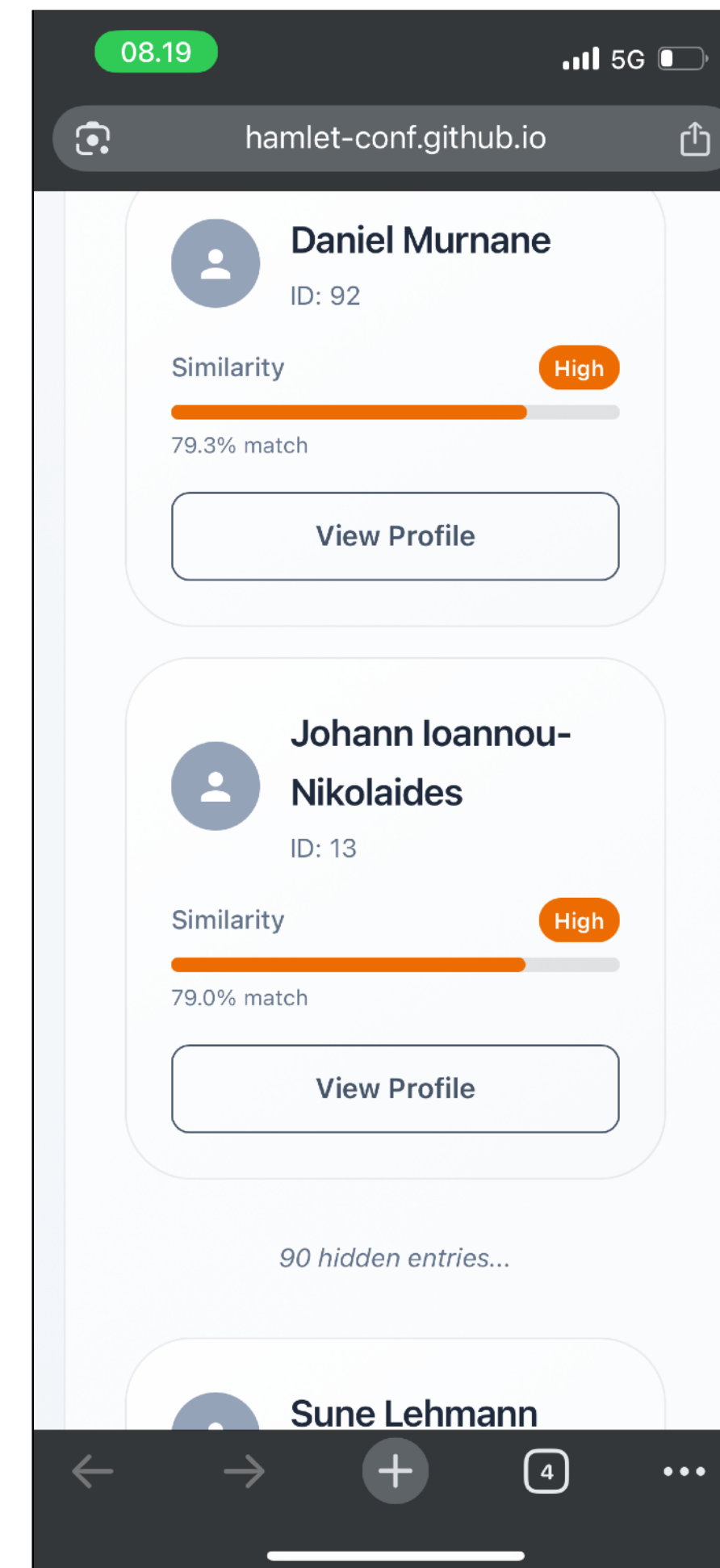
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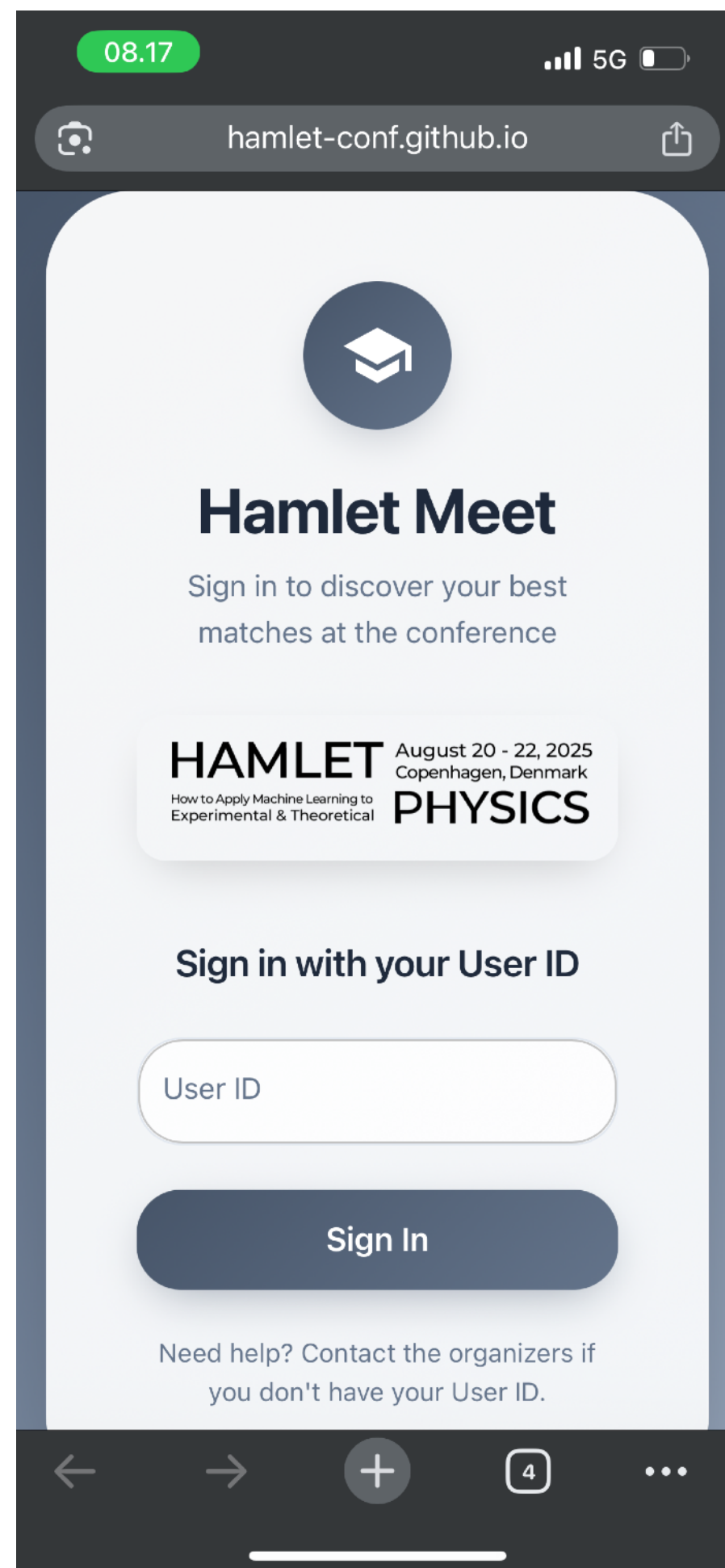
Writing your number





