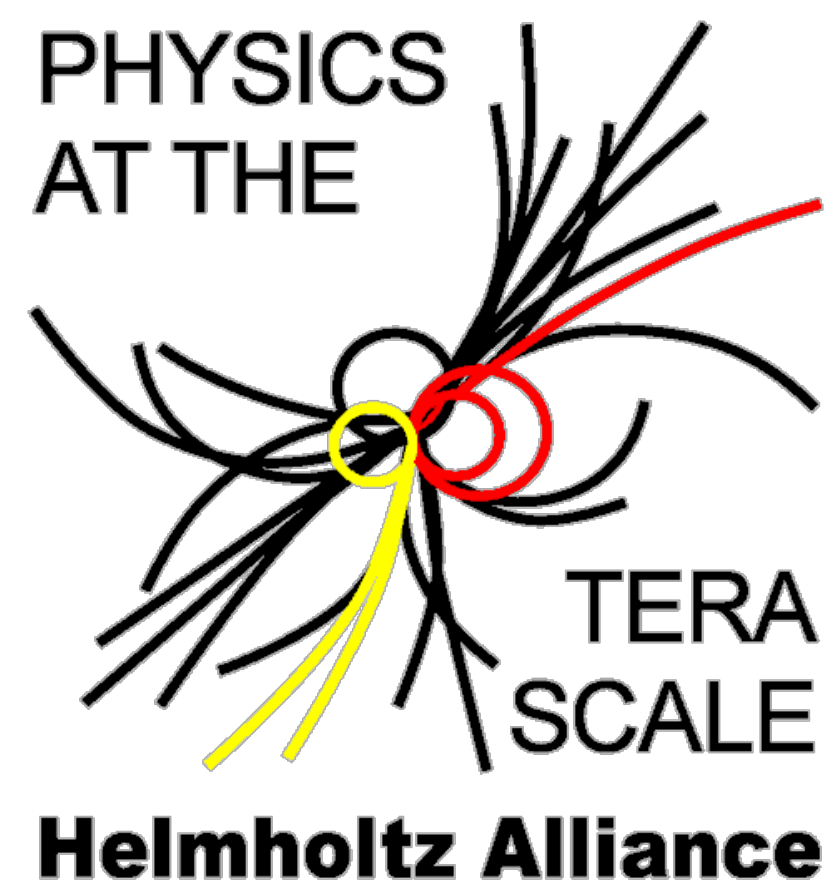


Terascale Alliance Statistics School

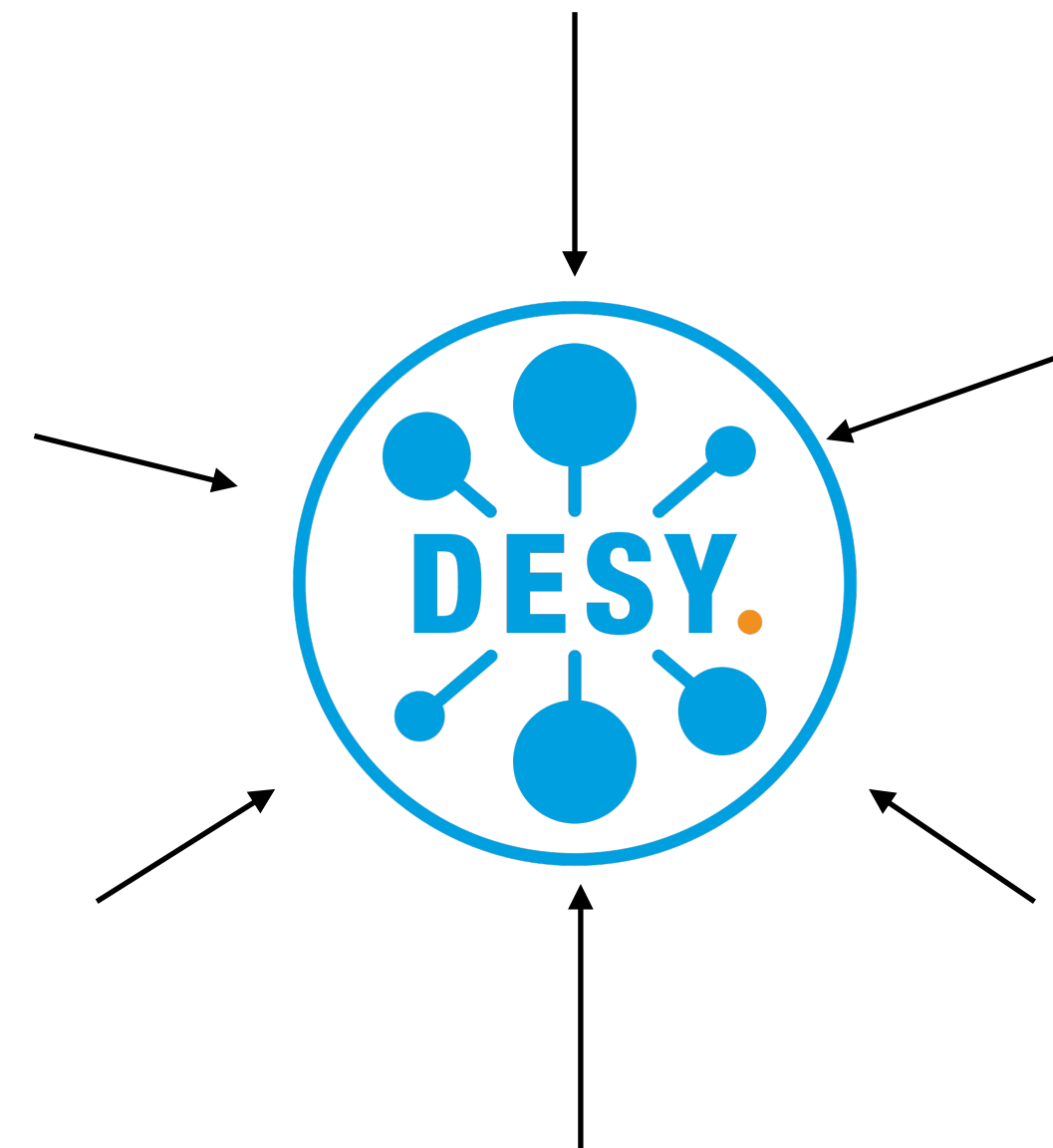
DESY Hamburg, 2-5 April 2024

INTRODUCTION





you, the 60+ participants
coming from various places!



**DESY orga team: Olaf Behnke, Andreas Hinzmann, Isabell Melzer-Pellmann,
Anna Gerhardt (secretary), Inna Henning (secretary)**

For any questions/suggestions/comments write email to: anacen@desy.de, olaf.behnke@desy.de

Scientific program

<https://indico.desy.de/event/43398/timetable/>

Statistical Inference

Glen Cowan



Lectures

Aliya Nigamova



Higgs Combine Tutorial

Nick Wardle



Kyle Cormier



Probability, Hypothesis Testing,
Parameter Estimation, Confidence Intervals, Asymptotics, ...

Machine Learning

Tilman Plehn



Lectures

Likelihood Function for one event

$$L(x_1, x_2, \dots, x_{N-Feature}; \theta)$$

Introduction to the main ML concepts/tools

The Core

Likelihood Function

$$L(x; \theta),$$

x = observed data,

θ = fit parameter(s)

