THE LOW ENERGY FRONTIER:

DARK MATTER & NEUTRINOS IN THEORY & EXPERIMENTS

20-31 JULY 2026

GARCHING BEI MÜNCHEN (DE)

ISAPP INTERNATIONAL DOCTORATE SCHOOL

SonderForschungsBereich1258 MONA GRADUATE SCHOOL

- AXIONS
- DARK MATTER
- NEUTRINO MASS
- ASTROPHYSICS & COSMOLOGY
- NEUTRINOLESS DOUBLE BETA DECAY
- LOW-ENERGY NEUTRINO ASTROPHYSICS

ISAPP Munich 2026

Federica Petricca (MPP)
Raimund Strauss (TUM)
Valentina Mantovani Sarti (TUM)

ISAPP International School on AstroParticle Physics

MAX-PLANCK-INSTITUT FÜR PHYSIK

ORIGINS

SFB 1258 Neutrinos Dark Matter Messengers

Technische Universität München

indico.mpp.mpg.de/event/11509/

Invited lecturers

C. Braggio Padua U.
F. Donato Turin U.
F. Kahlhoefer KIT
S. Knirck Harvard U.
F. Kühnel MPP Munich/LMU
T. Marrodan MPIK
S. Mertens MPIK
G. Raffelt MPP Munich
J. Redondo Saragossa U.
M. Vignati Rome Sapienza U.
F. Vissani LNGS
C. Volpe ACP Paris
Y. Wong New South Wales U.

Topics:

- Axions
- Dark Matter
- Neutrino mass
- Astrophysics & Cosmology
- Neutrinoless double beta decay
- Low-energy neutrino astrophysics

Organisation committee:
F. Petricca MPP Munich (chair)
R. Strauß TUM (chair)
V. Mantovani Sarti TUM (chair)
G. Raffelt MPP Munich
B. Majorovits MPP Munich
B. Döbrich MPP Munich
K. Schäffner MPP Munich
A. Ibarra TUM

Secretary:
D. Altwasser MPP Munich
P. Mucciarelli TUM
P. Riedel SFB1258
S. Wenzel TUM
D. Werner MPP Munich

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M. Vignati Rome Sapienza U.
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Y. Wong New South Wales U.

Could not leave the US
Lectures online

Topics:

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- Dark Matter
- Neutrino mass
- Astrophysics & Cosmology
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A. Ibarra TUM

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P. Mucciarelli TUM
P. Riedel SFB1258
S. Wenzel TUM
D. Werner MPP Munich

Timetable

ISAPP School 2026 "The Low Energy Frontier: Dark Matter and Neutrinos in Theory and Experiments"

from **Monday, 20 July 2026 (08:00)** to **Friday, 31 July 2026 (17:30)**

Monday, 20 July 2026

- 10:00 SFB Graduate School Day (SFB only)
- 13:00 Arrival and Registration
- 17:00 Welcome Reception
- 19:00 ISAPP2026 Introduction

Tuesday, 21 July 2026

- 08:30 Theory of neutrinos: oscillations, masses, leptogenesis and standard model extensions
- 10:00 Coffee Break
- 10:30 Axions as dark matter - axion cosmology
- 12:00 Lunch Break
- 13:30 Low-energy neutrino astrophysics
- 15:00 Coffe Break
- 15:30 Presentation hands-on activities

Wednesday, 22 July 2026

- 08:30 Cosmic rays and indirect dark matter searches
- 10:00 Coffee Break
- 10:30 Low-energy neutrino astrophysics
- 12:00 Lunch Break
- 13:30 Axions as dark matter - axion cosmology
- 15:00 Coffee Break
- 15:30 Constraints on particle physics from cosmological observations: structure formation, gravitational lensing and the neutrino mass
- 19:00 Social Dinner at Augustiner Stammhaus

Thursday, 23 July 2026

- 08:30 Constraints on particle physics from cosmological observations: structure formation, gravitational lensing and the neutrino mass
- 10:00 Coffee Break
- 10:30 Theory of neutrinos: oscillations, masses, leptogenesis and standard model extensions
- 12:00 Lunch Break
- 13:30 Particle dark matter: production and candidates
- 15:00 Coffe Break
- 15:30 Neutrino mass experiments: Neutrino mass experiments
- 17:30 Social Activity: ESO Supernova and Planetarium Show

Friday, 24 July 2026

- 08:30 Particle dark matter: production and candidates
- 10:00 Coffee Break
- 10:30 Neutrino mass experiments
- 12:00 Lunch Break
- 13:30 Primordial Black Holes dark matter: Primordial Black Holes dark matter
- 15:00 Coffee Break
- 15:30 Coherent Elastic Neutrino Nucleus Scattering: Prospects and Experimental Status
- 17:30 Soccer Match & Pizza

Saturday, 25 July 2026

- 08:30 Social Activity: Chiemsee Excursion

Sunday, 26 July 2026

- 10:00 Free Day

Monday, 27 July 2026

- 08:30 Astrophysical Axion Bounds
- 10:00 Coffee Break
- 10:30 Direct Dark Matter Searches
- 12:00 Lunch Break
- 13:30 Hands-on
- 15:00 Coffee Break
- 15:30 Hands-on
- 19:00 Social Activity: Guided tour Munich city

Tuesday, 28 July 2026

- 08:30 Direct Dark Matter Searches
- 10:00 Coffee Break
- 10:30 Quantum detectors for astroparticle physics
- 12:00 Lunch Break
- 13:30 Hands-on
- 15:00 Coffee Break
- 15:30 Hands-on

Wednesday, 29 July 2026

- 08:30 Quantum detectors for astroparticle physics
- 10:00 Coffee Break
- 10:30 Principles and status of the search for dark matter axions
- 12:00 Lunch Break
- 13:30 Hands-on
  - 13:30 - 15:00
  - Room: A.1.01 - Alps
- 15:00 Coffee Break
- 15:30 Hands-on
- 19:00 Social Dinner at Wirtshaus zur Brez'n

