

# **This Exercise**

Jan Kieseler

# Instructions for lectures

---

- Content
- Question to you
- Exercise for later in the hands-on part

# Our schedule

---

- We have 7 x 1.5 hours - this is not a lot of time!
- I will give short lectures here and there
- Most of it will be hands-on work
- Depending on your knowledge we will start with pre-exercises
- At the end you should all have a calorimeter design and a reconstruction for it

# The groups

---

- We should build a few groups  
(depending on the number of participants)
- Let's build groups now: **what are your preferences?**
- Please give your group a name!

# Final presentation

---

- At the end of Maria Laach, the group/person creating the best calorimeter design and reconstruction will receive great honour
  - The status on Wednesday 11. Sept. counts
- However, don't keep your findings to yourself, share them with other groups in the short presentations during this week
  - Doing the exact same as another group won't get you better performance
- The final presentations will be done on the 11th of Sept.
  - Which design and reconstruction did you chose?
  - How does that design map to what you have learned about calorimeters and NNs?

# Let's get started

---

- Exercises will be done in Jupyter notebooks
- They can be accessed via [giffels.me](https://giffels.me)
- You get a username + password from me
- There is no need for you to setup/install anything

# Server Options

- Jupyter Base Notebook**

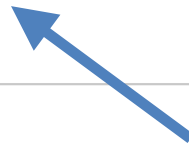
Default Profile

---


- Mini Calorimeter Simulation**

Mini Calorimeter Simulation

---



Start

 Notebook



Python 3  
(ipykernel)

 Console



Python 3  
(ipykernel)

