

Incubator Summer Academy - From Zero to Hero

Monday, September 12, 2022 - Friday, September 23, 2022

Book of Abstracts

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General / 2

Opening Session and Keynote Speech

Join us in the opening of the Incubator Summer Academy!

This event will be take place via Zoom.

→ [Register here](#) ←

Previous experience:

Maximum number of participants:

Target audience:

Learning target:

Workshops (Helmholtz Imaging) / 3

Intermediate: Sharing Scientific Software Solutions Across Tools and Domains with Helmholtz Imaging Solutions

Author: Helmholtz Imaging^{None}

Corresponding Author: deborah.schmidt@mdc-berlin.de

Brief content:

1. Simplifying reproducibility for users and authors of scientific tools
2. Introduction to Helmholtz Imaging Solutions and Album
3. Basics of using Helmholtz Imaging Solutions
4. Writing your own Helmholtz Imaging Solution
5. Publishing solutions in a catalog

→ [Register here](#) ←

Previous experience:

Phython basics

Maximum number of participants:

unlimited since online

Target audience:

Learning target:

- How to save time when dealing with scientific software; - How to achieve reproducible scientific routines with existing tools

Workshops (Helmholtz Imaging) / 4

Advanced: Machine Learning for Instance Segmentation and Tracking

Author: Helmholtz Imaging^{None}

Corresponding Author: dagmar.kainmueller@mdc-berlin.de

based on python, follow-up to the course by Paul Jäger on September 15, 2022.

The course will build on the introduction to convolutional neural networks in Imaging by Paul Jäger, and will cover essential rules for designing your own networks, in particular when dealing with large image data. You will get hands-on experience in setting up and training your own networks for image analysis tasks like images classification and image segmentation.

The number of participants is limited to 20.

→ **Register here** ←

Previous experience:

Python; the course is a follow up on the “Machine Learning-Based Biomedical Image Analysis” course by Paul Jäger, google account (we use GoogleColab)

Maximum number of participants:

20

Target audience:

no specific

Learning target:

Hands-on experience in setting up and training your own networks for image analysis tasks.

Workshops (Helmholtz Imaging) / 6

Intermediate: Machine Learning-Based Biomedical Image Analysis

Author: Helmholtz Imaging^{None}

Brief Content:

1. Introduction to Machine Learning-based Image Analysis
2. Applications and Examples on Biomedical Images
3. Introduction to nnU-Net
4. Hands-on Tutorial on how to train and apply nnU-Net (using google colab). The tutorial starts right after this course and will take 45min, number of participants is limited to 30.

→ **Register here** ←

Previous experience:

Enthusiasm for IT, General Programming Skills, google account (we use GoogleColab)

Maximum number of participants:

Target audience:

Data Science, Medical Informatics, Bioinformatics, Robotics

Learning target:

Basic principles of Machine Learning and how it is used for Image analysis with focus on the biomedical domain. How to install and apply the state-of-the-art method in biomedical image segmentation: nnU-Net.

General / 7

General: Helmholtz Imaging for you!

Author: Helmholtz Imaging^{None}

Corresponding Author: philipp.heuser@desy.de

From Helmholtz Imaging Modalities to the Helpdesk to Solutions to great images! A quick tour through the Helmholtz Imaging portfolio and how you can exploit our support and services to do your imaging experiments.

→ **Register here** ←

If you want to join spontaneously, here is the link:
<https://desy.zoom.us/j/66379738048> (Kenncode: HI4U)

Previous experience:

None

Maximum number of participants:

unlimited

Target audience:

all

Learning target:

Get to know Helmholtz Imaging

Data Challenge / 8

Data Challenge: Kick-off

Help a hematologist out!

Join us and find elegant domain transfer solutions for blood-cell classification.

Manual classification of blood cells is a tedious, but important task, for instance to diagnose diseases such as anemia or leukemia. Machine learning makes it easier, but algorithms that work on one set of images might not work on another. Join this challenge and find a solution that may contribute to making clinicians lives easier.

We'll kick off on September 14 with an introduction to the challenge and end with our award ceremony on September 23. You'll be working on your own time. On all days of the challenge there will be mentor support available in gather.town from 12-13 pm. Computing resources are available via HAICORE.