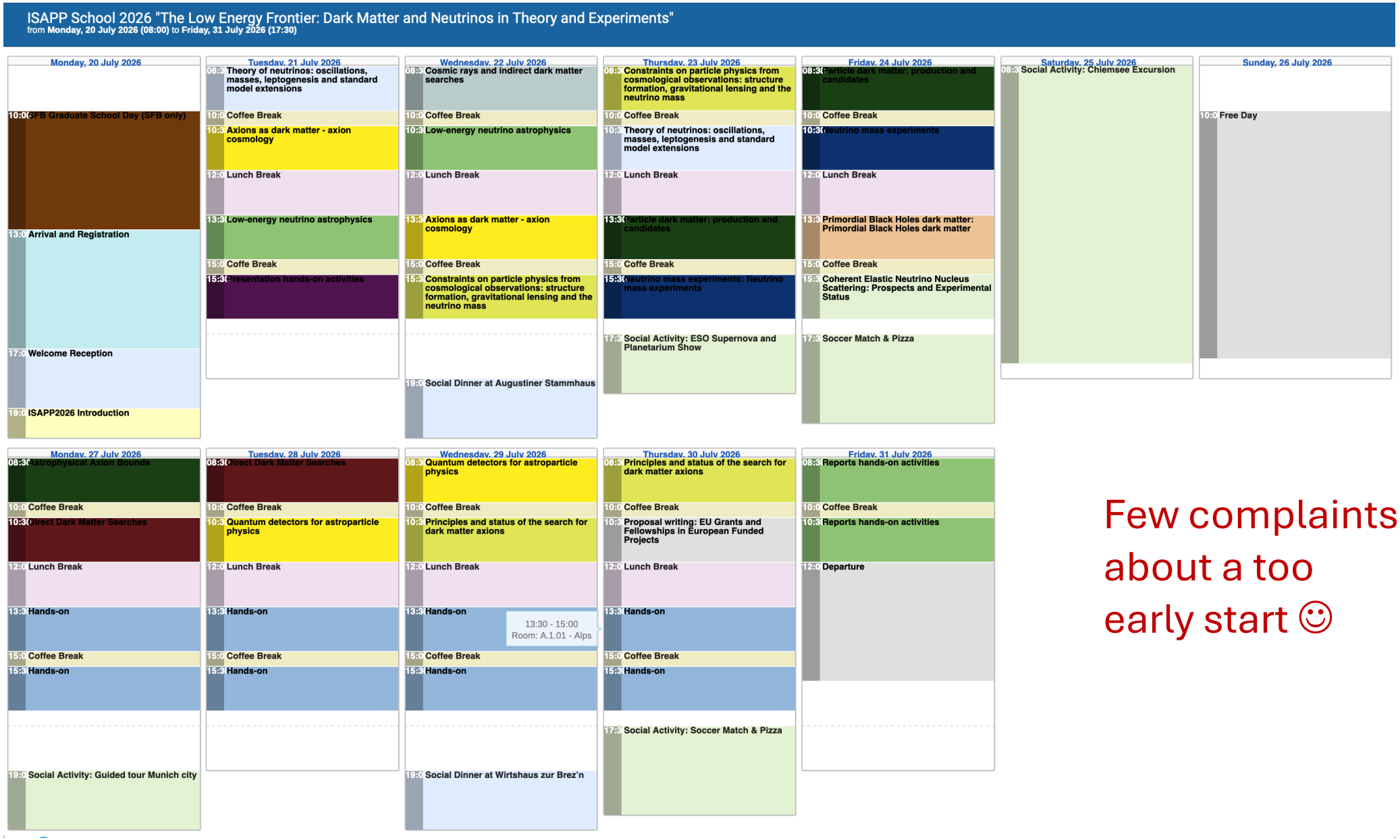
Thursday, 30 July 2026

- 08:30 Principles and status of the search for dark matter axions
- 10:00 Coffee Break
- 10:30 Proposal writing: EU Grants and Fellowships in European Funded Projects
- 12:00 Lunch Break
- 13:30 Hands-on
- 15:00 Coffee Break
- 15:30 Hands-on
- 17:30 Social Activity: Soccer Match & Pizza

Friday, 31 July 2026

- 08:30 Reports hands-on activities
- 10:00 Coffee Break
- 10:30 Reports hands-on activities
- 12:00 Departure

Timetable



Few complaints about a too early start ☺

Lecturers 50%F + 50%M

Y. Wong (University of Melbourne)
Constraints on particle physics from cosmological observations: structure formation, gravitational lensing and the neutrino mass

J. Redondo (University of Saragossa)
Axions as dark matter - axion cosmology

S. Knirck (Harvard University)
Principles and status of the search for dark matter axions

F. Kahlhofer (KIT)
WIMP DM intro

F. Kühnel (LMU)
Primordial BH Dark matter

F. Donato (University of Turin)
Indirect DM searches

G. Raffelt (MPP)
Axions: limits from astrophysics

F. Vissani (LNGS)
Neutrino theory

M. Vignati (University of Rome Sapienza)
CEvNS Experiments

C. Braggio (University of Padua)
Quantum detectors for astroparticle physics

C. Volpe (APC Paris)
Low-energy neutrino astrophysics

S. Mertens (MPIK)
Neutrino mass experiments

T. Marrodan (MPIK)
DM experiments

M. Lorenz (EU-Büro of the Max-Planck-Institutes In the Regional Cluster Bavaria)
Proposal writing: EU Grants and Fellowships in European Funded Projects

Hands-on Activities

Activity	Responsible	Format	# of participants	Room
CRYO1	Alex Langenkämper Ruby Müller	4 days	3	A.0.29
CRYO2	Colin Moore Nate Cullen	4 days	3	A.0.37.1
TES	Beatrice Mauri	4 days	3	A.0.26 A.0.22
STS	Andreas Erhart	2 days	11	A.3.11
Axion	Babette Dörich Elisa Gabbrielli	2 days	10	A.0.39 A.0.47
Analysis	Martin Stahlberg, Margarita Kaznacheeva	2 days	10	A.3.53
ML	Jed Homer Tae, Hyoun Park	2 days	15	Mo: A.1.03 Tu-Th: A.2.25/27
THEORY	Yago Porto	2 days	15	Mo: A.1.01 Tu-Th: A.1.01/03





ISAPP Hands-On Sessions

- 🎯 Pick your favorite topics
- 🌍 Look beyond your field
- 🚀 No prior experience needed
- ⏳ First come, first served

Hands-on Activities

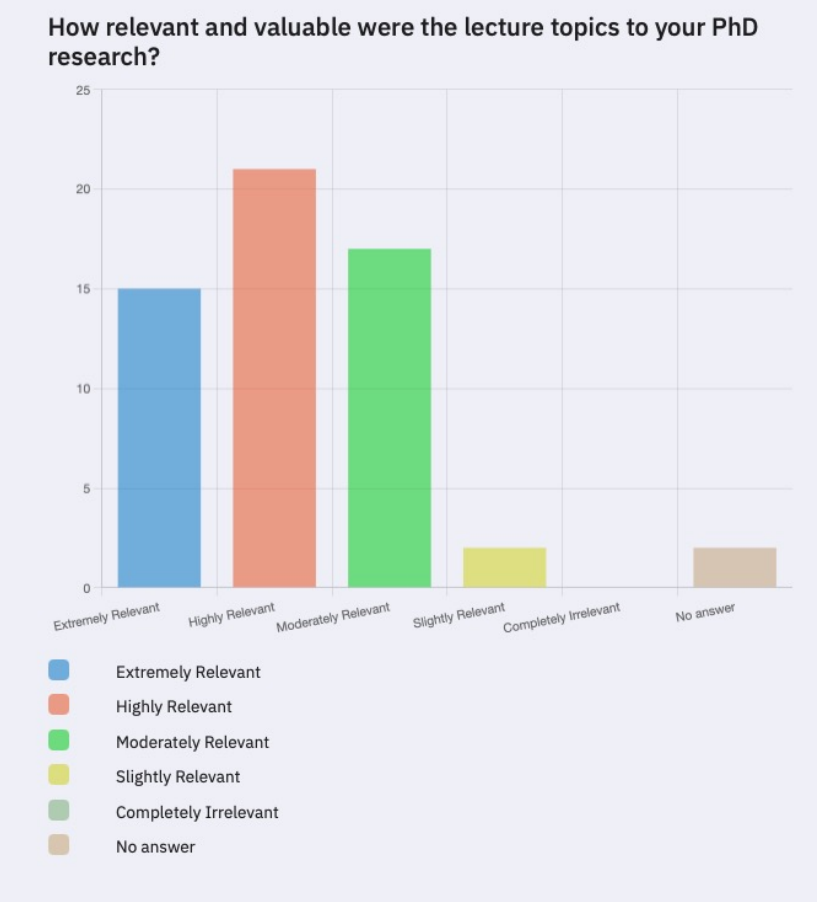








Feedback Lectures & Hands-on



Which lecture or topic did you find most valuable, and why?

