

Welcome to the
1st Artificial Intelligence Data Analysis (AIDA)
School for Heliophysicists





Artificial Intelligence and Data Analysis (AIDA) in Heliophysics:

- EC Horizon 2020 Project
- 8 partners
- 6 countries
- Experts in:
 - Heliophysics
 - HPC simulations
 - Space physics
 - Machine Learning
 - Data analysis



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- Experts in:
 - Heliophysics
 - HPC simulations
 - Space physics
 - Machine Learning
 - Data analysis
- Outreach and dissemination:
 - Increase awareness and improve the expertise in Machine Learning the European heliophysics community
 - Schools, tutorials, workshops





Artificial Intelligence and Data Analysis (AIDA) in Heliophysics:

Developing the AIDApY python package that centralizes and simplifies access to:

- Spacecraft data
- Space physics simulations
- Advanced statistical tools
- Machine Learning and Deep Learning algorithms and applications

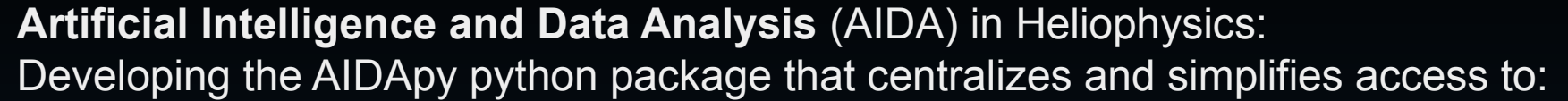
Data Assimilation

Statistics

Simulations

Observations

ML/DL



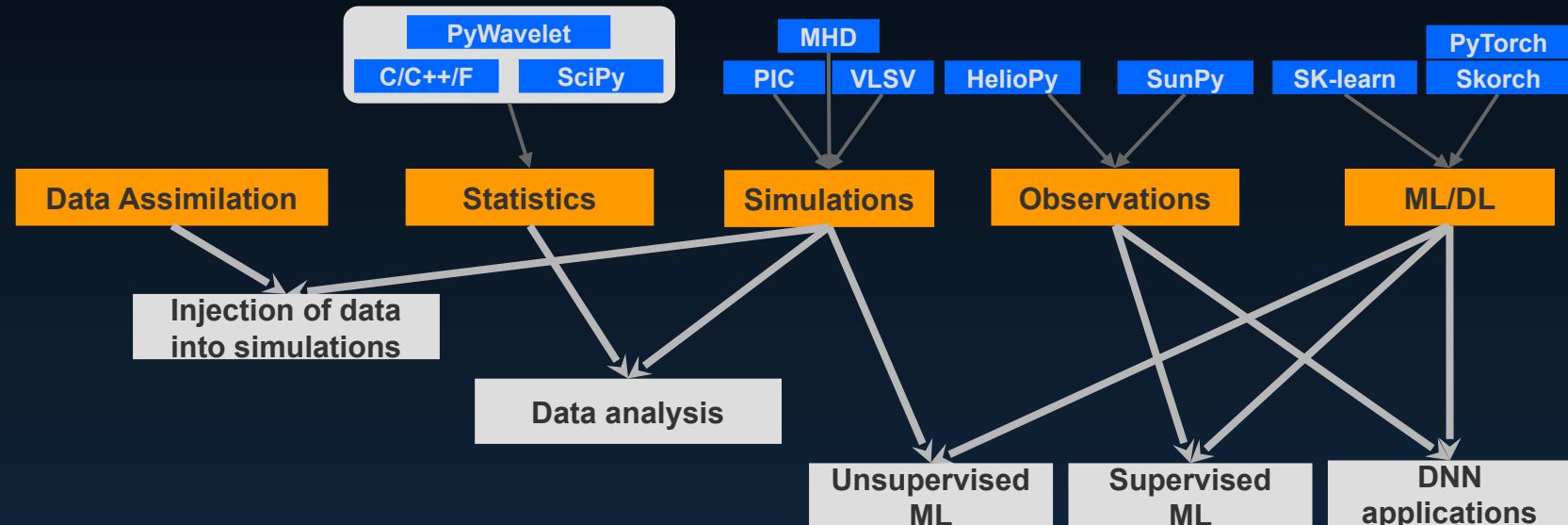
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- The diagram illustrates the integration of various data sources into machine learning applications. At the top, five orange boxes represent the data sources: **Data Assimilation**, **Statistics**, **Simulations**, **Observations**, and **ML/DL**. Below these, three white boxes represent intermediate processing steps: **Injection of data into simulations**, **Data analysis**, and **Unsupervised ML**. At the bottom, three white boxes represent the final machine learning applications: **Unsupervised ML**, **Supervised ML**, and **DNN applications**. Arrows indicate the flow of data: **Data Assimilation** leads to **Injection of data into simulations**. **Statistics**, **Simulations**, and **Injection of data into simulations** all lead to **Data analysis**. **Simulations**, **Observations**, and **ML/DL** all lead to **Unsupervised ML**. **Observations** and **ML/DL** both lead to **Supervised ML**. **ML/DL** leads to **DNN applications**.