Sign up now!

Deadline for submissions: 22.09.2022

→ **Register here** ←

Previous experience:

Maximum number of participants:

Target audience:

Learning target:

Workshops (Helmholtz Imaging) / 9

Intermediate: Introduction to Napari

It is recommended to take a Python-Basics Course before. For example from the first week of this Summer Academy.

In this course we will introduce image processing with Python, Jupyter lab and Napari. Students will learn how to process images interactively in Napari and afterwards how to replicate the same results in Jupyter notebooks. Additionally, the students will get an idea how to export tables of measurements and plot results in Jupyter notebooks. The notebooks can then be conserved and allow reproducible image data science mid-/long-term. We will use Python libraries such as numpy, scipy, scikit-image, pandas and matplotlib. Furthermore, GPU-accelerated image processing using pyclesperanto for processing 3D data will be introduced as well.

Attendees who attend the course should go through the installation instructions provided on this website:

<https://www.napari-hub.org/plugins/devbio-napari#installation>

In case of issues with the installation, attendees can reach out any time – before the course - by opening a thread on <https://image.sc> and tagging @haesleinhuepf . Or **consider joining the session at 9:30 to solve installation issues.**

This course is an excellent follow up to the lecture series Imaging - from Organisms to Molecules running this summer term. **Participants of the lecture will be given preference in participation.**

→ **Register here** ←

Previous experience:

Python basics.

Maximum number of participants:

unlimited

Target audience:

Researcher from Biology, Chemistry, Physics, Engineering, Computer Science, Mathematics with an affinity to Imaging

Learning target:

how to process images interactively in Napari, how to replicate the same results in Jupyter notebooks, how to export tables of measurements and plot results in Jupyter notebooks. GPU-accelerated image processing using pyclesperanto for processing 3D data will be introduced as well

Workshops (HMC) / 10**Fundamental: Fundamentals of Scientific Metadata / day 1****Corresponding Authors:** a.strupp@fz-juelich.de, s.gerlich@fz-juelich.de

In this course we will look at the intricate relationship between (digital) research data, metadata and knowledge, discuss why metadata is critical in today's research, as well as explain some of the technologies and concepts related to structured machine-readable metadata.

Have you ever struggled to make sense of scientific data provided by a collaborator - or even understanding your own data 5 months after publication? Do you see difficulties in meeting the data description requirements of your funding agency? Do you want your data to have lasting value, but don't know how to ensure that?

Precise and structured description of research data is key for scientific exchange and progress - and also for the recognition of your effort in data collection. The solution: make your data findable, accessible, interoperable and reusable by describing them with metadata.

You will learn:

- about the differences between and the importance of data & metadata
- to annotate your research data with structured metadata
- to find and evaluate a suitable metadata framework and data repository
- to use basic Markdown / JSON / XML
- which tools are already available to level up your metadata annotation game
- why structured metadata is important and how it can increase your scientific visibility

organized by HMC Hub Information

→ **Register here** ←

Previous experience:

none

Maximum number of participants:

20

Target audience:

PhD students, Postdocs, early career researchers

Learning target:**Workshops (HMC) / 11****Fundamental: Fundamentals of Scientific Metadata / day 2****Corresponding Authors:** a.strupp@fz-juelich.de, s.gerlich@fz-juelich.de

In this course we will look at the intricate relationship between (digital) research data, metadata and knowledge, discuss why metadata is critical in today's research, as well as explain some of the technologies and concepts related to structured machine-readable metadata.

Have you ever struggled to make sense of scientific data provided by a collaborator - or even understanding your own data 5 months after publication? Do you see difficulties in meeting the data

description requirements of your funding agency? Do you want your data to have lasting value, but don't know how to ensure that?

Precise and structured description of research data is key for scientific exchange and progress - and also for the recognition of your effort in data collection. The solution: make your data findable, accessible, interoperable and reusable by describing them with metadata.

You will learn:

- about the differences between and the importance of data & metadata
- to annotate your research data with structured metadata
- to find and evaluate a suitable metadata framework and data repository
- to use basic Markdown / JSON / XML
- which tools are already available to level up your metadata annotation game
- why structured metadata is important and how it can increase your scientific visibility

organized by HMC Hub Information

This is day two of the course starting on September 14 at 9 am.