- + topic close to own research
- + topic not covered in the own curriculum
- + interactive lectures

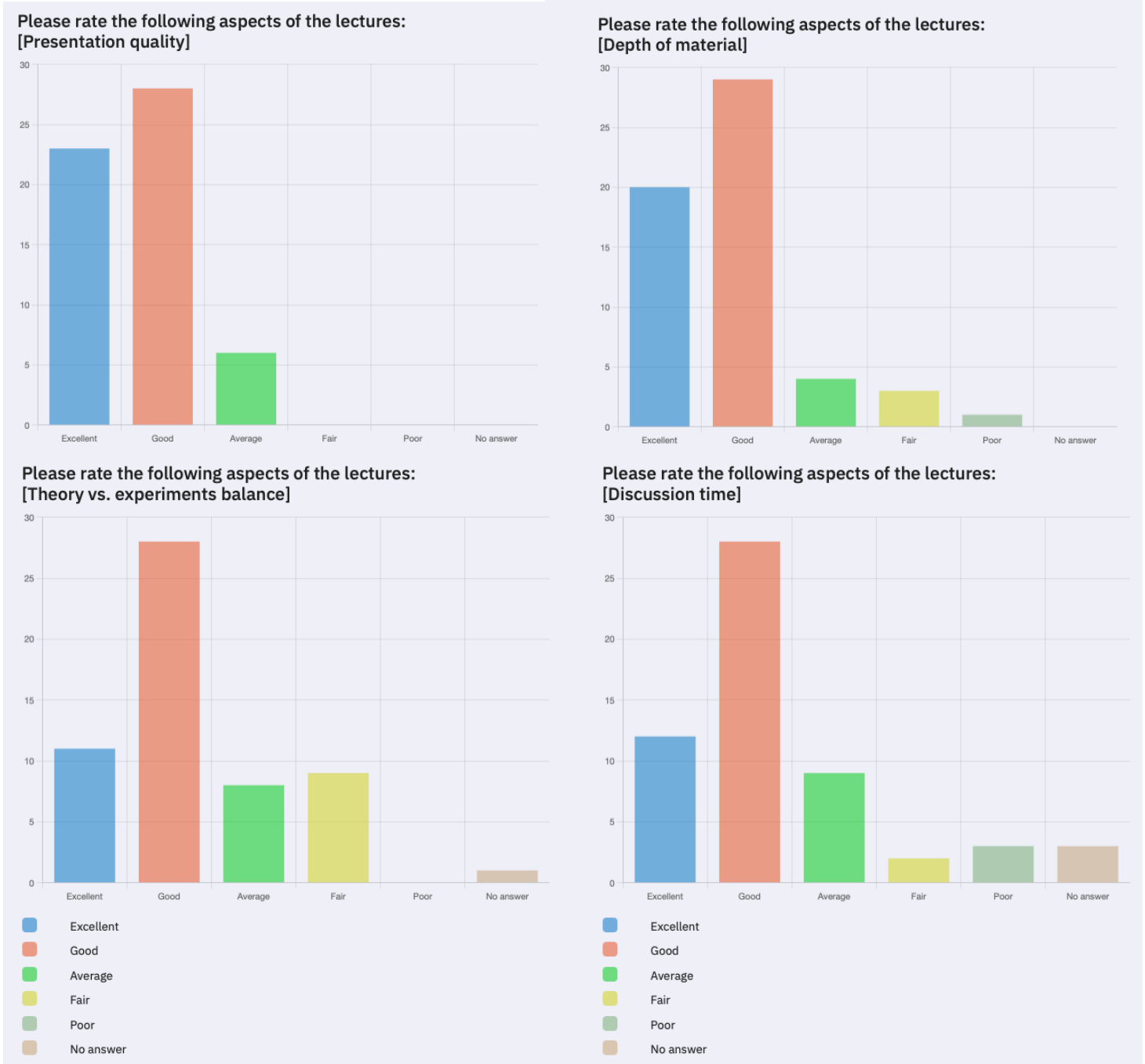
Are there any topics you wish had been covered or explored further?

- Maybe it would have been nice to do a panel discussion on some topics, especially future prospects
- More about gravitational waves in connection with BSM physics
- Gamma-rays and GWs

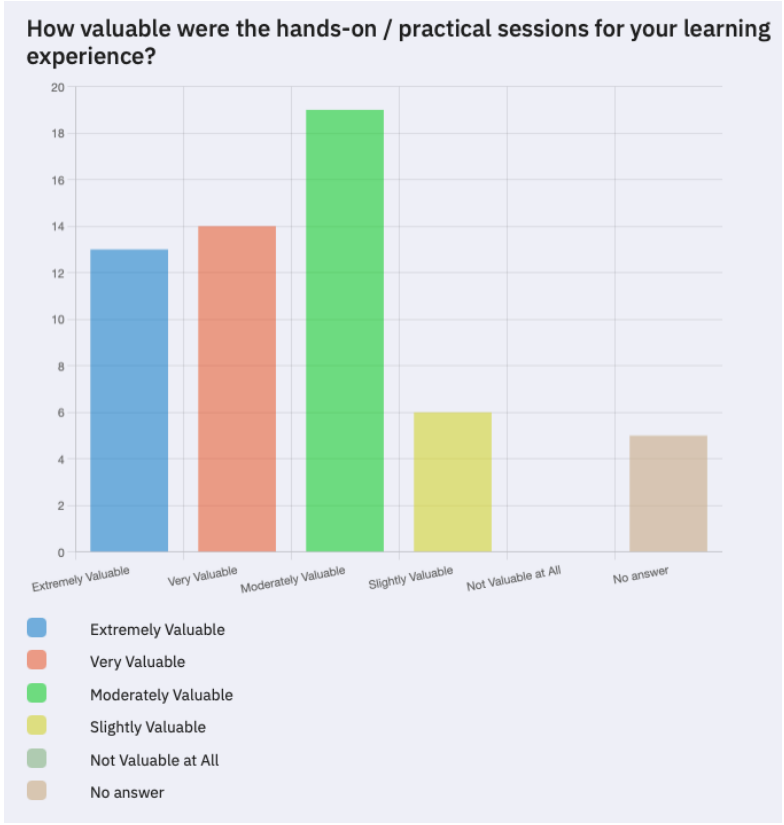
Do you have any additional comments or suggestions for the organisers?

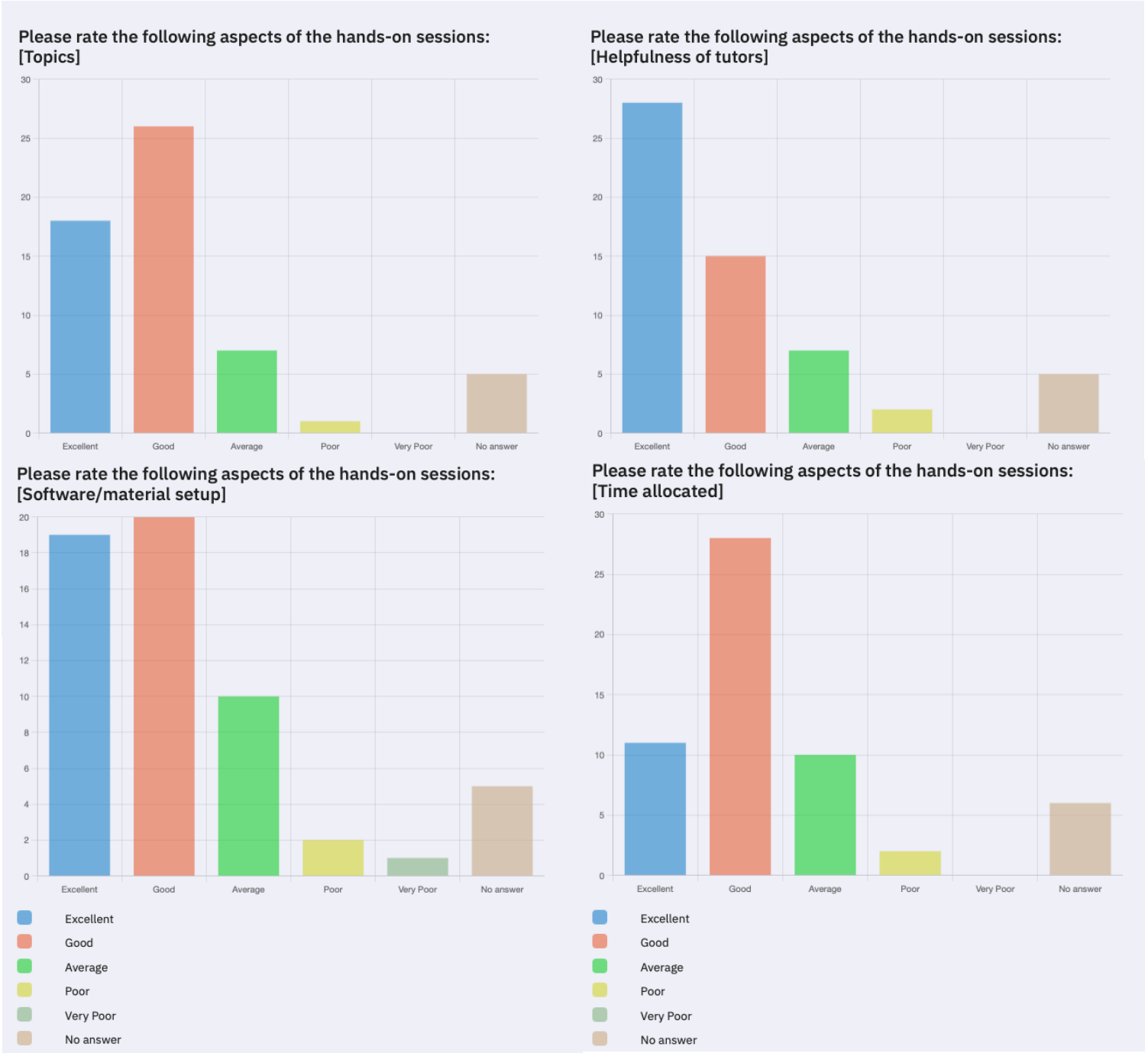
- We were rushed out of the question time, I would say. It is also normal in a busy schedule, but I would sacrifice some lecture time for question time. An idea could also be to have a ‘question session’ with the lecturers of the past 2 days or so, s.t. we really create the environment for it.

