Developing Training

Hands-on!

Michel Hernandez Villanueva
Brookhaven National Laboratory

Deep Learning Train-the-Trainer Workshop
15–19 Sept 2025

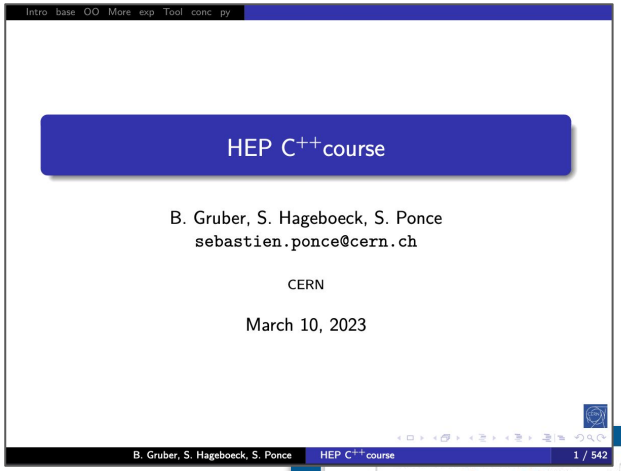
The HSF Hackathons

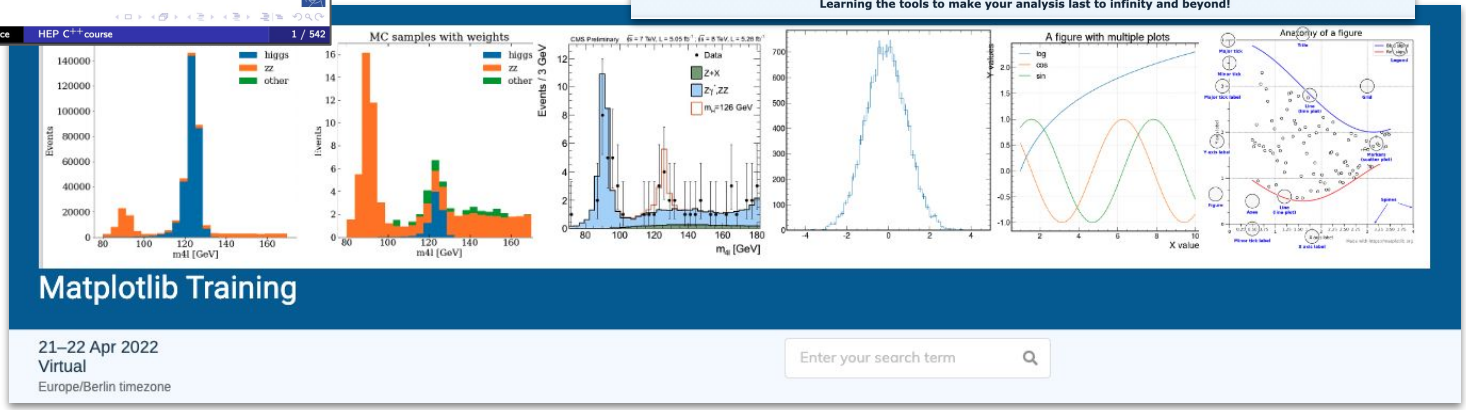
- An event where people come together for a short, fixed period to collaboratively develop new ideas, concepts, and prototypes

- The term hackathon combines
  - "Hack": solving problems or developing solutions
  - "Marathon": in the context of intense effort over a short timeframe