Previous experience:

none

Maximum number of participants:

20

Target audience:

PhD students, Postdocs, early career researchers

Learning target:

12

POSTPONED: Intermediate: Cooperation HMC + Helmholtz Imaging: Imaging Metadata

Corresponding Authors: luigia.cristiano@helmholtz-berlin.de, m.nolden@dkfz-heidelberg.de, philipp.heuser@desy.de, tschoening@geomar.de

Metadata for scientific images is crucial for the success of any imaging experiment. What are metadata, where do you find them, how do you exploit them? The use of metadata in imaging highly depends on the domain. In some research areas metadata is already a well established standard while others scribble them in their notebook.

Here we will give an introduction to metadata in imaging, using some use cases as examples, and show you some hands on examples how to deal with them in python.

Agenda:

- What is metadata?
- Imaging Modalities in the case studies
- Case Study - Photon and Neutron Science Imaging
- Case Study - Oceanic Imaging

- Case Study - Medical Imaging
- Hands-on: Jupyter notebook for image metadata

Basic Python knowledge will help you to follow the hands-on (but it is not mandatory).
If you want to learn more about metadata, we invite you to take a look at HMCs training material collection: <https://helmholtz-metadaten.de/en/hmc-office/training-material-collection>

→ **Register here** ←

Previous experience:

Nice to have, not mandatory: Capturing and organizing images, metadata

Maximum number of participants:

Target audience:

Working with imaging modalities

Learning target:

Record imaging metadata and select suitable metadata standards

Data Challenge / 14

Data Challenge: Closing & Award Ceremony

The top three teams will present their solutions to the *Incubator Summer Academy* data challenge “Help a hematologist out!”.

The closing & award ceremony will take place via Zoom.

[Register here](#)

Previous experience:

Maximum number of participants:

Target audience:

Learning target:

Workshops (HIFIS) / 15

Fundamental: Introduction to Python

Author: Fredo Erxleben¹

¹ *Helmholtz-Zentrum Dresden-Rossendorf*

Corresponding Author: f.erxleben@hzdr.de

Note: Due to huge demand we will offer this event also on 6., 9. and 12. September. Please choose the date that best suits you when registering.

In this workshop, participants will learn how to work with the Python programming language. We will introduce the basic building blocks needed to “make the computer do stuff” and lay a solid basis for future self-guided learning or more advanced courses.

No prior knowledge in programming is required. We do recommend Thonny (<https://thonny.org/>) as a good starter tool, but you are free to bring your own setup.

We will include a break of 30 minutes after around 90 minutes of workshop and a lunch break of 60 minutes.

→ **Register here** ←

Previous experience:

Maximum number of participants:

20

Target audience:

People who have never programmed before or want to switch to the Python language

Learning target:

Acquire a fundamental understanding how to write programs in Python and have a basis for future learning

Workshops (HIFIS) / 17

Fundamental: Introduction to Git

Authors: Benjamin Wolff¹; Tobias Schlauch²

¹ *Deutsches Zentrum für Luft- und Raumfahrt*

² *DLR*

Corresponding Authors: benjamin.wolff@dlr.de, tobias.schlauch@dlr.de

The workshop provides a solid introduction into the practical usage of the version control system Git in combination with the collaboration platform GitLab.

This workshop will cover the following topics:

- Introduction to version control
- Git setup
- Basic local Git workflow
- Branching and merging
- Resolving Conflicts

→ **Register here** ←

Previous experience:

Maximum number of participants:

Target audience:

Learning target:

Workshops (HIFIS) / 18

Intermediate: Data Science with Python (Pandas)

Author: Fredo Erxleben¹

¹ *Helmholtz-Zentrum Dresden-Rossendorf*

Corresponding Author: f.erxleben@hzdr.de

In this quick workshop we will get an overview over the data science framework *pandas*.

Participants should have some fundamental knowledge on how to work with Python and have a working Python-installation ready and the *pandas*-package installed.