Feedback Lectures & Hands-on



Feedback Lectures & Hands-on





Feedback Lectures & Hands-on

What did you like most or least about the hands-on sessions?

- Most: Topics Least: time-schedule
- I wish that they had communicated a more detailed/structured program on what we were going to do before the beginning, so that we could have chosen better
- Very Motivated tutors. The first come first serve sign-up was a bit chaotic. This should be improved in the future.
- I really liked the hands on activity which was not related to my topic, because it was easier to get in touch with other topics in a smaller setting
- I liked the variety of topics proposed, but not the way we had to choose among them. A google form would have been fairer
- I found them fantastic! I was very grateful to gain experience in the lab as a theorist.
- Very well structured and helpful. Ideally it would have been good to spend more time in the lab, but I understand it would have been much harder to organize



Social Events

- Saturday: trip to lake Chiemsee
- 2 x School dinner downtown
- Supernova visitor center in Garching
- Guided city tour
- 2 x Football evenings with pizza

Lake Chiemsee

62 registered, 51 participated







Chiemsee Excursion

Saturday, 25 July 2026

Come and join us on a day-trip excursion to lake Chiemsee and the beautiful island of Herrenchiemsee by bus and boat

We will participate in a guided tour through the breathtaking chambers of the Royal Palace of Herrenchiemsee built by King Ludwig II and you will also have a chance to visit the museum and take a walk in the beautiful park of the Palace.

When:
Saturday, 25 July 2026, 8:30 a.m.

!!!!!! Where: !!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!

Föhringer Ring 6, 80805 München-Schwabing-Freimann,
U6 Studentenstadt *Google link: https://maps.app.goo.gl/vn81Qp46cfsySWYu9*

!!!!!!!!!!!!!!!!!!!!!!

Duration: We will return to Max-Planck-Institute at about 18:30 p.m.







2 x School dinners downtown



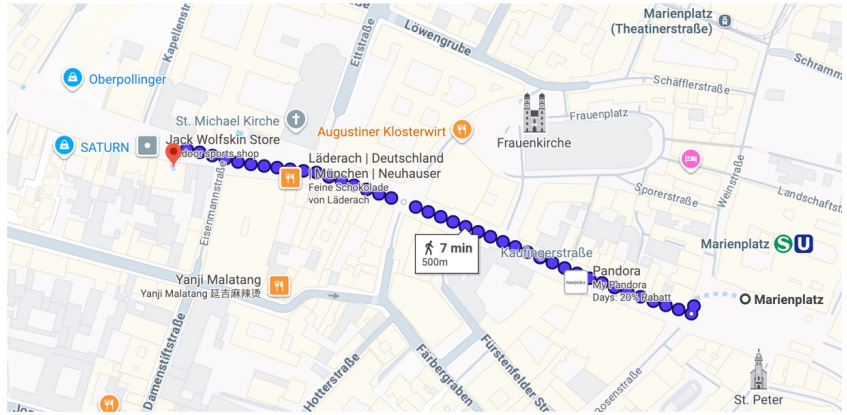


Wednesday, 22 July 2026 at 19:00 p. m.

Augustiner Stammhaus
Neuhauser Str. 27
80331 München

Website Augustiner Stammhaus

How to get there? From U-Bahn stop "Marienplatz" follow the directions:
Please click here: www.google.com/maps

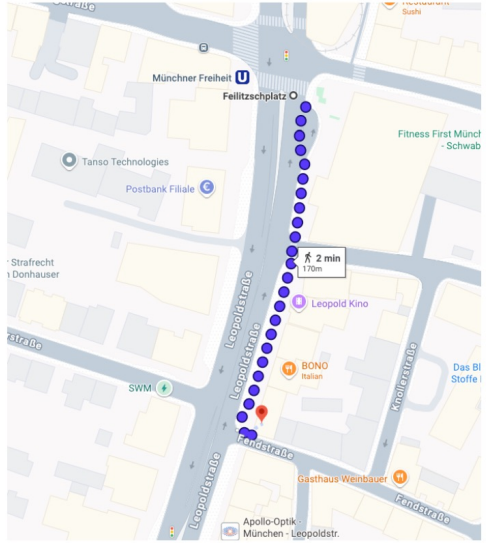


Wednesday, 29 July 2026. at 19:00 p.m.

Wirtshaus zur Brez'n
Leopoldstr. 72
80802 München

Website Zur Brez'n

How to get there? From U-Bahn stop "Münchner Freiheit" follow the directions:
Please click here for directions: www.google.com/maps



Supernova visitor center



ESO planetarium show & exhibtion



On Thursday, 23 July 2026, we welcome you to the ESO Planetarium and Visitor Centre in Garching.

The museum will open exclusively for us at 17:30, giving us one hour for an self-led exploration of the exhibition and the museum store. The planetarium show will start at 18:30 precisely so please be there latest by then. We will leave again at 19:30 for the rest of the evening to spend as you wish.

Guided city tour

57 registered, 38 participated

Guided tour Munich city



Munich's Hidden Secrets

Join us as we explore the **Sagas & Legends of the Old Town**. We'll be diving into the city's past to answer the important questions:

- **Luck & Wealth:** How to get it from the Residence Lions.
- **The Pretzel Rider:** Why was he giving away free snacks?
- **City Myths:** A look at the most enchanting stories from Munich's history.

Meeting Point: Mariensäule (Mary's Column) at Marienplatz

When: 27.7.2026 at 19:00 (Start)

Duration: 1.5 – 2 Hours

Soccer & Pizza







Soccer Match & Pizza

⚽ **Goals & Slices: The ISAPP Summer School 2026 Soccer & Pizza Nights**

What?

We'll have two voluntary just-for-fun soccer tournaments in the weeks of the ISAPP Summer School. We'll welcome you to play with us on an outdoor soccer field and enjoy some pizza slices for dinner.

When?

Friday, 24 July 2026, and Thursday, 30 July 2026 after the sessions are finished about 5:30 p.m.

Where?

On the Garching Research Campus, about 10min footwalk from the MPI for Physics.