$$\text{Example: } L \sim e^{-\frac{(x - \theta)^2}{2\sigma^2}}$$

Uncertainties

Roger Barlow



Lectures

Introduction

Asymmetric Uncertainties

Example: exponential lifetime

$$L(t; \tau) = \tau \cdot e^{-t/\tau}$$

plus School Summary on Friday

Glen Cowan



Lectures

Error on Error

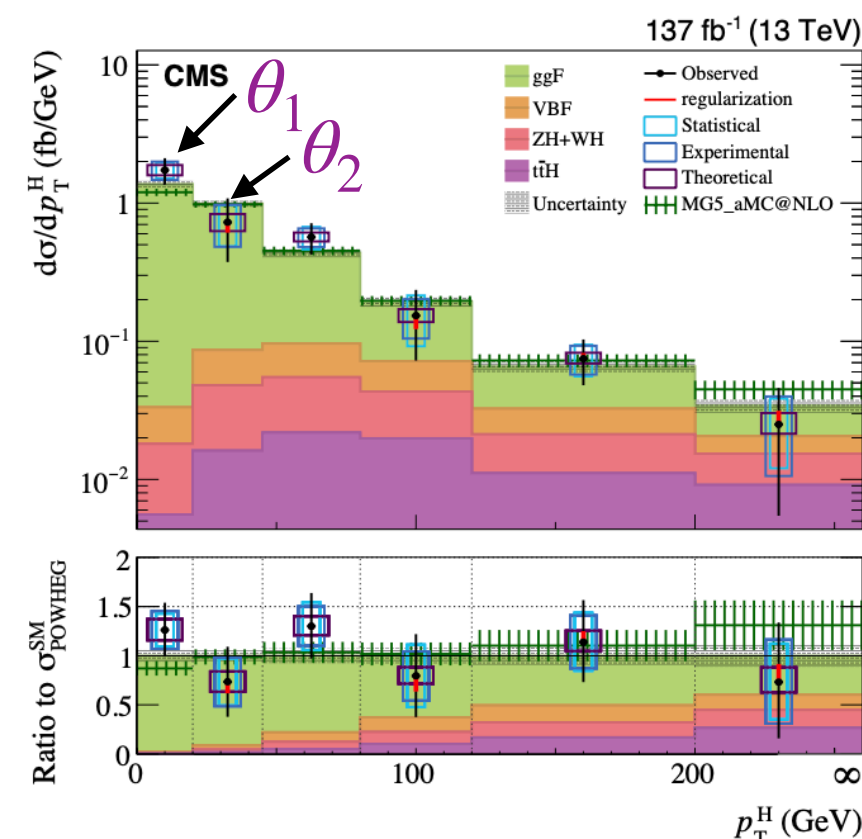
Unfolding

Vincent A. Croft



Lectures

Measuring distributions — correcting for
detector smearing/acceptance/efficiency



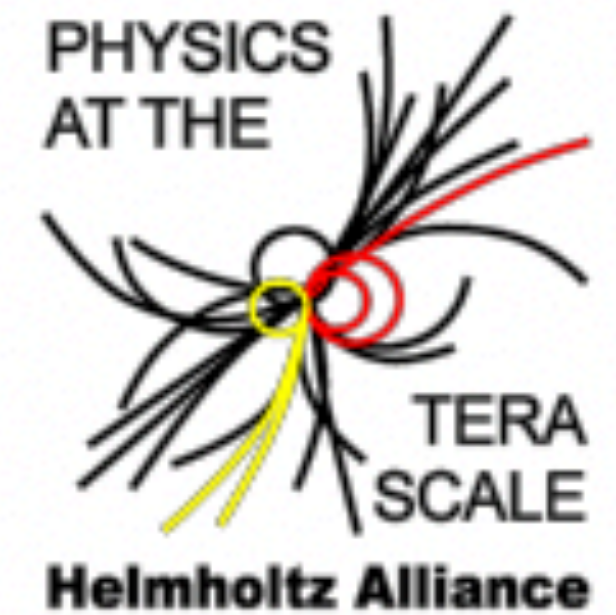
CMS-HIG-19-002

$H \rightarrow WW$

Computing information

- WLAN: connect to “Science-Hotspot” (easy registration) or “Eduroam”
- Combine Tutorial: Detailed Information will be given Tuesday afternoon on the spot <https://gitlab.cern.ch/anigamov/combine-tutorial-2023/-/blob/master/README.md>
- We will **not** stream the School in ZOOM