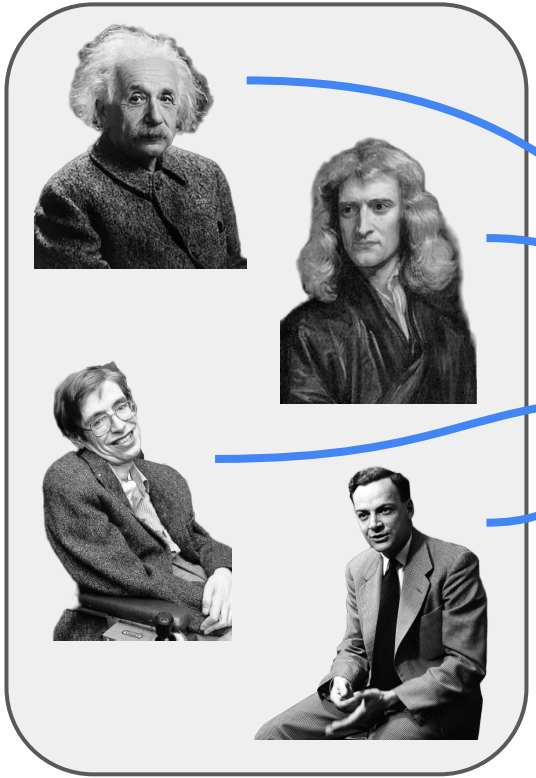
https://en.wikipedia.org/wiki/Hackathon

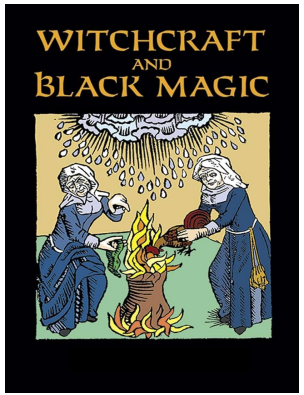
Some of the HSF “hacks”

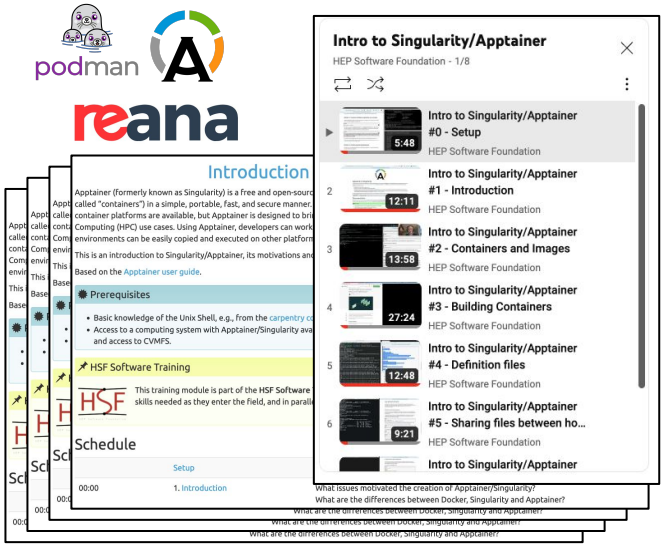




How the Hackathon works?

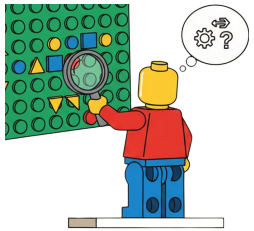




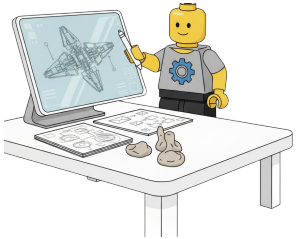


How the Hackathon works?