Google Maps Link



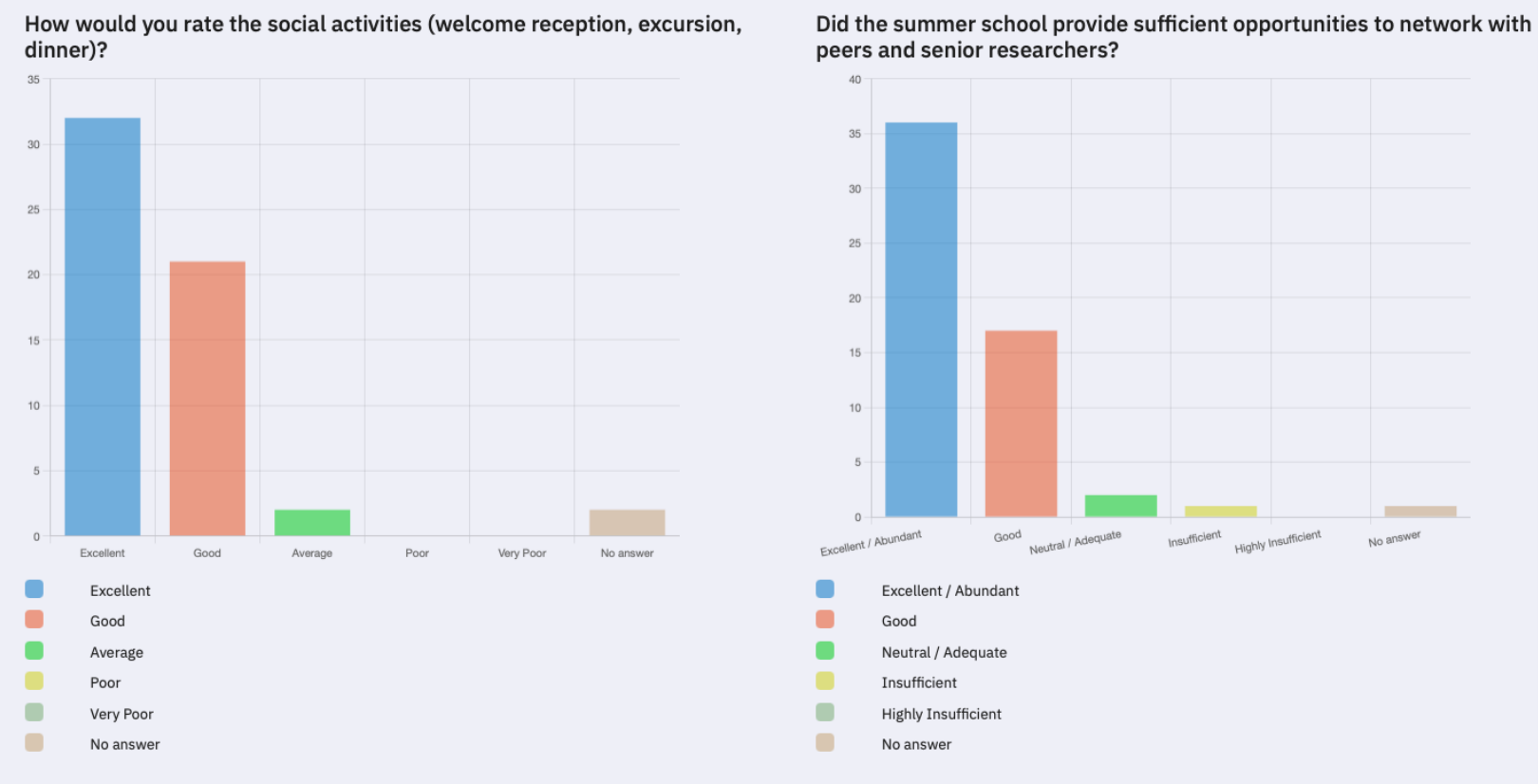
Good to know

The soccer field is outdoors, there is no weather protection. Please stay tuned and listen to the announcements on the respective day whether the tournament can take place should the weather conditions be adverse.

If you wish to play:

- Wear comfortable athletic clothing appropriate for the weather
- We recommend athletic shoes or soccer cleats with plastic studs. Shoes with metal studs are not allowed.
- If it's sunny, bring sun protection (sunscreen, a cap).

Feedback
Social Activities



Do you have any additional comments or suggestions for the organisers?

- Almost too many social activities, two weeks of lectures and networking were really exhausting
- Maybe the schedule was a bit tight; I know there was a lot of things to fit in 2 weeks, but at the end of the day I felt really tired (never had enough energy to join the other guys in some after-dinner activities :))
- Better to do the welcome presentation/introduction first, and then the reception with food, etc. Also, some people already left by the time the presentation started.



- I liked them very much; that made the experience even better
- I appreciate the variety of extra activities, both during the evenings and weekend
- Thank you for the huge work behind all of this. You stayed with us even on Saturday and many evenings, after the working hours



Preliminary cost estimate (May 2026)

Coffee:	~ 12k€
Social dinner/Welcome:	~ 15k€
Speakers: 2000€ /lecturer	~ 26k€
Fellowships:	~ 5k€
Social activities:	~ 6k€
**********	
Total	~ 65k€

Funding granted:

• SFB graduate school:	**25k€**
• General support from MPP:	**20k€**
• General support from TUM:	**5k€**
• Excellence Cluster ORIGINS-II:	**10k€**
Total:	**60k€**

Fee for 70 paying participants (300 €)	**21k€**

Likely positive balance:

- One more fellowship?
- Add lunches during school days?
- Add lunch during the Saturday excursion?
- Upgrade welcome reception to dinner?
- School t-shirt?

Preliminary cost estimate (June 2026)

Coffee:	~ 12k€
Social dinner/Welcome:	~ 15k€
Speakers: 2000€ /lecturer	~ 26k€
Fellowships:	~ 5k€
Social activities:	~ 6k€
**********	
Total	~ 65k€

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- General support from MPP: **20k€**
- ~~General support from TUM:~~ **~~5k€~~**
- Excellence Cluster ORIGINS-II: **10k€**

Total: **~~60k€~~** 55k€

Fee for ~~70~~ paying participants (300 €) **~~21k€~~**
61 18k€

School fee included:
9 lunches
5 dinners
2 coffee breaks/day
1 full day excursion
2 evening excursions

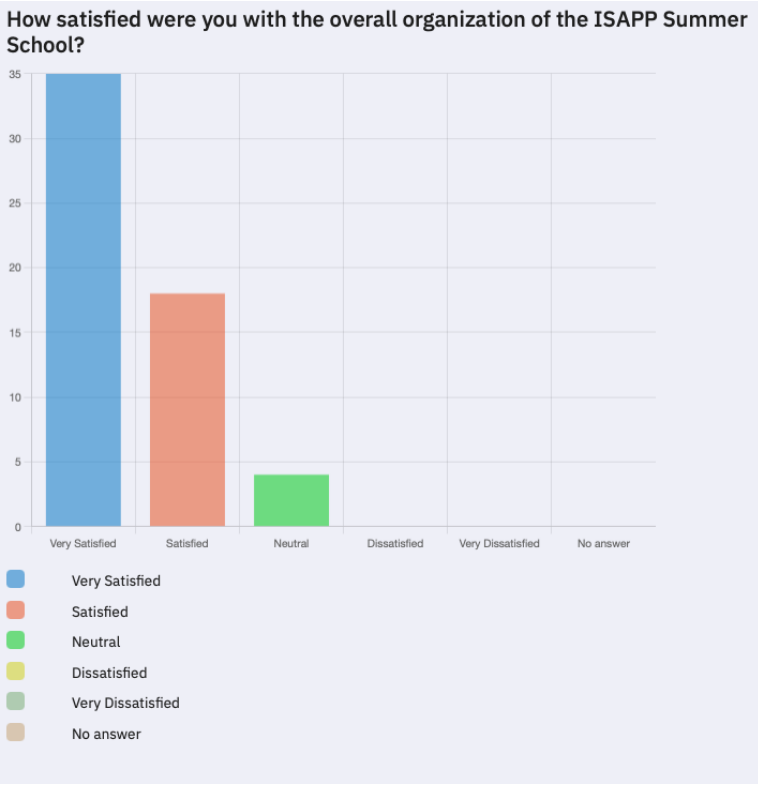
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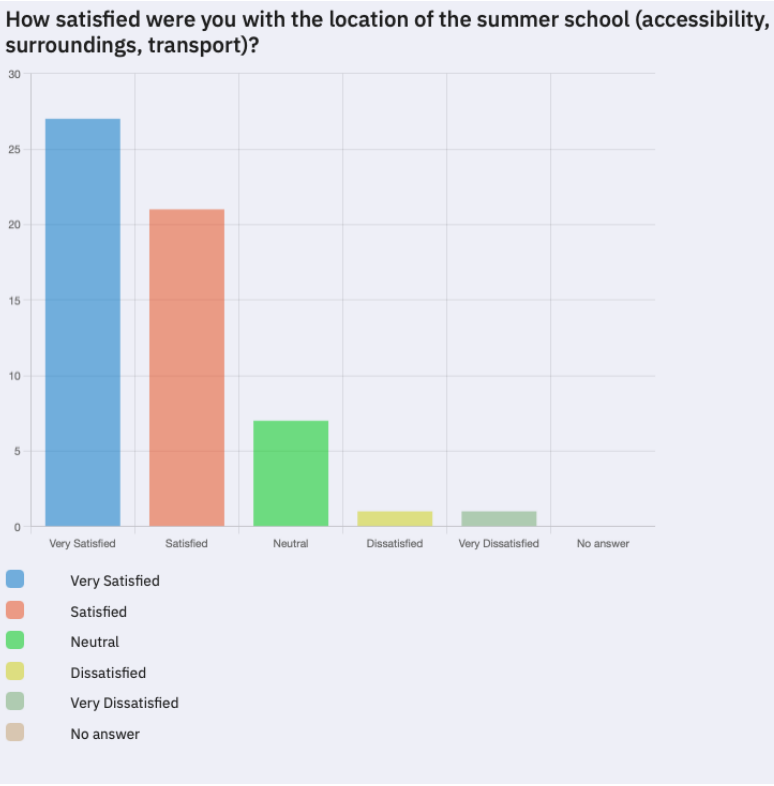
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- ~~School t-shirt?~~