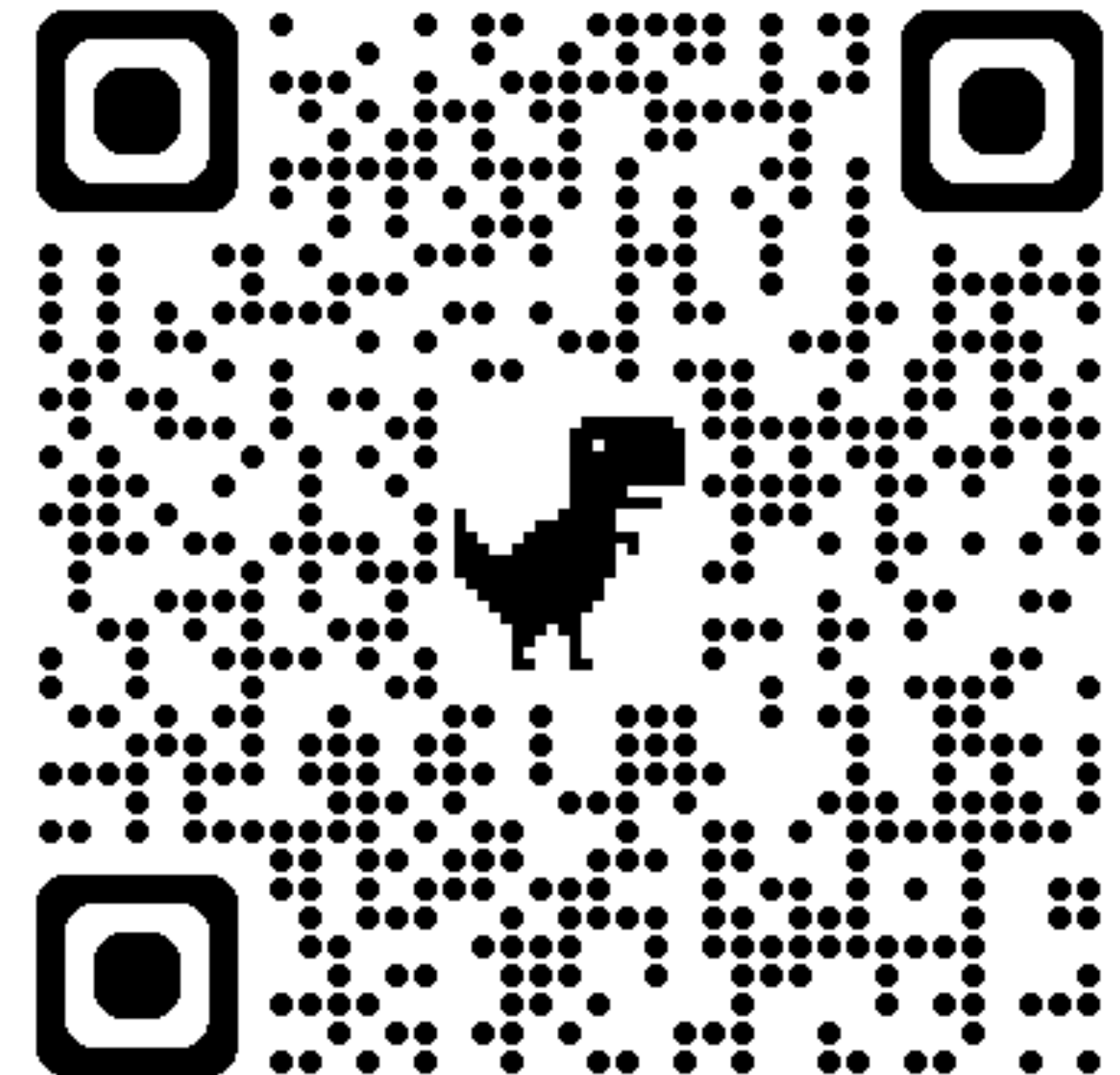
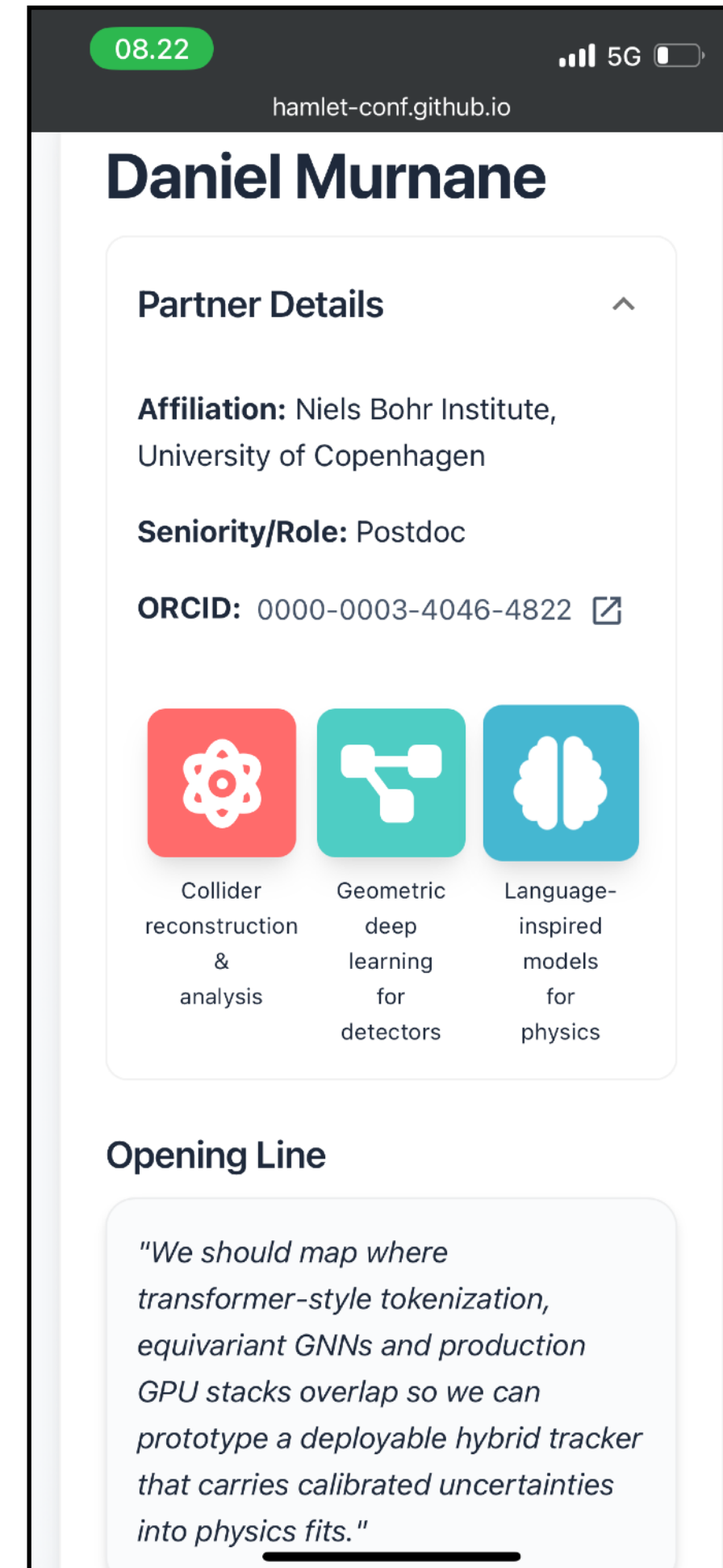
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