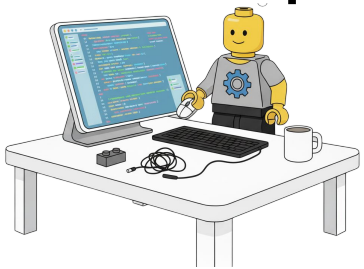
Analyze



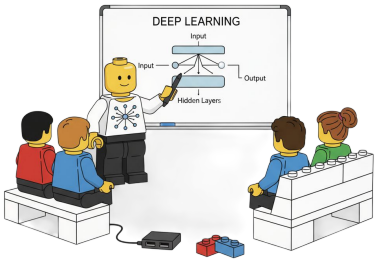
Design



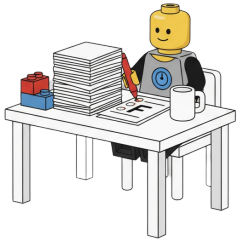
Develop



Implement

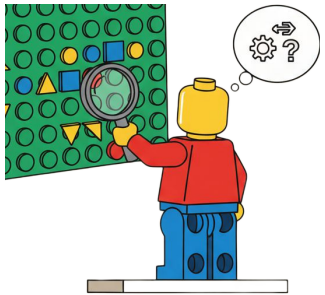


Evaluate

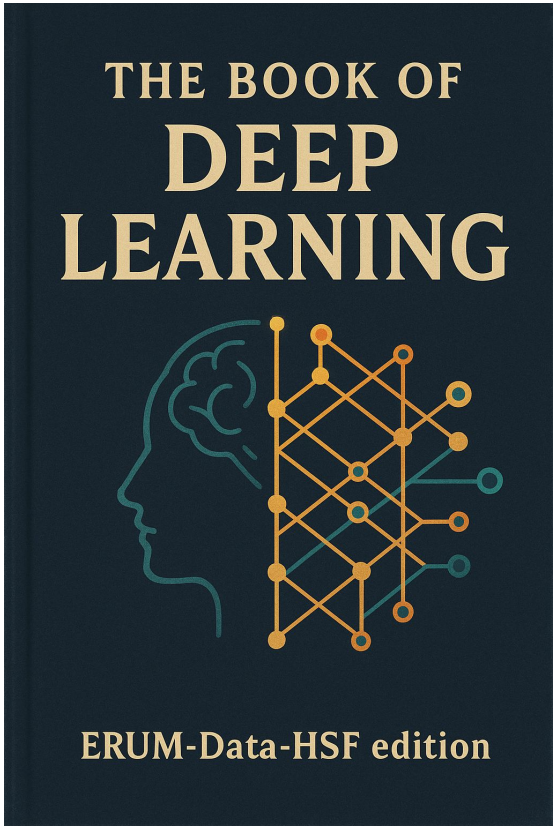


Analyze

- Usually we call for a Hackathon after we find the training need (topic)
  - Today you have a topic :)



The task for today



Analyze

Current knowledge

- Bash
- Scientific Python

Training!

Required

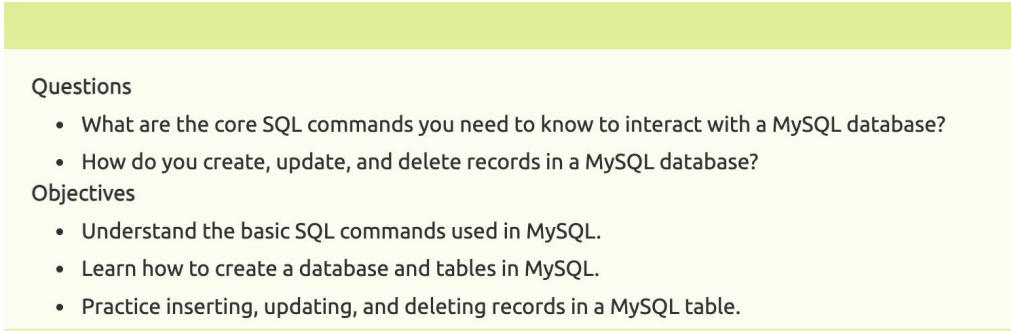
- Bash
- Scientific Python
- Training
- Inference
- …

A few ideas for today

- K-Fold for training and validation
- Optuna for optimization
- Activation functions
- Inference with ONNX
- Your favorite Python package
- …

Design

- Prerequisites
- Setup
- Questions and Objectives
- Chapters
  - Introduction
  - Main content
  - Summary / what's next
- Examples and exercises
  - Think about datasets (very important for Deep Learning)