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AIDA School lectures by



Prof. Dr.-Ing. Morris Riedel
Jülich Supercomputer Center
University of Iceland



UNIVERSITY OF ICELAND



Prof. Dr. Geert Jan Bex
Flemish Supercomputer Centre
KU Leuven
Hasselt University



KU LEUVEN



Dr. Peter Wintoft
Swedish Institute of Space Physics



INSTITUTET FÖR RYMDFYSIK
Swedish Institute of Space Physics

AIDA support team



Prof. Dr.-Ing. Giovanni Lapenta
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Principal Investigator

KU LEUVEN



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KU LEUVEN

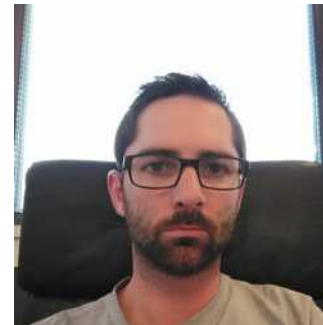


Dr.-Ing. Francesca Delli Ponti
CINECA
Outreach and dissemination



Dr. Romain Dupuis
KU Leuven
Machine Learning expert

KU LEUVEN



Dr. Hugo Breuillard
Laboratory of Plasma Physics
Ecole Polytechnique / CNRS
Data analysis expert



Objectives of the school

Learn the basics of
Machine Learning



Learn how to acquire
and process
heliophysics data



Learn about the latest
trends in Machine
Learning

Program and announcements

Time	Day 1	Day 2	Day 3
9 - 10	Welcome and intro to the school (Giovanni Lapenta, Jorge Amaya)	Space missions data acquisition (Hugo Breuillard)	Review of ML applied to heliophysics (Peter Wintoft)
10 - 11	Introduction and differences between AI, ML, NN and Big Data (Morris Riedel)	Data manipulation in python with pandas, xarray, and additional python tools (Geert Jan Bex)	Review of ML applied to heliophysics (Peter Wintoft)
	Coffee break	Coffee break	Coffee break
11:30 - 12:30	Unsupervised learning (Morris Riedel)	Feature engineering and data reduction (Geert Jan Bex)	Reinforcement learning (Morris Riedel)
	Lunch	Lunch	Lunch
14 - 15	Unsupervised learning (Morris Riedel)	Data reduction and visualization (Geert Jan Bex)	Physics informed ML (Romain Dupuis)
15 - 16	Supervised learning (Morris Riedel)	CNN, DNN (Morris Riedel)	Explainable AI (Jorge Amaya)
	Coffee break	Coffee break	Coffee break
16:30 - 18:00	Supervised learning (Morris Riedel)	CNN, DNN (Morris Riedel)	Performance and tuning of ML (Morris Riedel)

	Morris Riedel
	Geert Jan Bex
	Peter Wintoft
	AIDA member

Announcements:

- Coffe break
- Lunch
- Social Diner
- Presentations
- Filming/Videos

Enjoy the 1st Artificial Intelligence Data Analysis (AIDA) School for Heliophysicists



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