The workshop contains a code-along introduction and introduces a set of exercises to build some practical experience.

Instructors will be available to help with the exercises and give feedback on your solutions.

The workshop includes a 30-minute break every 90 minutes and offers the opportunity to take a lunch break at your own discretion during the exercise part (after 12:30).

→ **Register here** ←

Previous experience:

Python Fundamentals

Maximum number of participants:

20

Target audience:

People familiar with Python who want to get to know the popular data science framework

Learning target:

Get an overview over the framework and gather first hands-on experience working with *pandas*

Workshops (HIFIS) / 19

Intermediate: Introduction to GitLab CI

Author: Tobias Huste¹

Co-authors: Christian Hueser²; Norman Ziegner³

¹ *Helmholtz-Zentrum Dresden-Rossendorf*

² *Helmholtz-Zentrum Dresden-Rossendorf (HZDR)*

³ *UFZ*

Corresponding Author: t.huste@hzdr.de

This workshop provides a practical introduction to Continuous Integration (CI) using GitLab CI. It will cover these aspects:

- Setting up a basic CI pipeline with linting and testing.
- Advanced concepts to optimize the CI implementation. With a focus on
 - Performance
 - Reducing Redundancies
 - Concise pipeline definition and cross-project reuse.
- Optional: Other useful examples what CI could be used for.

→ **Register here** ←

Previous experience:

Maximum number of participants:

Target audience:

Learning target:

Workshops (HIFIS) / 20

Fundamental: Introduction to GitLab

Authors: Benjamin Wolff¹; Tobias Schlauch²

¹ *Deutsches Zentrum für Luft- und Raumfahrt*

² *DLR*

Corresponding Authors: benjamin.wolff@dlr.de, tobias.schlauch@dlr.de

This workshop provides a practical introduction into GitLab.

In detail, we cover the following topics:

- Overview about GitLab
- Working with the Git repository
- Planning tasks using Issues
- Collaboration using Merge Requests
- Overview of advanced functionalities

→ **Register here** ←

Previous experience:

Maximum number of participants:

Target audience:

Learning target:

Workshops (HIFIS) / 21**Intermediate: Visualization with Python (matplotlib)****Author:** Fredo Erxleben¹¹ *Helmholtz-Zentrum Dresden-Rossendorf***Corresponding Author:** f.erxleben@hzdr.de

In this quick workshop we will get an overview over the data visualization framework *matplotlib*.

Participants should have some fundamental knowledge on how to work with Python + *pandas* and have a working Python-installation ready and the *pandas* and *matplotlib*-packages installed.

The workshop contains a code-along introduction and introduces a set of exercises to build some practical experience.

Instructors will be available to help with the exercises and give feedback on your solutions.

The workshop includes a 30-minute break every 90 minutes and offers the opportunity to take a lunch break at your own discretion during the exercise part (after 12:30).

→ **Register here** ←

Previous experience:

Python Fundamentals, Experience in Pandas

Maximum number of participants:

20

Target audience:

People interested in data visualization

Learning target:

Use the Python framework matplotlib to create visualizations from data sets

Workshops (HIFIS) / 22**Intermediate: Foundations of Research Software Publication****Authors:** Benjamin Wolff¹; Tobias Schlauch²¹ *Deutsches Zentrum für Luft- und Raumfahrt*² *DLR***Corresponding Authors:** benjamin.wolff@dlr.de, tobias.schlauch@dlr.de

We will provide you with actionable advice about how to prepare your research code before publishing it or submitting it alongside a research publication.

This workshop will cover the the following topics:

- Code repository structuring
- Minimum coding practices
- Documentation

- Open source licensing
- Minimum software release practices
- Software citation

We demonstrate the practical implementations of the presented topics using a data publication project as an example.

→ **Register here** ←

Previous experience:

Maximum number of participants:

Target audience:

Learning target:

General / 23

General: Helmholtz Career Corner

Corresponding Authors: viktor.schwarze@helmholtz.de, stephanie.schworm@helmholtz.de

Come and join us in the Helmholtz Career Corner in gather.town!

This is the place where you can gather information about career opportunities within the Helmholtz Community- be it the latest job openings or exchange opportunities. Get an overview of the activities of some Helmholtz Centers and platforms, and network with your peers and representatives from the Helmholtz Community.