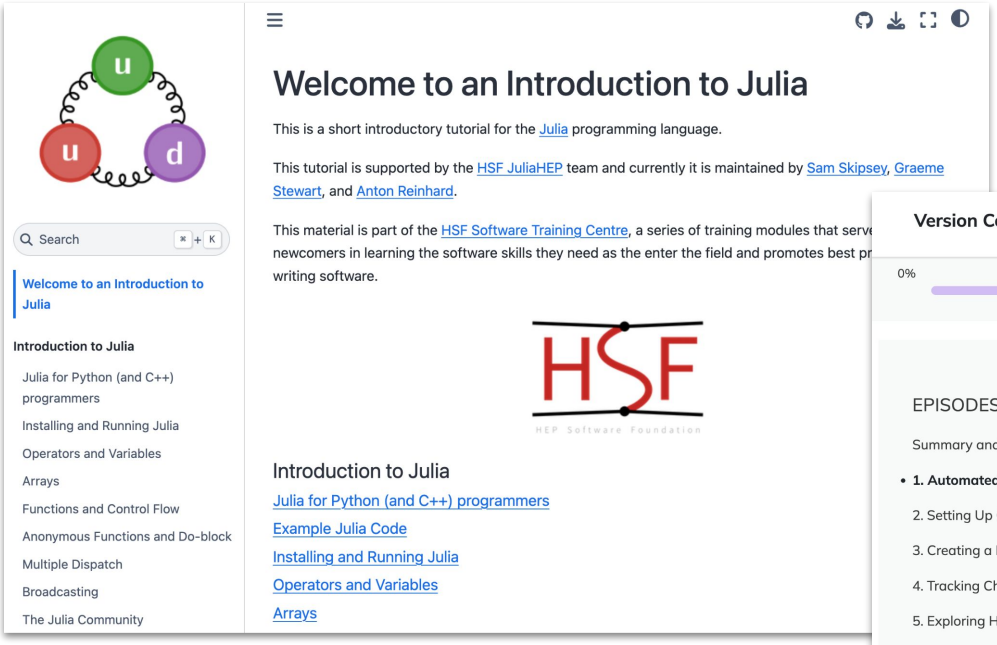
Questions

- What are the core SQL commands you need to know to interact with a MySQL database?
- How do you create, update, and delete records in a MySQL database?

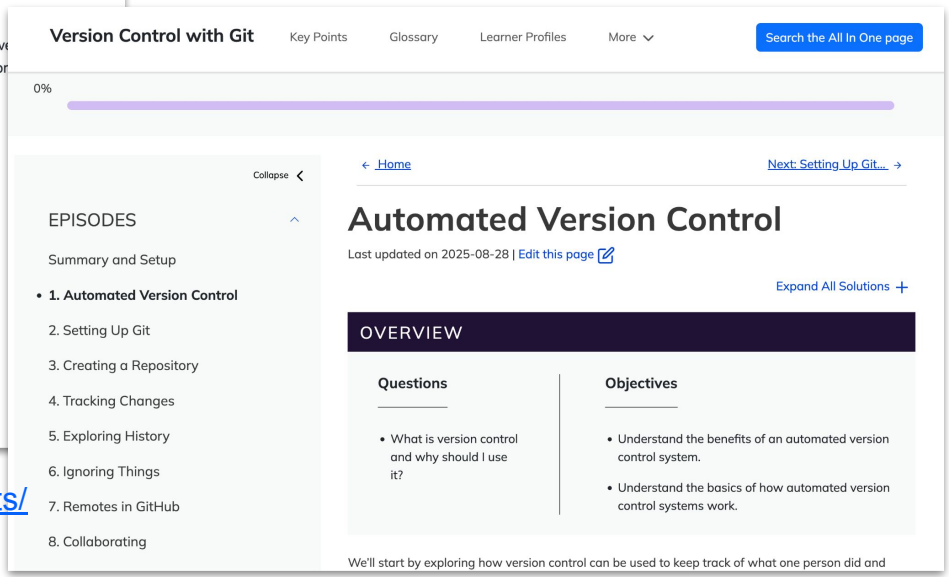
Objectives

- Understand the basic SQL commands used in MySQL.
- Learn how to create a database and tables in MySQL.
- Practice inserting, updating, and deleting records in a MySQL table.