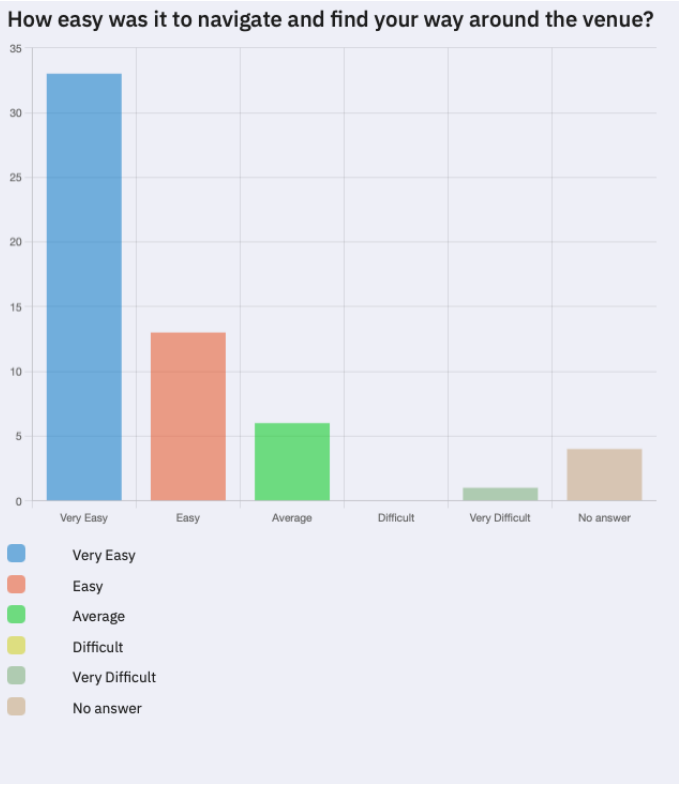
Final cost (October 2026)

Coffee & Lunch weekdays:	~ 20k€
Social dinners:	~ 8k€
Welcome reception:	~ 3k€
Speakers:	~ 15k€
Fellowships:	~ 5k€
Social activities:	~ 9k€
**********	
Total	~ 60k€

Feedback General Organization







Do you have any comments regarding the location or overall organization?

- Maybe starting at 9:00
- Maybe being in the center of Munich would have been nicer
- It would have been nice to have a bit more diverse group of students
- The first time looking for the rooms the guy at the entrance send us in a completely different direction

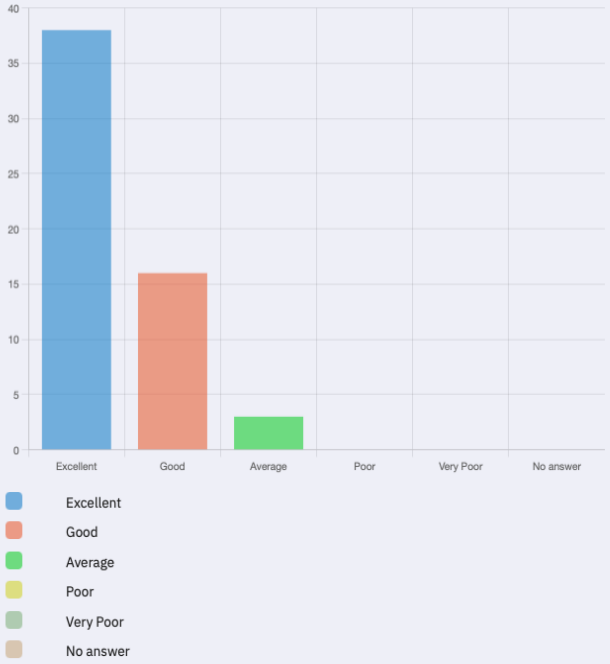


- No comments, everything was smooth and very well organized
- It was an amazing school to be a part of

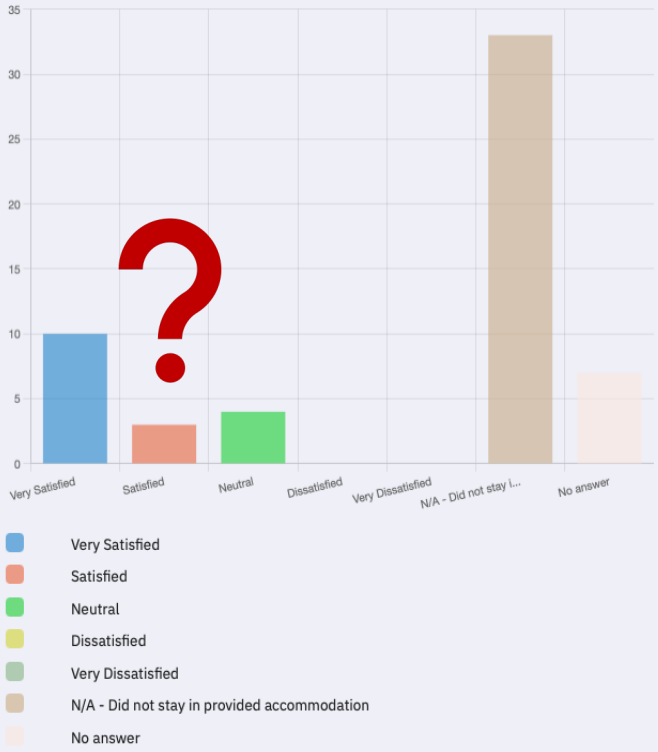


Feedback General Organization

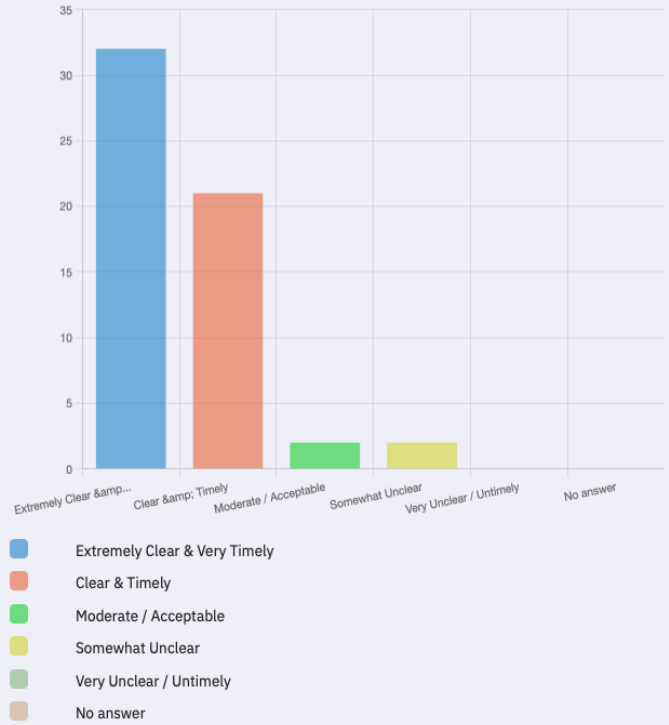
How would you rate the support provided by the local organizing team?