Additionally, we are happy to announce the addition of two new partners to the Career Corner: Siemens and ELLIS will present their PhD and Postdoc programs.

You have already received the link to our gather.town space by email at the beginning of the Incubator Summer Academy. We are looking forward to seeing you there!

→ **Register here** ←

Previous experience:

Maximum number of participants:

Target audience:

Learning target:

Workshops (Helmholtz AI) / 24

Intermediate: Introduction to Statistical Learning / day 1

Topics covered involve basic concepts in statistical learning, as well as supervised learning techniques (high-dimensional regression and classification) and unsupervised learning (mixture models and dimension reduction).

→ [Register here](#) ←

Previous experience:

Python, Numpy, Sklearn

Maximum number of participants:

-

Target audience:

PhD students and any other academics with a master degree

Learning target:

Participants will understand the fundamentals behind statistical learning and standard ML techniques such as linear regression, lasso, adaboost and random forest etc.

Workshops (Helmholtz AI) / 25

Advanced: Introduction to Interpretable Machine Learning

Corresponding Authors: marie.piraud@helmholtz-muenchen.de, christina.bukas@helmholtz-muenchen.de, donatella.cea@helmholtz-muenchen.de, elisabeth.georgii@helmholtz-muenchen.de, erinc.merdivan@helmholtz-muenchen.de, subramanian@helmholtz-muenchen.de, helene.hoffmann@hzdr.de, isra.mekki@helmholtz-muenchen.de, mahyar.valizadeh@helmholtz-muenchen.de, s.starke@hzdr.de, rao.umer@helmholtz-muenchen.de, helena.pelin@helmholtz-muenchen.de, lisa.barros@helmholtz-muenchen.de

During this course participants will get an introduction to the topic of Explainable AI (XAI). The goal of the course is to help participants understand how XAI methods can help uncover biases in the data or provide interesting insights. After a general introduction to XAI, the course goes deeper into state-of-the-art model agnostic interpretation techniques as well as a practical session covering these techniques. Finally, we will focus on two model specific post-hoc interpretation methods, with hands-on training covering interpretation of random forests and neural networks with imaging data to learn about strengths and weaknesses of these standard methods used in the field.

→ [Register here](#) ←

Previous experience:

Attended course Introduction to Machine Learning and Introduction to Deep Learning (or relevant experience)

Maximum number of participants:

50

Target audience:

Any

Learning target:

Participants will gain an understanding and practical experience of classic interpretability methods for Machine Learning and Deep Learning

26

General: Keynote

Outcome of the Pilot Project AI-CORE: <https://www.ai-core.eoc.dlr.de/>

Previous experience:

Maximum number of participants:

Target audience:

Learning target:

General / 27

Helmholtz Entrepreneurs: From Idea to I did

Corresponding Author: mathieu.seyfrid@helmholtz-muenchen.de

What is entrepreneurial thinking and why does it matter?

Entrepreneurial thinking is a way of thinking and refers to the capacity to act upon opportunities and ideas, and to transform them into value for others. It is founded upon creativity, critical thinking and problem solving, taking initiative and perseverance and the ability to work collaboratively in order to plan and manage projects that are of cultural, social or financial value.

Why does it matter? Businesses and employers across all sectors presuppose the academic and technical excellence of graduates. However, they must increasingly differentiate and identify future employees based on core competencies and skills, such as creative problem-solving, teamwork, understanding of risk and overall resilience. In many countries, however, academic institutions are very slow to adjust, partly because traditional career advancement in academia is mostly dependent on research activity. In the same way as labour markets and workplaces are undergoing rapid change, higher education and research institutions need to adjust in order to stay relevant. This requires entrepreneurial thinking among students, researchers and staff alike.

This workshop is based on experiential and action-based learning and will give participants a short, hands-on introduction on what it means to think entrepreneurially and how it may be useful in career development.