Develop

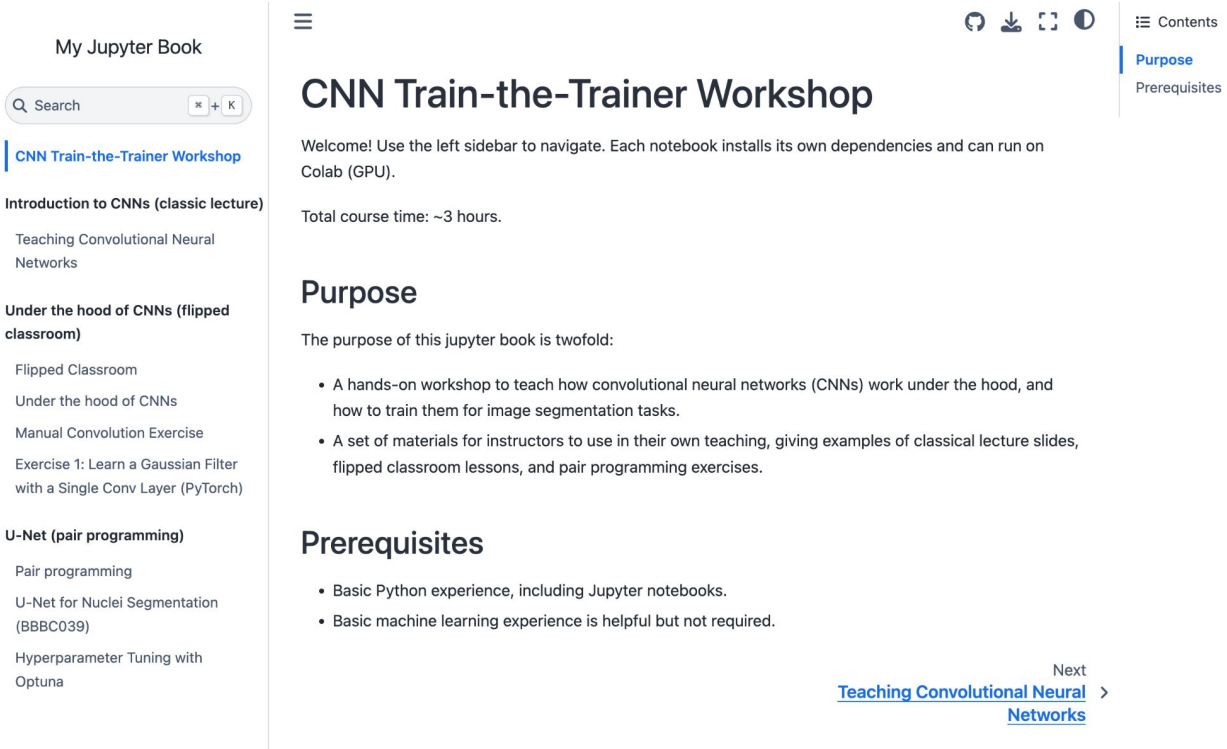


https://juliahep.github.io/Hands-on-Julia-for-particle-physicists/



https://swcarpentry.github.io/git-novice/01-basics.html

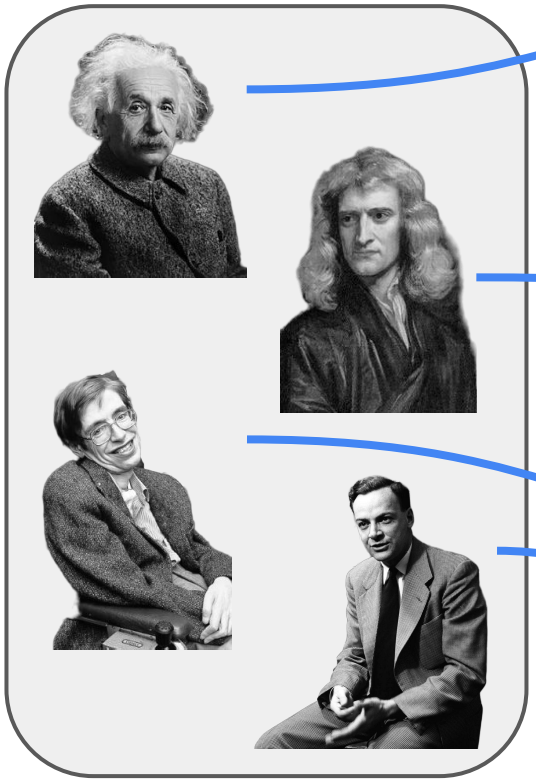
Develop



Claude

Gemini

Develop



Setup

1. Introduction

2. MySQL Basics

3. 03 Break

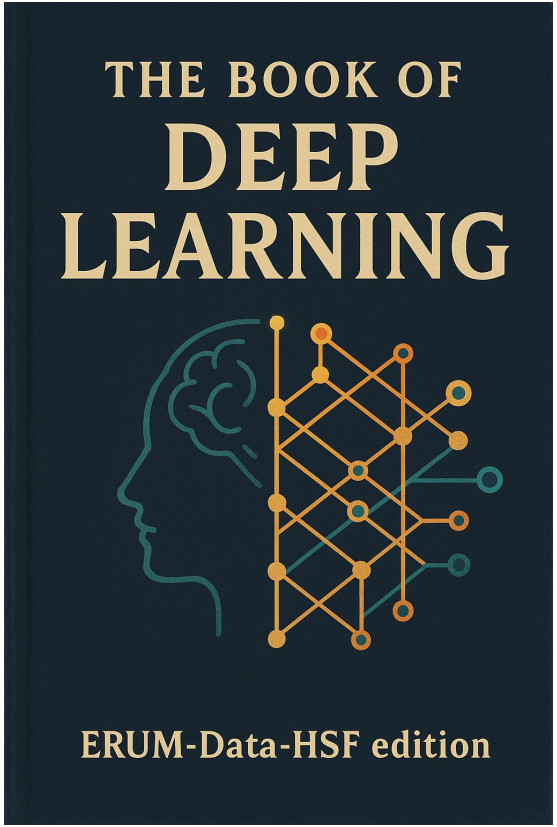
4. SQLAlchemy and MySQL: Exercises

5. Relations between Tables

Communication is key!