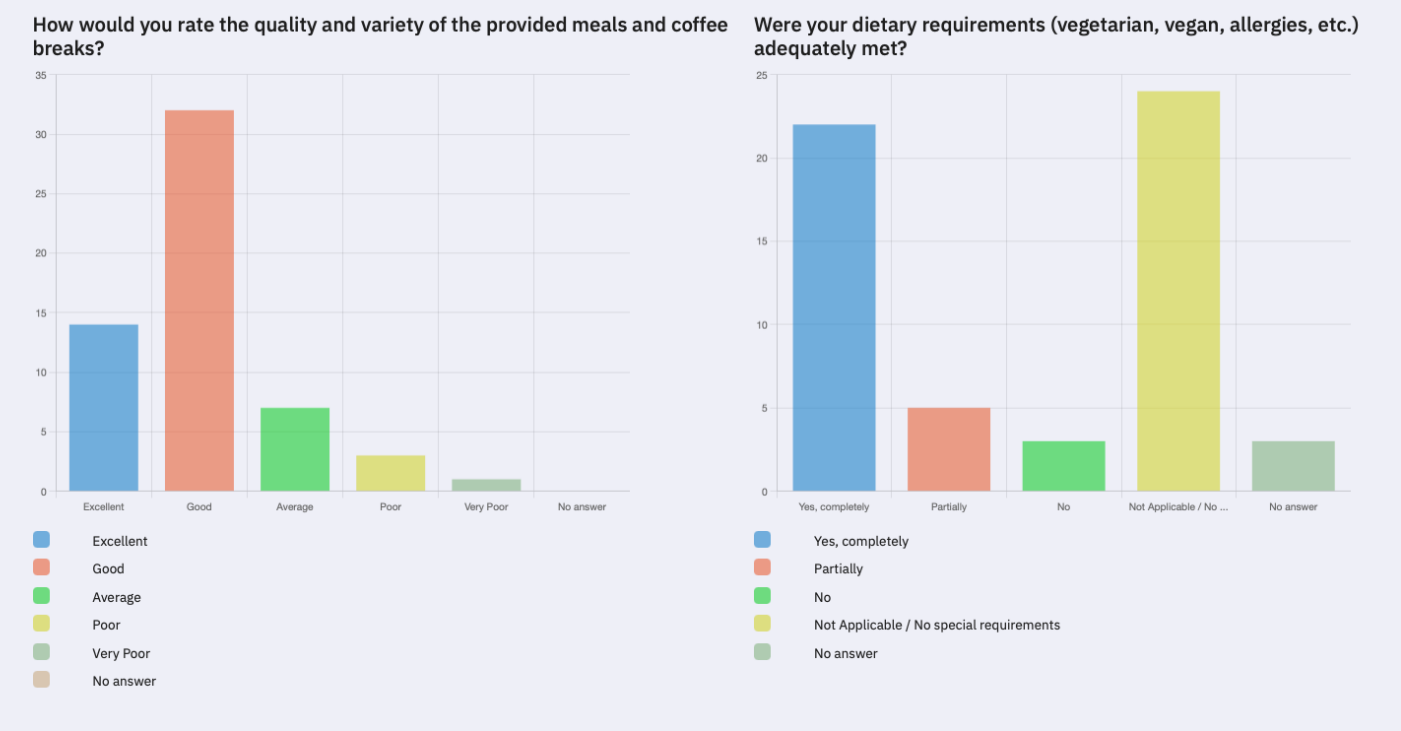
If you stayed in provided accommodation, how satisfied were you with it?



How clear and timely was the information provided (welcome package, schedule updates)?



Feedback General Organization



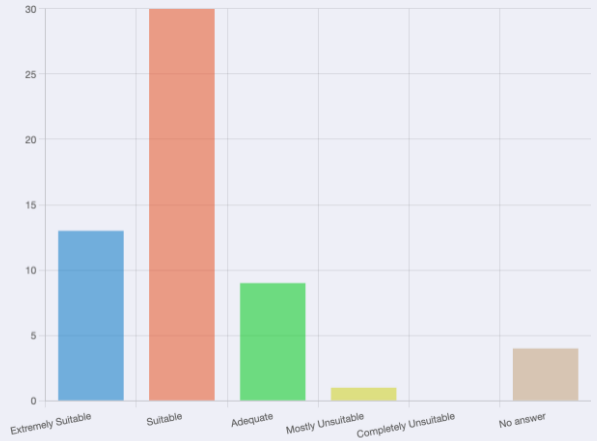
Do you have any additional comments or suggestions for the organisers?

- The XXX was not good in terms of vegetarian/vegan options and declaration
- Some of the vegetarian lunch meals (especially Monday + Tuesday of the second week) were really terrible
- Maybe paying more attention to dietary conditions, and make sure they are met and understood by the restaurants*.

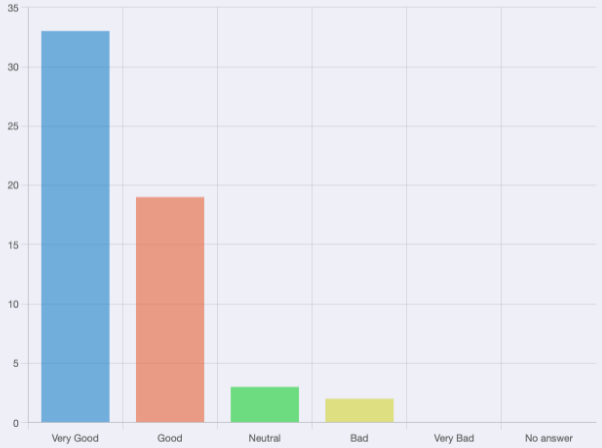
* People with allergies could choose from the menu

Feedback General Organization

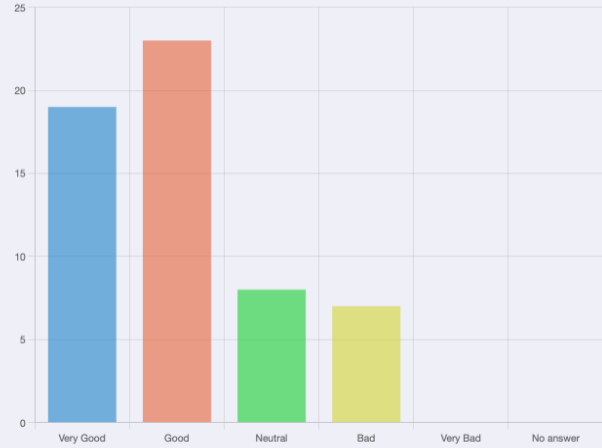
Were the breakout areas suitable for working and informal discussions during breaks?