 Other



Terminal



Text File



Markdown File



Python File



Show  
Contextual Help

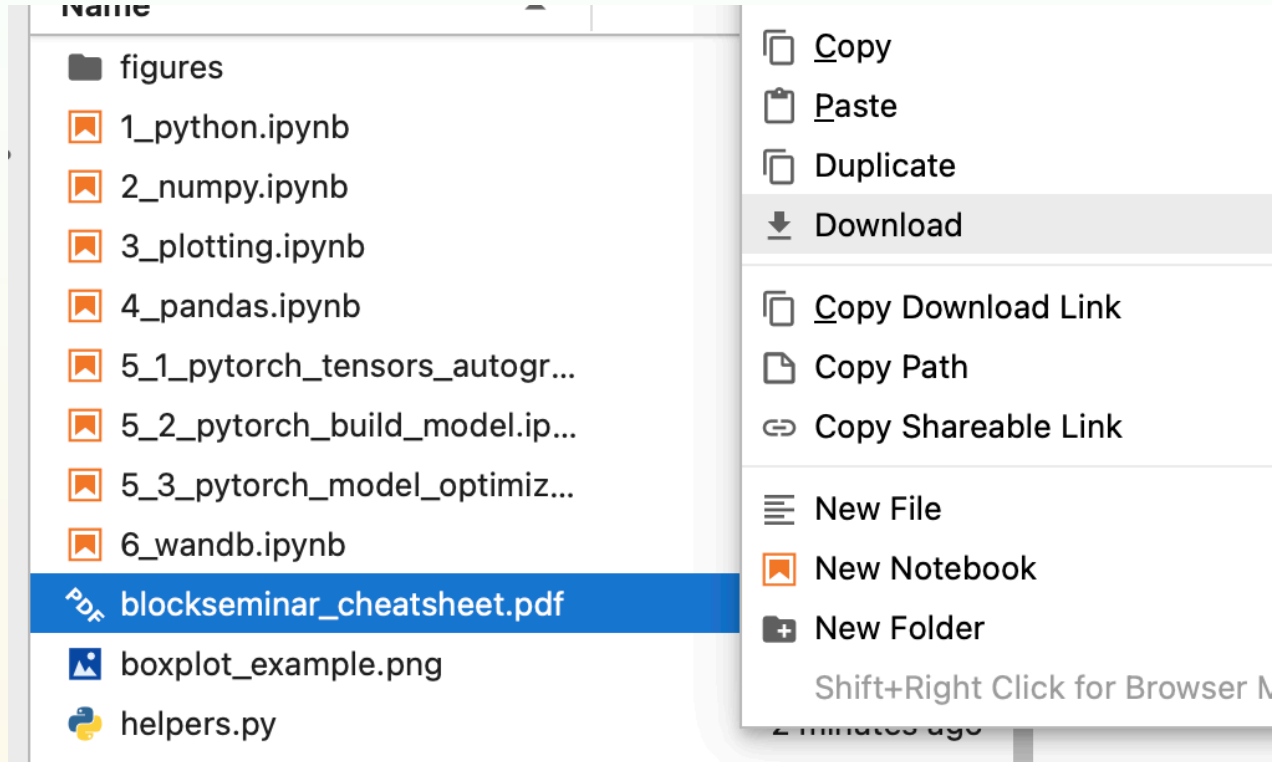




- Starting point is the repository:  
<https://gitlab.etp.kit.edu/Lehre/gnns4objectreco>
- Please “git clone” it and start with the pre-exercises (maybe we can skip that)
- For the main exercises, please switch to branch workshop-2024

📁 / gnns4objectreco / pre-exercises /

Name	Modified
📁 figures	1m ago
📄 1_python.ipynb	1m ago
📄 2_numpy.ipynb	1m ago
📄 3_plotting.ipynb	1m ago
📄 4_pandas.ipynb	1m ago
📄 5_1_pytorch_ten...	1m ago
📄 5_2_pytorch_bu...	1m ago
📄 5_3_pytorch_m...	1m ago
📄 6_wandb.ipynb	1m ago
📄 blockseminar_ch...	1m ago
📄 boxplot_exempl...	1m ago
📄 helpers.py	1m ago
📄 titanic.csv	1m ago



- Please download and go through the cheat sheet
- If you can answer all questions, you may be able to go very quickly through the pre-exercises and then help the others
- Take a few minutes and let me know

# It is up to you

If you feel confident with matplotlib or even want to use another library that you know very well, skip as you like

Only up to Summary Statistics

Skip automatic differentiation (just know it exists)

## Sign Up

You have to sign up first in order to use W&B. Go to the link you like and are free of charge. Additionally, you have to install wandb.

```
pip install wandb
```

We have already installed it for you here.

/ gnns4objectreco / pre-exercises /

Name	Modified
figures	1m ago
1_python.ipynb	1m ago
2_numpy.ipynb	1m ago
3_plotting.ipynb	1m ago
4_pandas.ipynb	1m ago
5_1_pytorch_ten...	1m ago
5_2_pytorch_bu...	1m ago
5_3_pytorch_m...	1m ago
6_wandb.ipynb	1m ago
blockseminar_ch...	1m ago
boxplot_exempl...	1m ago
helpers.py	1m ago
titanic.csv	1m ago

# Let's get started (2)

---

- With the pre-exercises you will have all skills you need!
- But I am / we are here to help and will provide you with some code snippets here and there along the lines
- Feel very encouraged to export functions you might use more often into modules outside of the notebook
- If you encounter problems:
  1. Try (hard) for a few minutes - not too long, don't get stuck
  2. Ask in your group
  3. Ask the internet / chatGPT is also fine (don't trust it blindly)
  4. Check the answer:  
if is very evolved and complicated it is probably not the right one, if in any doubt, **ask me/us**

# Geant4 simulation

- That's what we will be working with in addition to what's covered in the pre-exercises
- Created a convenient wrapper around full Geant4 simulation (the state-of-the-art used by the LHC experiments, and many others)
- Examples can be found in the branch 'workshop-2024' in the GNNs4ObjectReco gitlab repository: **calo\_example.ipynb**

```
from G4Calo import GeometryDescriptor, run_batch, display_event

gd = GeometryDescriptor() | Thickness [cm]

gd.addLayer(4, "G4_Pb", False) | Material
gd.addLayer(3, "G4_POLYSTYRENE", True, 7) | Is active
gd.addLayer(4, "G4_Pb", False) |
gd.addLayer(3, "G4_POLYSTYRENE", True, 7) | X-y granularity
gd.addLayer(4, "G4_Pb", False) |
gd.addLayer(3, "G4_POLYSTYRENE", True, 7) |
```

(NB: I would not build *that* calorimeter for EM showers, next lecture will tell you why)

- **This is just a preview, we will get back to it**