Code of conduct



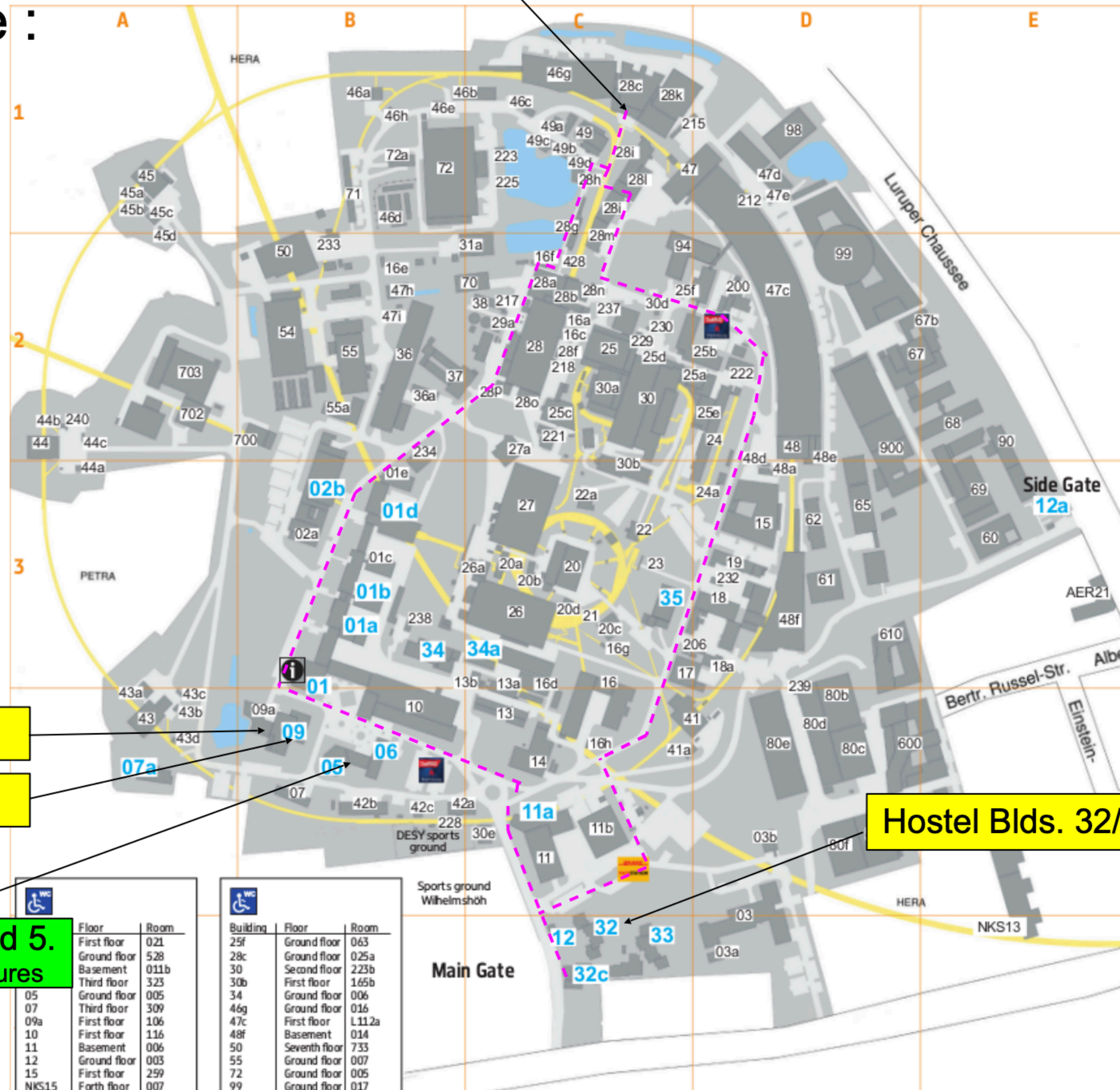
- The Helmholtz Alliance 'Physics at the Terascale' consists of members with varied national origin, ethnic background, race, gender identity, sexual orientation, gender, age, physical ability, and religion.
- As a community, we are committed to being positive and inclusive in all regards. Members of the Terascale Alliance and participants of all Terascale events must maintain a professional environment in an atmosphere of tolerance and mutual respect and abstain from all forms of harassment, abuse, intimidation, bullying, and mistreatment of any kind.
- This includes, but is not limited to, intimidation, sexual or crude jokes or comments, inappropriate anonymous emails, offensive images, and unwelcome physical conduct.
- Keep in mind that behavior and language deemed acceptable to one person may not be to another.
- We commit to helping our community adhere to this code of conduct and speak up when we see possible violations of it.
- In the event that the letter or the spirit of this code has been violated, appropriate action will be taken.

https://indico.desy.de/event/33888/attachments/80565/105358/Code_of_Conduct_Terascale_Slide.pdf

Central school venue →

Flash Seminar Room 28c

The DESY Site :