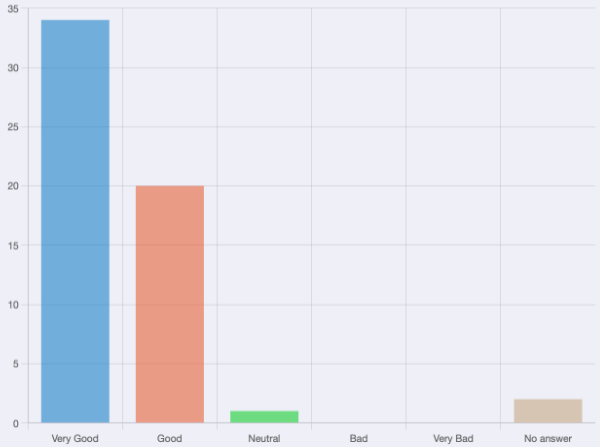
Please rate the quality of the lecture rooms and technical facilities: [Seating comfort]



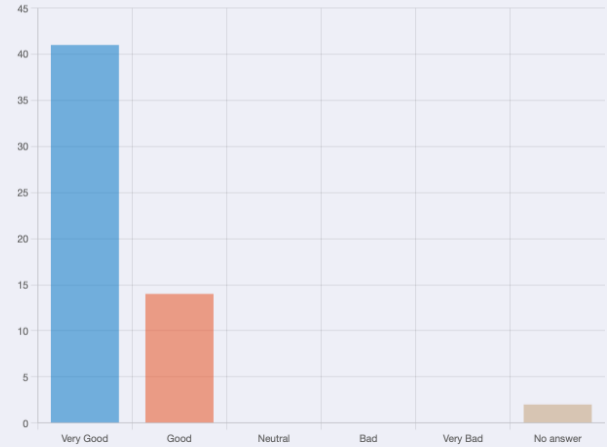
Please rate the quality of the lecture rooms and technical facilities: [Room temperature/ventilation]



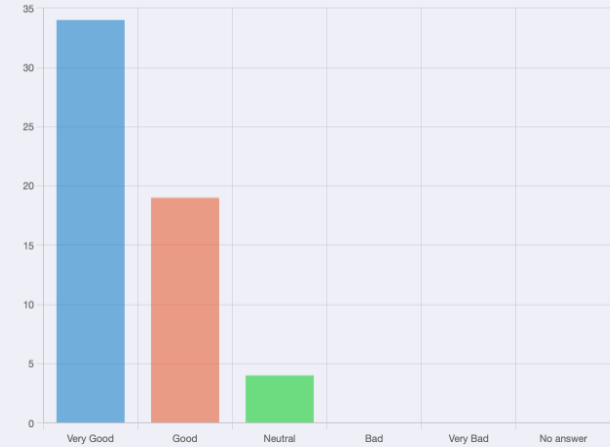
Please rate the quality of the lecture rooms and technical facilities: [Visibility of slides]



Please rate the quality of the lecture rooms and technical facilities: [Audio quality]



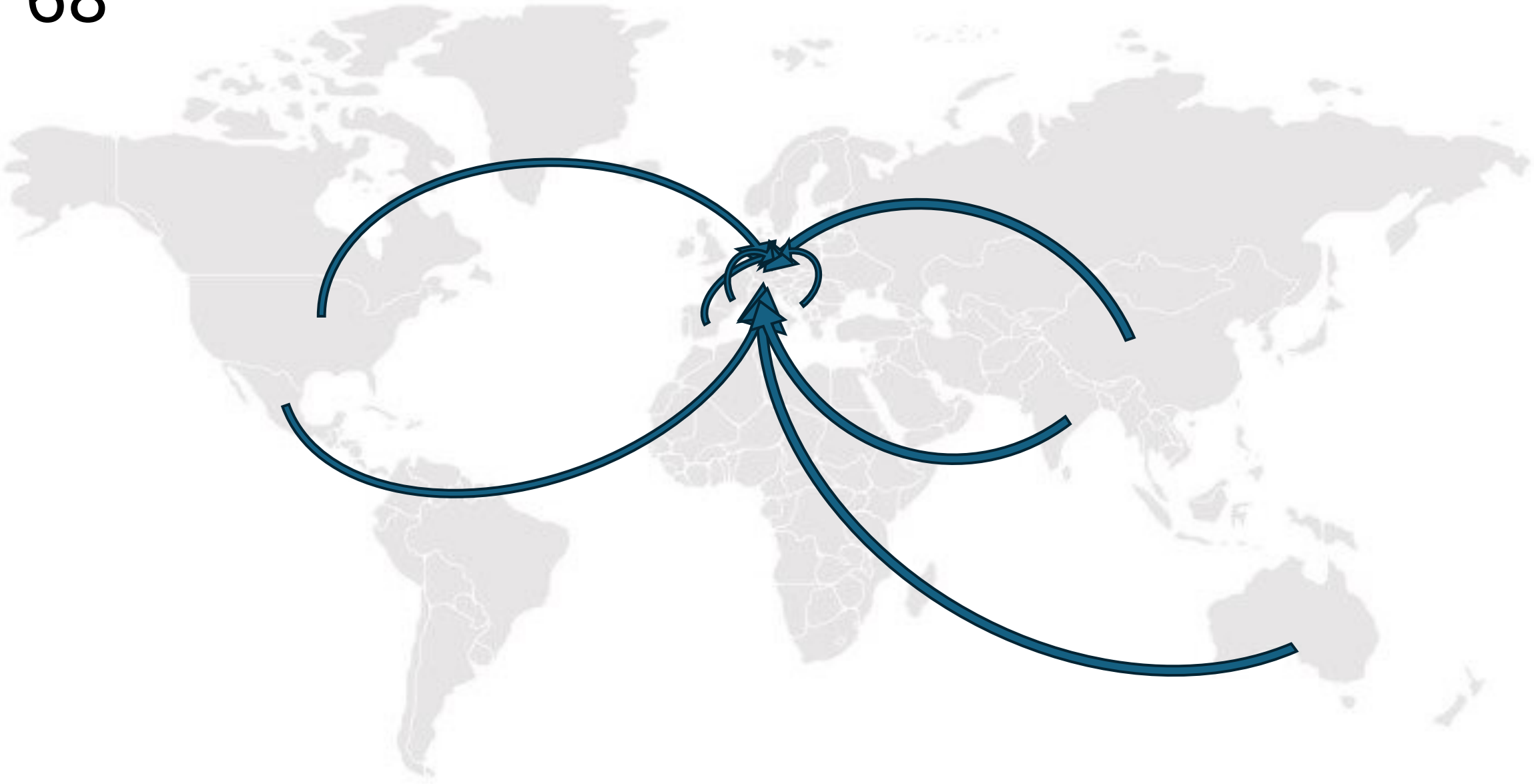
Please rate the quality of the lecture rooms and technical facilities: [Wi-Fi & outlets]



Registrations

Completed:	70 (we closed registrations before the original deadline) 2 cancelled on short notice (one due to health reasons was refunded) ➔ 68 participants
Withdrawn:	11
Rejected:	17 (master students or no reference)

~~70~~ Participants from Around the Globe
68



Fellowships

Commitment to ensuring broad and equitable access to the school

50% of registrants requested support

Fellowships covering registration fees and lodging prioritised for participants from institutions in developing countries or for those facing exceptionally high travel costs

Indian Institute of Science Education and Research, Berhampur	India	Completed	Fellowship	Registration completed
IFUNAM	Mexico	Completed	Fellowship	Registration completed
The University of Melbourne	Australia	Completed	Fellowship	Registration completed
Indian Institute of Science Education and Research Tirupati	India	Completed	Fellowship	Registration completed
The University of Melbourne	Australia	Completed	Fellowship	Registration completed
The University of Melbourne	Australia	Completed	Fellowship	Registration completed

Comment on young faculty

Statistics

My biased assumption!

37% F

Country	Participants	F	M
Australia	3	1	2
Austria	1		1
China	1		1
France	5	2	3
Germany	33	9	24
India	2		2
Italy	17	11	6
Mexico	1		1
Spain	2		2
Switzerland	2	1	1
US	1	1	

25 local

18 of the 25 F students are Italian

Soccer tournament!



Networking game welcome event!





SurvivingISAPP

Group · 3 members

Lessons Learned

Include a question regarding accessibility needs during registration!!!

Make sure your co-organisers are really on board.

Caterers are poorly responsive to dietary needs.

There is never enough cake at the coffee break.

Regardless of how well you try to organize, someone will always find something to complain about!

