NATIONAL RESEARCH
UNIVERSITY

LAMBDA • HSE

Machine Learning for Physicists

Hands-on session
Day 1

Moscow International School of Physics 2024

Vladimir Bocharnikov, Alexey Boldyrev,
Evgeniy Kurbatov, Fedor Ratnikov

LAMBDA • HSE

Our Team

Fedor Ratnikov

LHCb, SHiP,
NICA, c-tau

Previously:
ARGUS, SSC,
HERA-B, CDF, CMS

Vladimir Bocharnikov

BM@N

Previously:
COMET, ILD, CALICE

Alexey Boldyrev

LHCb

Previously:
ATLAS

Evgeniy Kurbatov

SHiP, LHCb

Previously:
CLAS12

Hands-on session

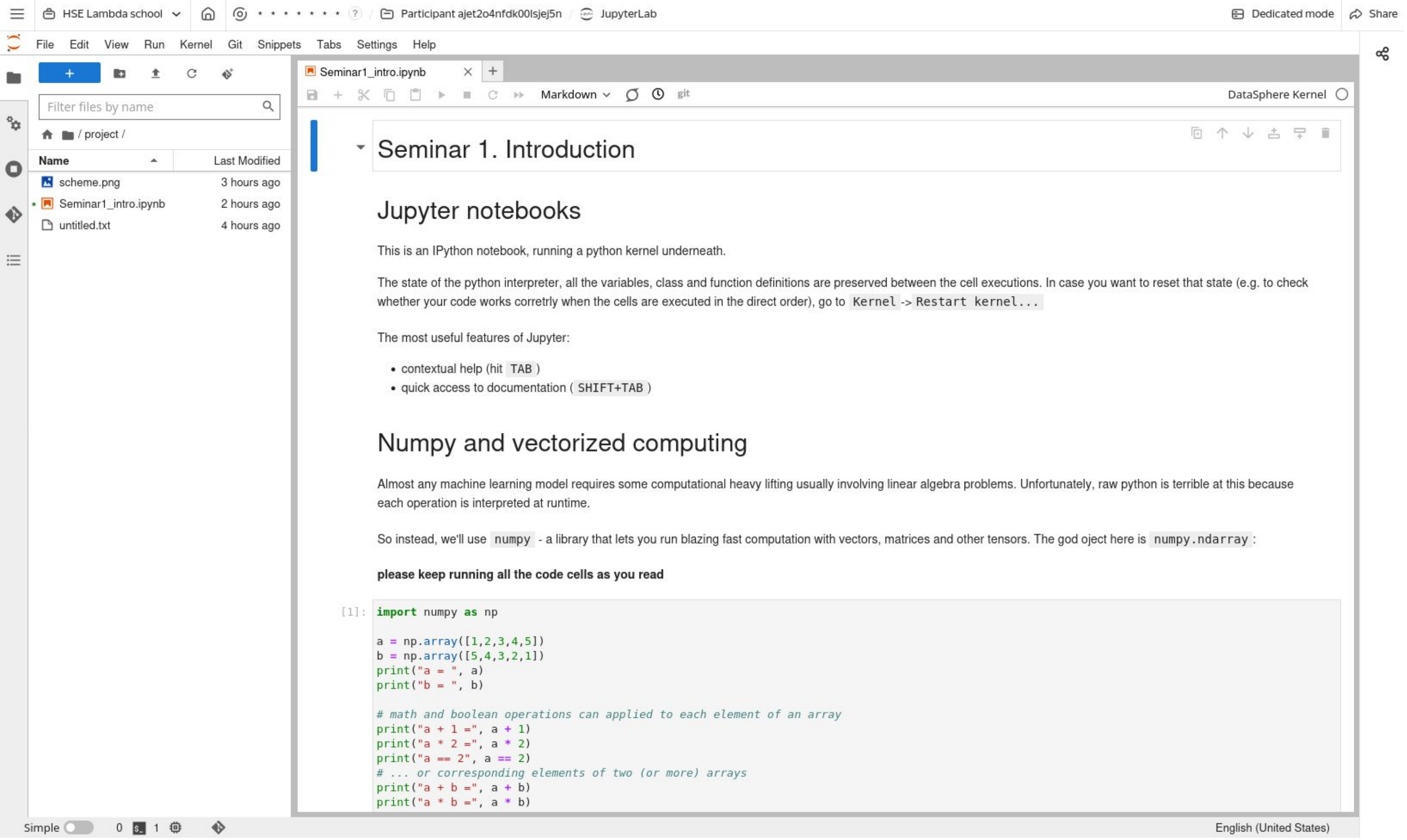
Day 1 - General Data Analysis

Practice of Data Analysys using Yandex DataSphere:
https://datasphere.yandex.ru

Connection instructions and announcements are in:

ML@MosPhys Telegram chat

Hands-on session: JupyterLab @DataSphere



Seminar 1. Introduction

Jupyter notebooks

This is an IPython notebook, running a python kernel underneath.

The state of the python interpreter, all the variables, class and function definitions are preserved between the cell executions. In case you want to reset that state (e.g. to check whether your code works corretrly when the cells are executed in the direct order), go to `Kernel` -> `Restart kernel...`

The most useful features of Jupyter:

- contextual help (hit `TAB`)
- quick access to documentation (`SHIFT+TAB`)

Numpy and vectorized computing

Almost any machine learning model requires some computational heavy lifting usually involving linear algebra problems. Unfortunately, raw python is terrible at this because each operation is interpreted at runtime.

So instead, we'll use `numpy` - a library that lets you run blazing fast computation with vectors, matrices and other tensors. The god oject here is `numpy.ndarray` :

please keep running all the code cells as you read

[1]:

```
import numpy as np

a = np.array([1,2,3,4,5])
b = np.array([5,4,3,2,1])
print("a = ", a)
print("b = ", b)

# math and boolean operations can applied to each element of an array
print("a + 1 =", a + 1)
print("a * 2 =", a * 2)
print("a == 2", a == 2)
# ... or corresponding elements of two (or more) arrays
print("a + b =", a + b)
print("a * b =", a * b)
```