Canteen extension

Canteen & Cafeteria

DESY Main Auditorium Bld 5.
Wednesday April 3 morning Lectures

Hostel Blds. 32/33

Food

You can buy Lunch
and Breakfast in DESY
Canteen & Cafeteria

<https://desy.myalsterfood.de/>

School Dinner takes
place Wednesday
7-9 pm in Canteen
extension

Terascale Statistics School 2024

Apr 2 – 5, 2024
DESY Hamburg
Europe/Berlin timezone



Please take note: this is just
a small selection, based on personal
experiences

Overview

Timetable

Contribution List

My Conference

My Contributions

Registration

Participant List

Accommodation

Code of conduct

Restaurants in the
vicinity of DESY

Terascale School Support

✉ anacen@desy.de

Restaurants in the vicinity of DESY



Most of the Restaurants below are situated in Ottensen, the nearest downtown quarter ~5km from DESY, reachable by bus, e.g. lines 1 and 2, within ~20-30 minutes.

It maybe worthwhile to buy a daily group ticket for 14,10 Euro, valid for up to 5 persons.

Timetables can be found [here](#). Please take note that the Hamburg City Centre is not the most lively place for going out in the evening, the "action" is mostly in other places like Ottensen, Schanzenviertel, Portuguese quarter or St. Pauli.

- [Klempau's Biergarten](#) (Bavarian beergarden, reachable via footwalk from DESY)
- [Panda's Kueche](#) (Asian)
- [Farina meets Mehl](#) (exquisite Pizza)
- [Da Michele](#) (Best Pizza in Hamburg?)
- [Scotty's](#) (Typical Hamburg Kneipenrestaurant)
- [L'Orient](#) (modern libanese kitchen)
- [Wild Rice](#) (Asian)
- [Green Papaya](#) (Asian)
- [Otto's Burger](#) (The name says it)
- [Il Gambero](#) (italian)
- [Burgerlich](#) (in city centre)

Please take note that the above list is just a small selection of recommended restaurants, based on our personal experiences, there is much more to find/discover in Hamburg!

Program of today

Enjoy!

TUESDAY, APRIL 2				
10:00 AM	→ 11:00 AM	Registration	🕒 1h	📍 Seminarraum Flash 
11:00 AM	→ 11:05 AM	Welcome	🕒 5m	📍 Seminarraum Flash 
		Speakers: Isabell Melzer-Pellmann (Deutsches Elektronen-Synchrotron DESY), Olaf Behnke (CMS (CMS Fachgruppe TOP))		
11:05 AM	→ 12:30 PM	Statistical Inference Lecture 1	🕒 1h 25m	📍 Seminarraum Flash 
		Plan for Lectures 1 and 2: - Quick review of probability, frequentist vs. Bayesian approaches - Parameter estimation, maximum likelihood, asymptotic properties of MLEs - Hypothesis tests – general formalism, p-values - Confidence intervals from inversion of test, from likelihood function - General analysis including nuisance parameters, asymptotics Speaker: Glen Cowan (RHUL)		
12:30 PM	→ 2:00 PM	Lunch Break	🕒 1h 30m	📍 Canteen (DESY)
2:00 PM	→ 3:30 PM	Combine Tool Tutorial I	🕒 1h 30m	📍 Seminarraum Flash 
		Plan for Tutorial parts I - IV: In this tutorial we will go through the main features of the Combine software package which provides a command-line interface to many different statistical techniques, available inside RooFit/RooStats, that are used widely inside CMS. In the first part of the tutorial we'll explain the format of the Combine configuration file (datacard), and then discuss how to set up a simple counting experiment, followed by the shape analysis setup using ROOT histograms as inputs. Then we'll look at how to build simultaneous fits using independent categories, add systematic uncertainties and extract the limits or uncertainty estimates for the parameters of interest. Second part of the tutorial describes how to construct parametric models with RooFit and extract the measurements using Combine. Speakers: Aliya Nigamova (University of Hamburg), Kyle Cormier (Uni Zurich), Nicholas Wardle		
		 Combine setup		
3:30 PM	→ 4:00 PM	Coffee Break	🕒 30m	📍 Seminarraum Flash
4:00 PM	→ 5:30 PM	Combine Tool Tutorial II	🕒 1h 30m	📍 Seminarraum Flash 
		Speakers: Aliya Nigamova (University of Hamburg), Kyle Cormier (Uni Zurich), Nicholas Wardle		