→ **Register here** ←

Previous experience:

Optional: Entrepreneurship event beginning of June

Maximum number of participants:

-

Target audience:

any academic level

Learning target:

Basics of entrepreneurship, Understanding of the opportunities to create a start-up

Workshops (Helmholtz AI) / 28**Intermediate: Introduction to Deep Learning / day 1**

Corresponding Author: p.steinbach@hzdr.de

This is an hands-on introduction to the first steps in Deep Learning, intended for researchers who are familiar with (non-deep) Machine Learning.

The use of Deep Learning has seen a sharp increase of popularity and applicability over the last decade. While Deep Learning can be a useful tool for researchers from a wide range of domains, taking the first steps in the world of Deep Learning can be somewhat intimidating.

We start with explaining the basic concepts of neural networks, and then go through the different steps of a Deep Learning workflow. Learners will learn how to prepare data for deep learning, how to implement a basic Deep Learning model in Python with Keras, how to monitor and troubleshoot the training process and how to implement different layer types such as convolutional layers.

More information can be found here: <https://carpentries-incubator.github.io/deep-learning-intro/>

→ **Register here** ←

Previous experience:

numpy ndarrays, fundamentals of classification - ideally participants will have already taken the Introduction to Machine Learning course

Maximum number of participants:

20-25

Target audience:

Any Academic Level

Learning target:

This introduction aims to cover the basics of Deep Learning in a practical and hands-on manner, so that upon completion, you will be able to train your first neural network and understand what next steps to take to improve the model

Workshops (Helmholtz AI) / 29**Intermediate: Introduction to Machine Learning / day 1**

Corresponding Author: p.steinbach@hzdr.de

This course will introduce participants to the concepts of AI and Machine Learning, covering clustering and classifications fundamentals as well as practical experience with standard methods for both techniques. Lastly, participants will gain an insight on best practises for evaluating a machine learning model's performance (ROC curve, FPR etc.)

More information can be found here: <https://deeplearning540.github.io/>

→ **Register here** ←

Previous experience:

fundamentals of pandas

Maximum number of participants:

20-25

Target audience:

any academic level

Learning target:

Learn fundamentals of Machine Learning and gain hands-on experience with training clustering and classification models

Workshops (Helmholtz AI) / 30

Fundamental: Reproducible Data Science / day 1

Topics:

- What is reproducible research?
- Reproducible research practices
- Project organisation for reproducible research
- Reproducible analyses

This course will span over two days. The second half will be on September 14 at 2 pm.

→ **Register here** ←

Previous experience:

Basic coding skills (e.g. R or Python)

Maximum number of participants:

25-30

Target audience:

PhD students at all levels and any other interested person

Learning target:

In this workshop you will learn about the most important reproducible research practices and start implementing them. This includes project organization and publication of research output (data, code, etc.). This is a practical workshop where you will improve your current research project.

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?? Introduction to Fiji

Previous experience:

Maximum number of participants:

Target audience:

Learning target:

32

?? Imaging Libraries

Previous experience:

Maximum number of participants:

Target audience:

Learning target:

General / 33

HIDA lecture: Data-Driven Inertial Sensing

The purpose of navigation is to determine the position, velocity, and orientation of manned and autonomous platforms, humans, and animals. Obtaining accurate navigation commonly requires fusion between several sensors, such as inertial sensors and global navigation satellite systems, in a model-based nonlinear estimation framework. Recently, data-driven approaches applied in various fields show state-of-the-art performance, compared to model-based methods. In this talk, we address data-driven based navigation algorithms, recently derived at the autonomous navigation and sensor fusion lab. The purpose of those algorithms is to enhance common navigation and estimation tasks and open new possibilities for accurate and robust navigation. Data driven inertial navigation topics included in this talk will highlight hybrid learning and end to end learning approaches for different platforms and applications such as: pedestrian dead reckoning with inertial sensors, quadrotor dead reckoning, learning vehicle trajectory uncertainty by hybrid models, and autonomous underwater vehicle navigation.

This lecture will take place in a hybrid format: We will stream the talk via Zoom from our HIDA offices in Berlin-Mitte.

→ [Register here](#) ←

Previous experience:

None

Maximum number of participants:

Target audience:

Open to everyone

Learning target:**Workshops (Helmholtz AI) / 36****Intermediate: Introduction to Deep Learning / day 2****Corresponding Author:** p.steinbach@hzdr.de

This is an hands-on introduction to the first steps in Deep Learning, intended for researchers who are familiar with (non-deep) Machine Learning.

