

IT advanced methods for research

Description: The class is aimed on IT methods that might be useful in research. It will be a mix of methods from high performance computing, python, devops, mathematica and AI. The class is divided into three parts 1/ Supercomputer Calculations 2/ DevOps, Advanced Programing and IT Tools for Research 3/ Mathematica for Physicists. Below you can find a tentative agenda. Please be aware that it might be a subject to change. The class will have different lecturers for each part.

Class coordinator: Adam Zadrozny (adam.zadrozny@ncbj.gov.pl)

Number of hours: 30 h

1. Supercomputer Calculations - 4h (by CiŚ - Świerk Supercomputing Centre)

Crash course on using resources of Świerk Supercomputing Centre and basic concepts in supercomputing.

2. DevOps, Advanced Programing and IT Tools for Research (by Dr Adam Zadrozny)

This part describes IT concepts that might be helpful in research projects. It is a little bit mix&match, but they are the things that we use everyday or will be using in the near future.

- a. Advanced Python Features (decorators, functional programming, ...) - 4h
- b. Jupyter notebook - 1h
- c. Streaming services - Apache Kafka - 2h
- d. Docker & Kubernetes - 3h
- e. Open Stack (model for cloud computing) - 1h
- f. Apache Software Foundation Projects - 2h
- g. Data Science Tools and Modern AI architectures and applications - 3h

3. Mathematica for Physicists - 10 h (by Dr Alexandre Serantes)

In this series of lectures, we will take a hands-on approach to learn how Mathematica can help us in addressing several problems relevant to modern theoretical physics research. Topics covered will range from the use of packages to perform differential geometry computations to the numerical solution of partial differential equations.