The teams

- Let’s assign the task in 4 teams
  - Overlaps in content are OK!
- “Divide and conquer”
  - Easier to collaborate in small groups
- Each team will have a different approach on how to teach deep learning
  - Reduces the impact of the “curse of knowledge”
  - Adds value to the training



The teams


EPOCH
WARRIORS


SOFTMAX
SUPREMACY


THE BACKROPOPAGATORS
F.C.


RELU REBELS
CLUB

The teams

- Epoch Warriors
- ReLU Rebels
- Softmax Supremacy
- The Backpropagators

https://github.com/orgs/erum-data-hsf/repositories

The coaching staff

The “not that kind of training” team


The ErUM Data encyclopedia



The deep learning wizards




Backup

Designing Material for Adult Learners

- M. Knowles suggested 4 principles that are applied to adult learning

Adults need to be involved in the planning and evaluation

Experience (including mistakes) is the base for learning

Problem-centered, rather than content-oriented

Subjects that have immediate impact in the work

https://elearningindustry.com/the-adult-learning-theory-andragogy-of-malcolm-knowles

Analyze Training needs

- Step 1: let's give some thought to ***why*** we want to develop a training program
- Training is a solution that can fix gaps in knowledge and skills

Current knowledge

- Basic shell commands
- Basic Python

Training!

Required

- Scripting in Bash
- Scientific Python
- Continuous Integration (CI)
- Docker Containerization

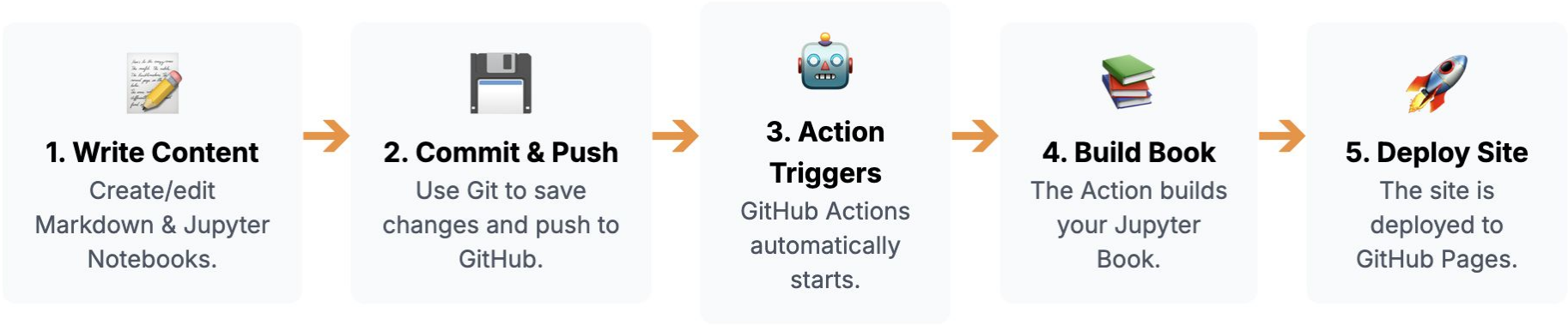
Training Goals

- Must be well defined and shared across all stakeholders: leaders, educators, students, funding agencies, etc.
- **When leaders and supervisors do not align with the training goals, it is difficult to put in practice the new knowledge and skills recently acquired**

- It is easier to determine if a goal has been met when the goal is written with SMART objectives
  - **S**pecific: clearly state what the learner will be able to do
  - **M**easurable: the outcome must be observable and quantifiable
  - **A**chievable: should be realistic given the learner's background and the time available
  - **R**esult-oriented: focus on the outcome
  - **T**ime-bound: specify a timeframe for achieving the objective ("by the end of this module")

The Automated Development Workflow

- We will automate the process of deploying training content, from local edits to a public website with minimal manual intervention
- Each push to the repository will trigger a build a deployment, ensuring the training is always up to date



https://michmx.github.io/2025-09-hsf-train-the-trainer/intro.html

The HSF-Training Design Philosophy

- **Hands-On**
  - Learning is achieved by doing
- **Experiment Agnostic**
  - Teach tools and techniques that are independent of a specific context
- **Student-Centric**
  - Acknowledging student voice as central to the learning experience
- **Reusable**
  - If resources already exist, use them
  - If they do not exist, develop them
- **Open and Accessible**