The use of Deep Learning has seen a sharp increase of popularity and applicability over the last decade. While Deep Learning can be a useful tool for researchers from a wide range of domains, taking the first steps in the world of Deep Learning can be somewhat intimidating.

We start with explaining the basic concepts of neural networks, and then go through the different steps of a Deep Learning workflow. Learners will learn how to prepare data for deep learning, how to implement a basic Deep Learning model in Python with Keras, how to monitor and troubleshoot the training process and how to implement different layer types such as convolutional layers.

More information can be found here: <https://carpentries-incubator.github.io/deep-learning-intro/>

This is day two of the course starting on September 19 at 9 am.

Previous experience:

numpy ndarrays, fundamentals of classification - ideally participants will have already taken the Introduction to Machine Learning course

Maximum number of participants:

20-25

Target audience:

Any Academic Level

Learning target:

This introduction aims to cover the basics of Deep Learning in a practical and hands-on manner, so that upon completion, you will be able to train your first neural network and understand what next steps to take to improve the model

Workshops (Helmholtz AI) / 37**Intermediate: Introduction to Machine Learning / day 2****Corresponding Author:** p.steinbach@hzdr.de

This is day two of the course starting on September 15 at 2 pm.

This course will introduce participants to the concepts of AI and Machine Learning, covering clustering and classifications fundamentals as well as practical experience with standard methods for both techniques. Lastly, participants will gain an insight on best practises for evaluating a machine learning model's performance (ROC curve, FPR etc.)

More information can be found here: <https://deeplearning540.github.io/>

Previous experience:

fundamentals of pandas

Maximum number of participants:

20-25

Target audience:

any academic level

Learning target:

Learn fundamentals of Machine Learning and gain hands-on experience with training clustering and classification models

Workshops (Helmholtz AI) / 38**Intermediate: Introduction to Statistical Learning Day 2**

Topics covered involve basic concepts in statistical learning, as well as supervised learning techniques (high-dimensional regression and classification) and unsupervised learning (mixture models and dimension reduction).

This is day two of the course starting on September 21 at 2 pm.

Previous experience:

Python, Numpy, Sklearn

Maximum number of participants:

-

Target audience:

PhD students and any other academics with a master degree

Learning target:

Participants will understand the fundamentals behind statistical learning and standard ML techniques such as linear regression, lasso, adaboost and random forest etc.

Workshops (Helmholtz AI) / 39**Fundamental: Reproducible Data Science / day 2**

Topics:

- What is reproducible research?
- Reproducible research practices
- Project organisation for reproducible research
- Reproducible analyses

This is day two of the course starting on September 13 at 1 pm.

Previous experience:

Basic coding skills (e.g. R or Python)

Maximum number of participants:

25-30

Target audience:

PhD students at all levels and any other interested person

Learning target:

In this workshop you will learn about the most important reproducible research practices and start implementing them. This includes project organization and publication of research output (data, code, etc.). This is a practical workshop where you will improve your current research project.

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DC: Hearts-Gym Kick-off

Corresponding Authors: ja.ebert@fz-juelich.de, s.kesselheim@fz-juelich.de

Teach an agent to play the Hearts card game, get into touch with multi-agent reinforcement learning.

Previous experience:

Python, Git

Maximum number of participants:

40

Target audience:

PhD students at all levels and any other interested person

Learning target:

Deep reinforcement learning basics, collaborative software development, work with a foreign code base.

Workshops (Helmholtz Imaging) / 41

Intermediate: Tutorial for "Machine Learning-Based Biomedical Image Analysis"

Author: Helmholtz Imaging^{None}

Brief Content:

This tutorial is designed as a follow-up to the intermediate course "Machine Learning-Based Biomedical Image Analysis" on September 15, 2022 at 10:00 by Paul Jäger et al.

It comprises a hands-on Tutorial on how to train and apply nnU-Net (using google colab). **The number of participants is limited to 30.**

Participation in the course “Machine Learning-Based Biomedical Image Analysis” is mandatory.