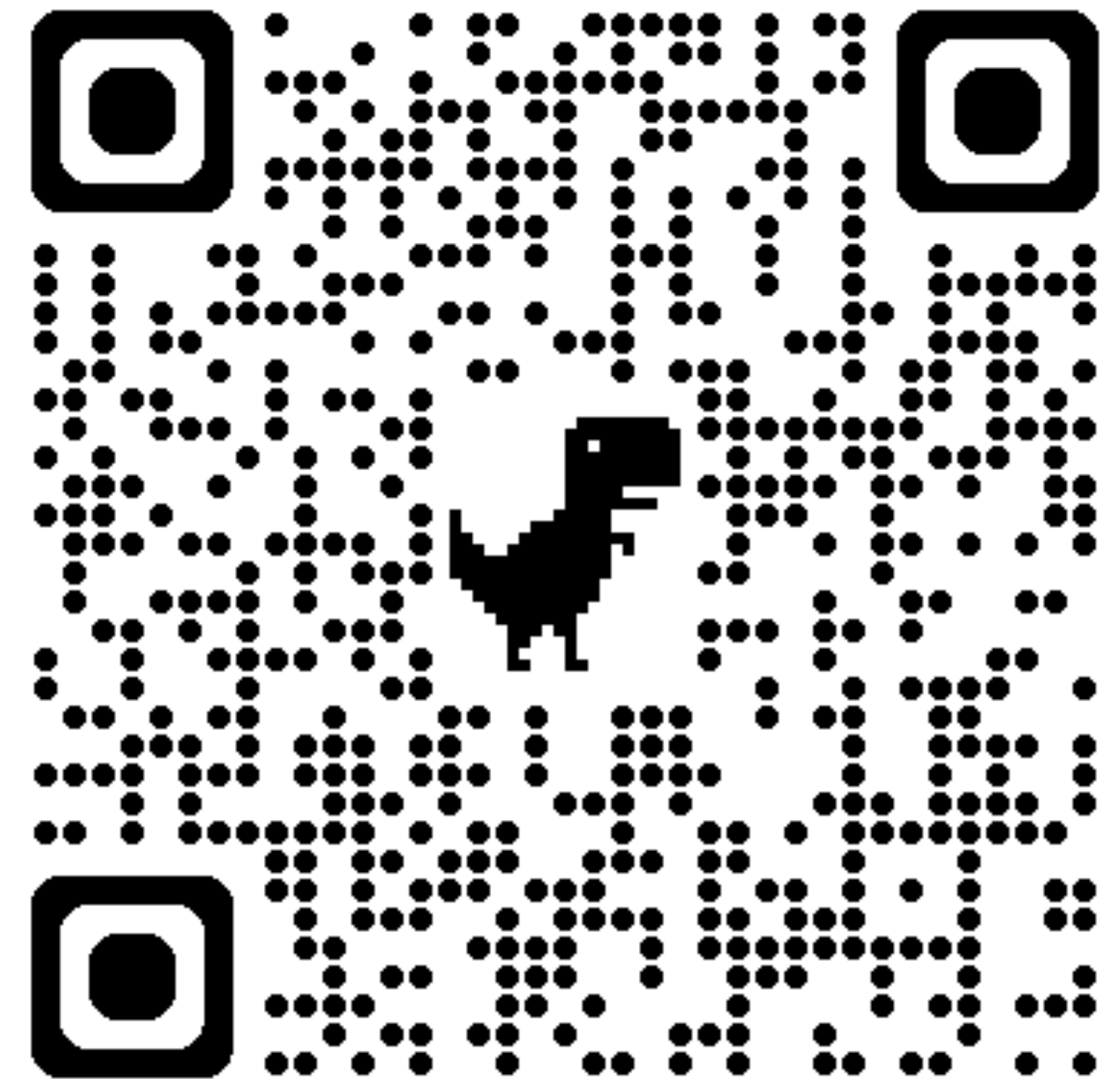
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**Try to look up yourself...**

Pushing this idea, Daniel (in collaboration with ChatGPT) also worked out, how we all pair-wise scientific connection/overlap (or lack of).

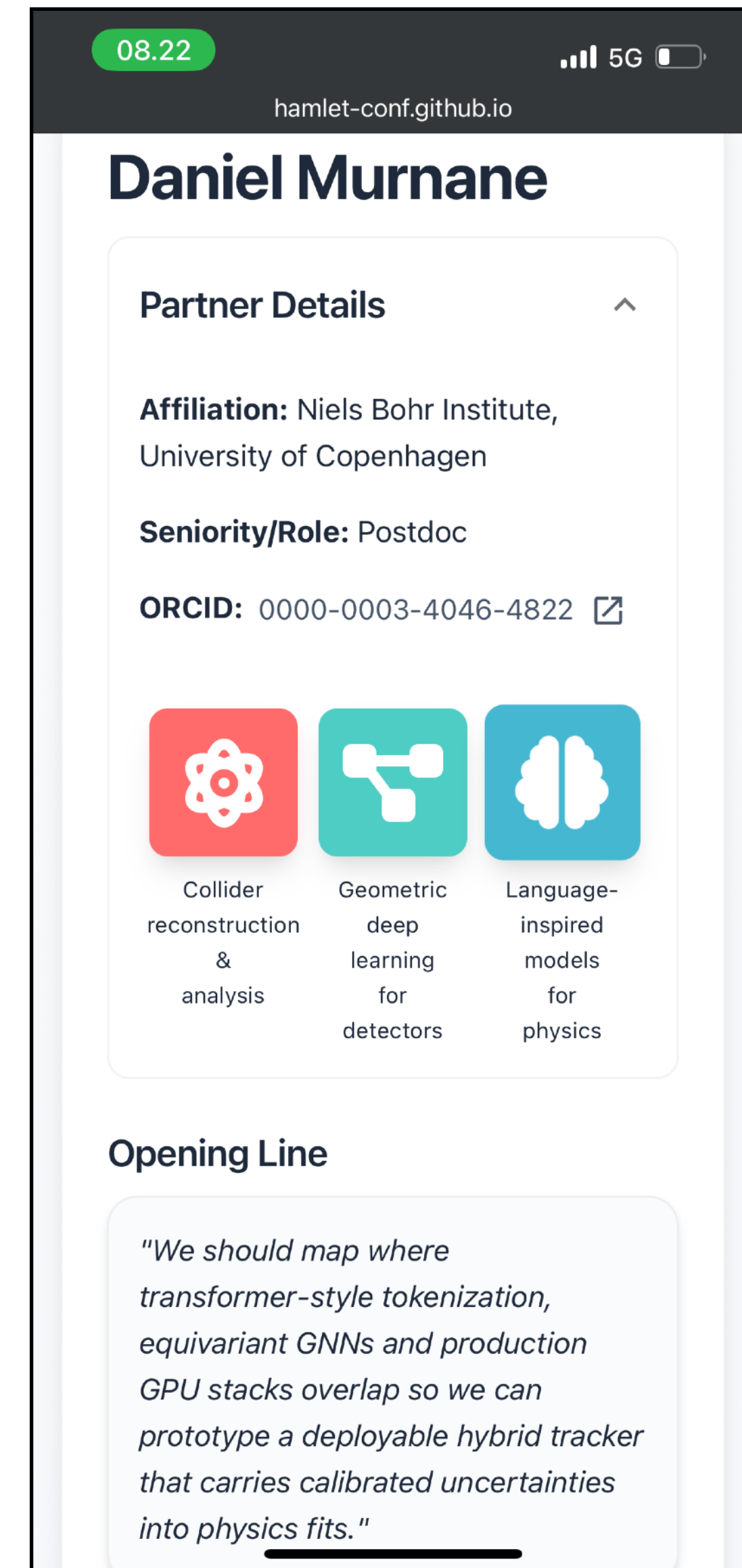
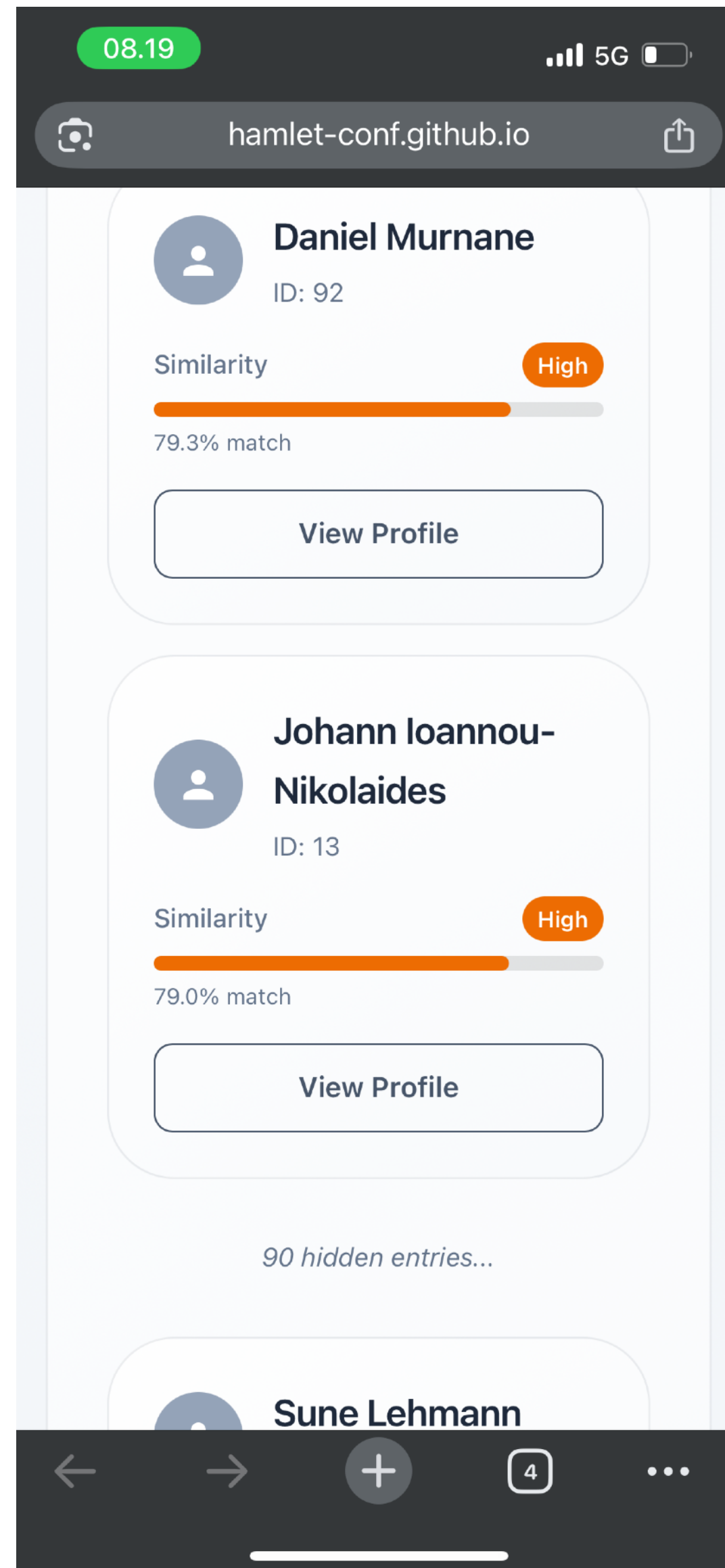
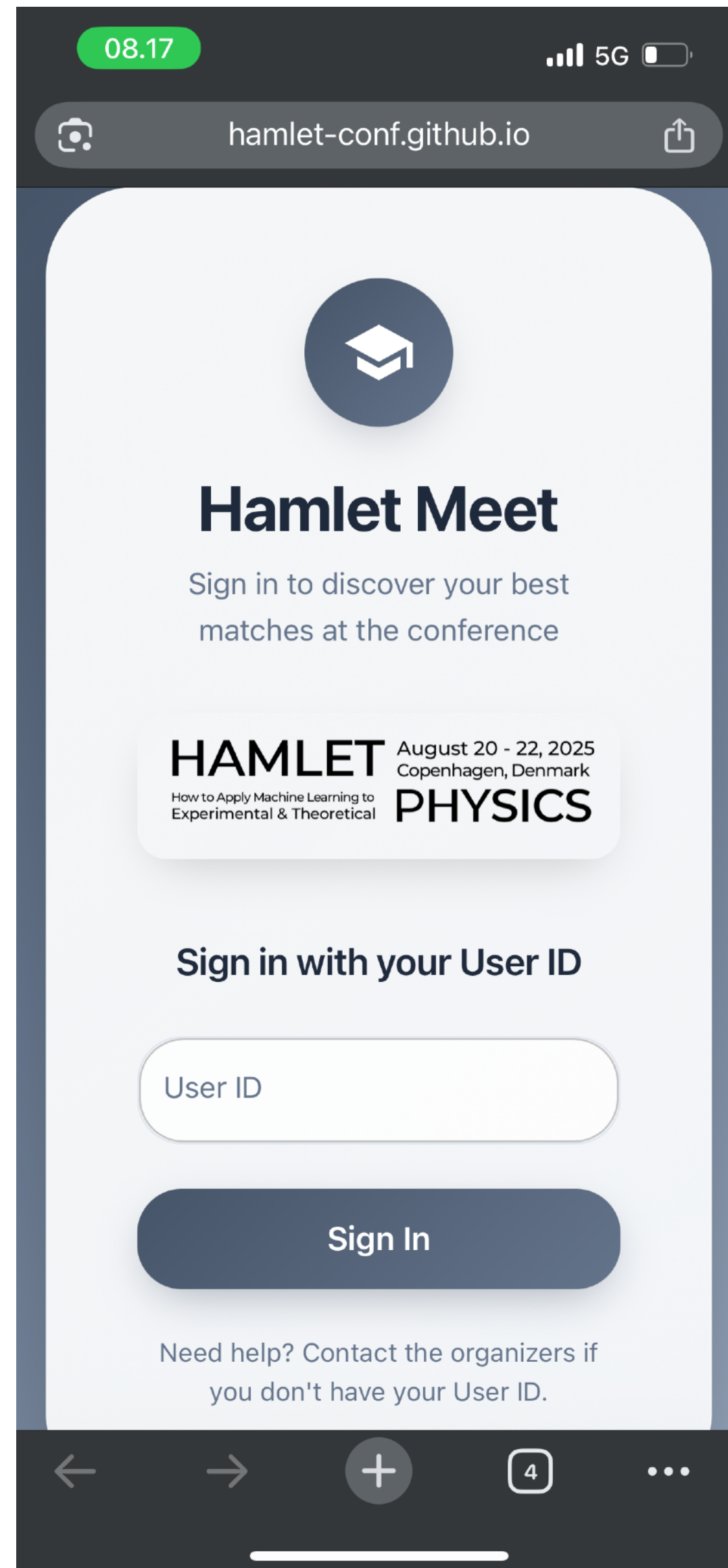
Using the conference number of others, you can in the app find your connection to others at the conference. We list the 3 closest (and 3 furthest) co-HAMLETs, and save your history, so that you can continue possible collaborations after the conference.

**Try to look up the connection you have with someone near you...**



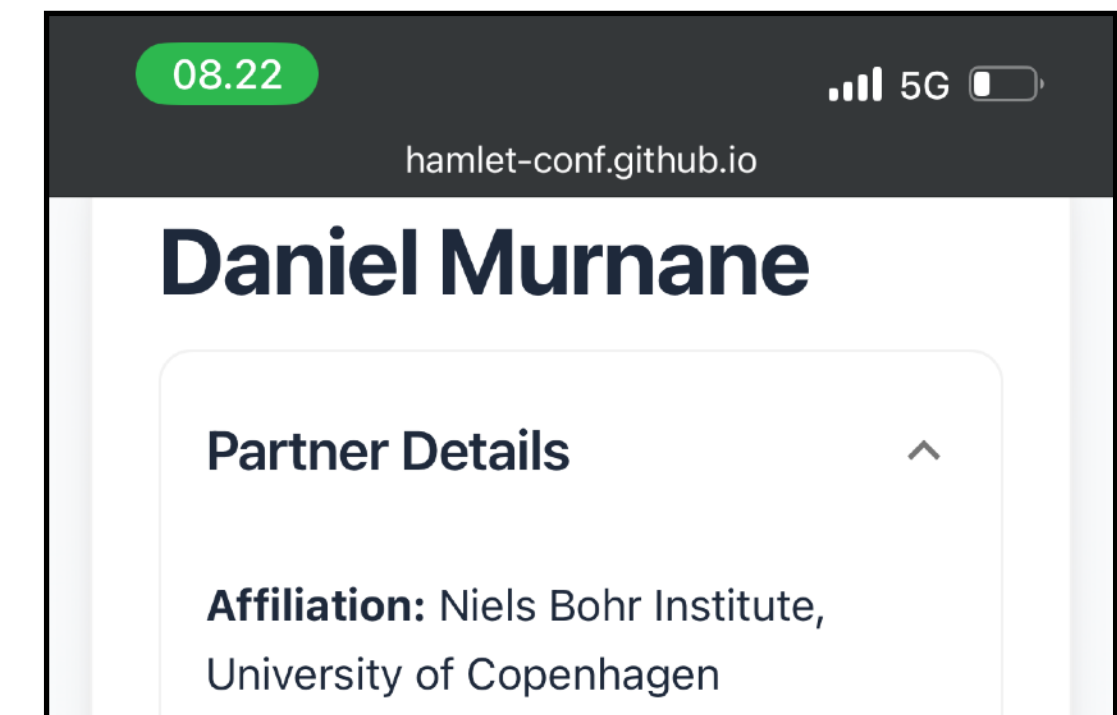
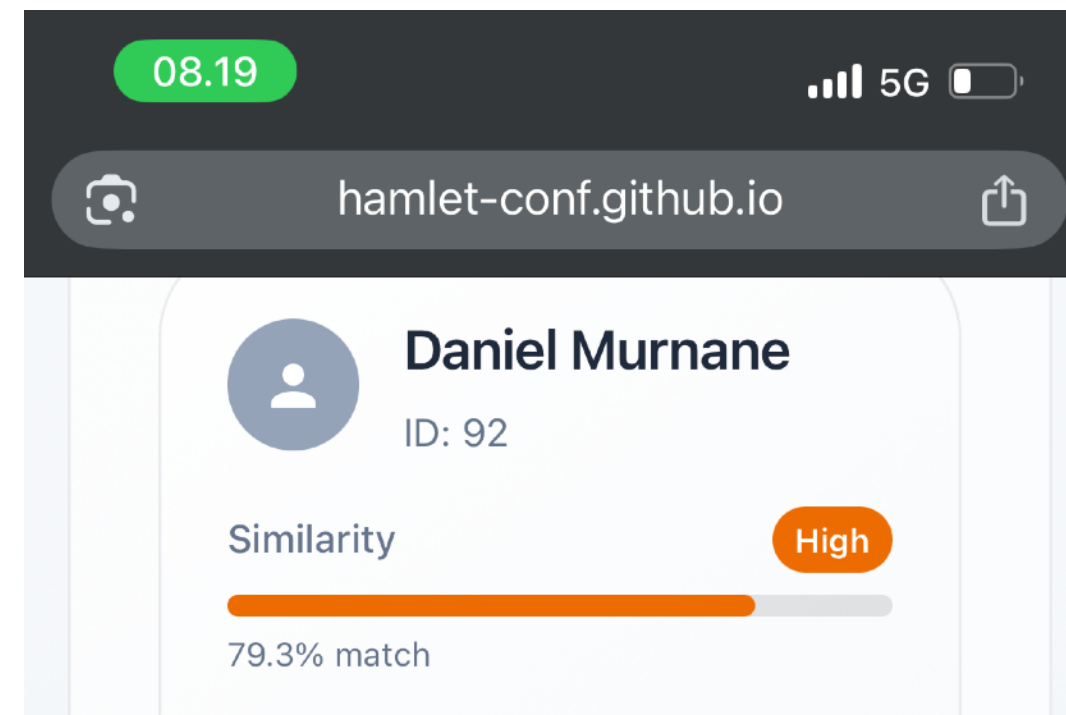
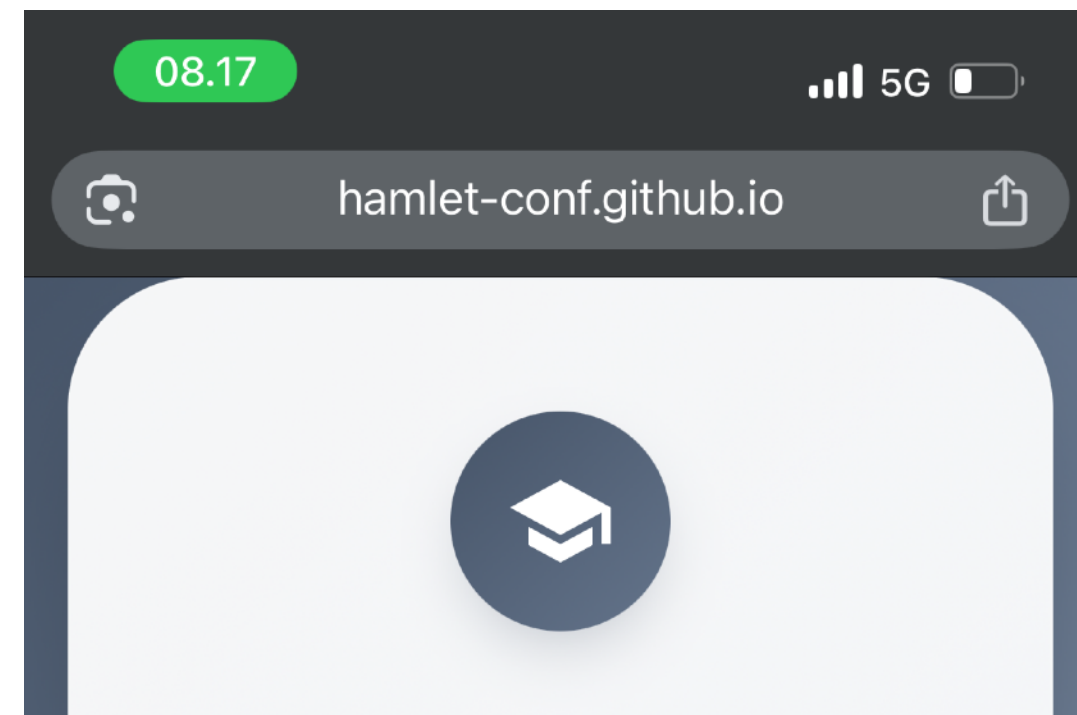


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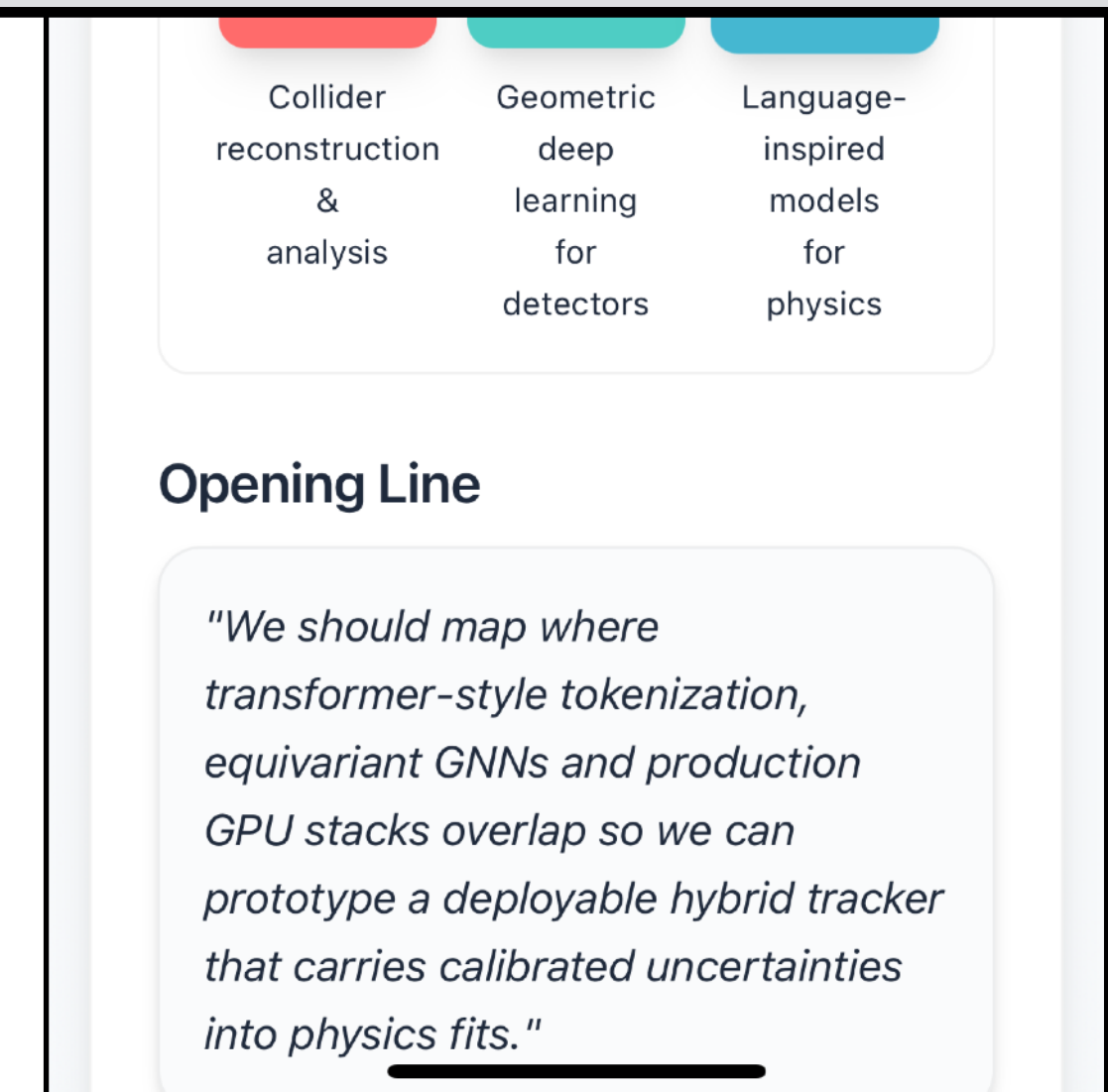
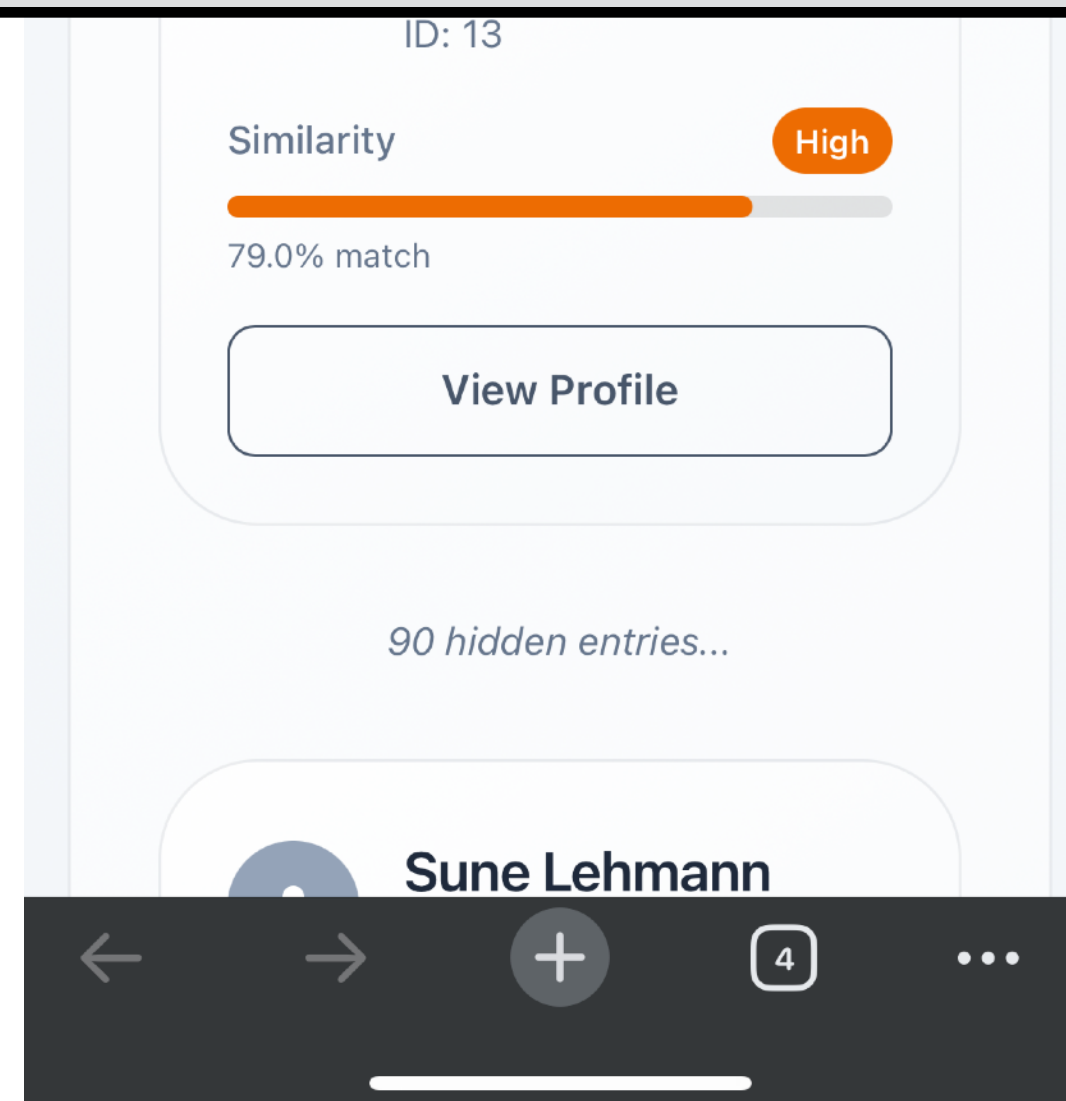
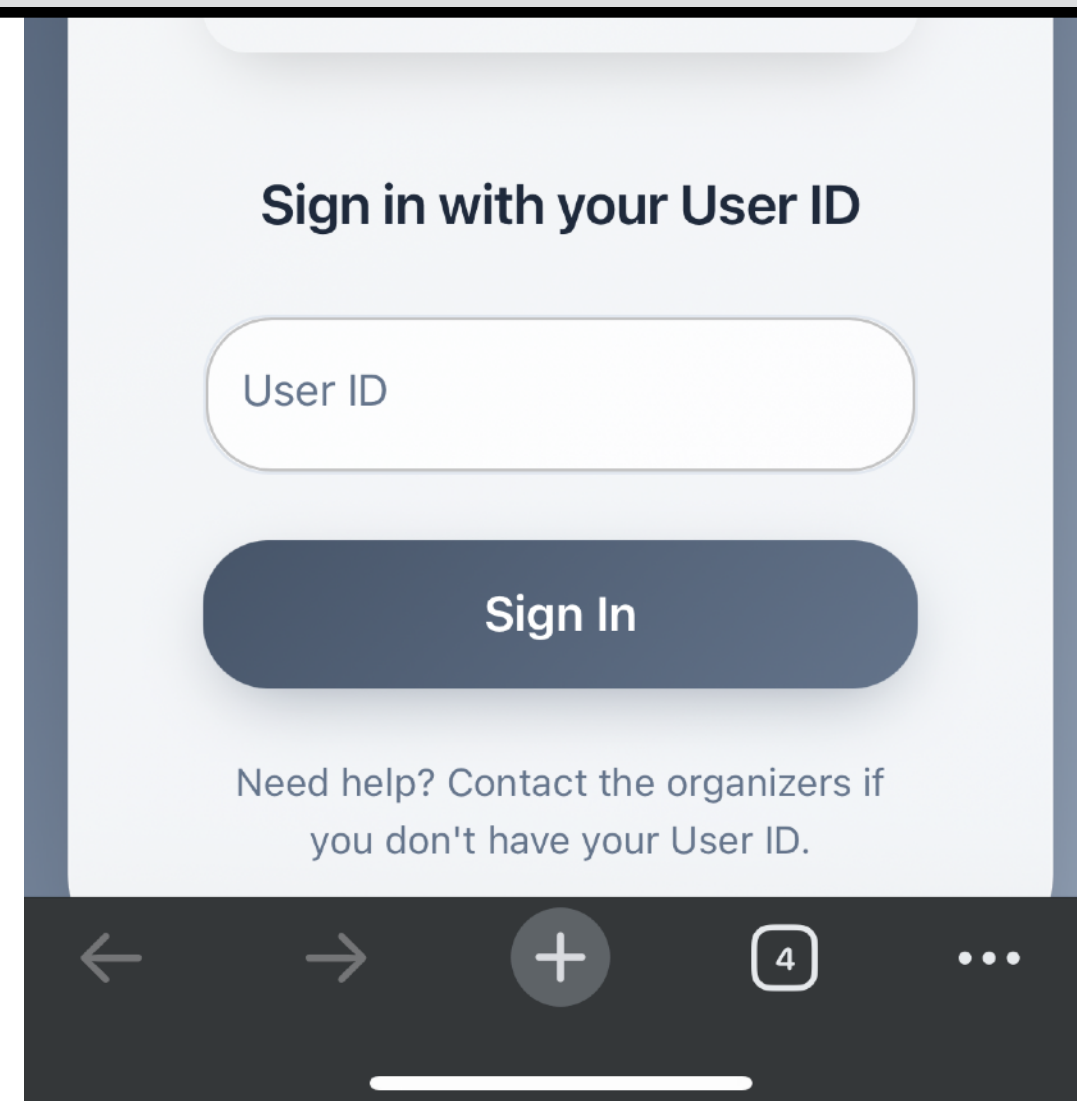




# The HAMLET MeetUp App



Play around with this tool, and don't hesitate to give us feedback.  
Happy App'ing...





# Code of Conduct

HAMLET-Physics is a community event intended for presentations, networking and collaboration. We value a civil and respectful environment which encourages the free expression and exchange of scientific ideas.

All attendees are expected to adhere to the [CERN Code of Conduct](#).

Should a lapse of professional decorum occur (such as discrimination or harassment), attendees are encouraged to bring issues, in a confidential setting, to the advisors appointed by the conference organizers. The advisors will suggest ways of redressing the matter and counsel the parties involved. The conference organisers may, after due consideration, take action as they deem appropriate, including, in severe cases, expulsion from the conference.

If you believe someone is violating the code of conduct, we ask that you report it by emailing Daniel Murnane ([daniel.murnane@nbi.ku.dk](mailto:daniel.murnane@nbi.ku.dk)) and / or Troels C. Petersen ([petersen@nbi.dk](mailto:petersen@nbi.dk)).



# The “old” Niels Bohr Institute

Entrance for  
Niels Bohr's  
Work Room

Entrance to Auditorium A  
Also interesting history in Auditorium D!

Blegdamsvej



**And on that happy note... Welcome!**