Previous experience:

Participation in “Intermediate: Machine Learning-Based Biomedical Image Analysis”, Enthusiasm for IT, General Programming Skills, google account (we use GoogleColab)

Maximum number of participants:

30

Target audience:

Data Science, Medical Informatics, Bioinformatics, Robotics

Learning target:

Basic principles of Machine Learning and how it is used for Image analysis with focus on the biomedical domain. How to install and apply the state-of-the-art method in biomedical image segmentation: nnU-Net.

Workshops (Helmholtz Imaging) / 42

Optional: Solve installation issues (related to the Napari Workshop)

Author: Helmholtz Imaging^{None}

This 30min slot is optional for those who had problems installing the program.

<https://www.napari-hub.org/plugins/devbio-napari#installation>

Please do install the programm before!

In case of issues with the installation, attendees can reach out any time – before the course - by opening a thread on <https://image.sc> and tagging @haesleinhuepf .

Use this session to solve still remaining issues with Robert (@haesleinhuepf).

Previous experience:

Python basics.

Maximum number of participants:

unlimited

Target audience:

Researcher from Biology, Chemistry, Physics, Engineering, Computer Science, Mathematics with an affinity to Imaging

Learning target:

how to process images interactively in Napari, how to replicate the same results in Jupyter notebooks, how to export tables of measurements and plot results in Jupyter notebooks. GPU-accelerated image processing using pyclesperanto for processing 3D data will be introduced as well

43

Intermediate: WS: Foundations of Research Software Publication

We will provide you with actionable advice about how to prepare your research code before publishing it or submitting it alongside a research publication.

This workshop will cover the the following topics:

- Code repository structuring
- Minimum coding practices
- Documentation
- Open source licensing
- Minimum software release practices
- Software citation

We demonstrate the practical implementations of the presented topics using a data publication project as an example.

Workshops (HIFIS) / 44

Intermediate: WS: Foundations of Research Software Publication

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This workshop will cover the the following topics:

- Code repository structuring
- Minimum coding practices
- Documentation
- Open source licensing
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We demonstrate the practical implementations of the presented topics using a data publication project as an example.

General / 45

HIDA lecture: What is Health? Taking a Non Dualist Multi-Scale Approach to Studying Adaptive Immune Interactions

The reductive approach which sees health as the rejection of the other - be it cancer or pathogens is false. As we learn more about the individual characteristics of cells in the body and the variable forms of immune responses it becomes ever clearer that we need a new paradigm of study one that

considers open systems of interactions across scales of biology rather than defining sharp borders of good and bad health outcomes. The immune system is comprised of multivariate B cells and T cells. To develop these repertoires they must first be tested for some level of activity. They are then activated during an immune response. Most commonly this secondary activation is seen to be by pathogens. However, it is becoming every clearer that these are not the only events that interest or influence are immune repertoires and their role in promoting health. The immune system also helps to cultivate and moderate the commensal bacteria in our gut and is a key factor in the modulation of cancer and autoimmunity. Setting goals and borders for the immune system is thus not an effective way to understand what it is doing. Instead we should study as far as we can the processes of immune interaction and change. In this lecture I will present our attempts to characterize how the genome of B cell receptors encodes the potential for change in the adaptive immune system and how this is translated into actual patterns of diversity, implemented in a specific immune responses. I hope these ideas and findings will lead to further questions and help spark new conversations and research projects.

This lecture will take place via Zoom.

→ [Register here](#) ←

Previous experience:

Maximum number of participants:

Target audience:

Learning target:

General / 46

HMC FAIR Friday: Metadata as a key? Open science, good scientific practice and research integrity

Openness is a pillar for good scientific practice and contributes to research integrity. How do metadata fit in here?

About HMC FAIR Friday

To stimulate and support interdisciplinary exchange on FAIR and (meta)data, the Helmholtz Metadata Collaboration (HMC) - in close cooperation with the Helmholtz Information & Data Science Academy (HIDA) - is organising the lecture series.

Roland Bertelmann will kick off our fall/winter edition 2022.

→ [Register here](#) ←

Previous experience:

Maximum number of participants:

Target audience:

Learning target: