Problem Solving Using Open-Source Languages; R and Python

- course program -

Date: from 1st to 26th October 2024

Timezone: CET

Modality: Blended

Location: Online and University of Novi Sad

Host: University of Novi Sad

October 1st, 2024

Lectures (*online*):

08:30 – 09:45 1st Session

- ✓ **Welcome & Introduction**
- ✓ **Overview of Python programming language**
- ✓ **Setting up the environment for Python programming language**

09:45 – 10:15 Coffee break

10:15 – 11:30 2nd Session

- ✓ **Basic calculation operations in Python**
- ✓ **Assigning values to variables and expressions in Python**
- ✓ **Different packages in Python**

11:30 – 12:30 Lunch break

12:30 – 13.45 3rd Session

- ✓ **Introduction to R programming language**
- ✓ **Setting up the R environment (R Studio)**
- ✓ **Basic math in R**

13:45 – 14:15 Coffee break

14:15 – 15:30 4th Session

- ✓ **Variables and Data Types in R**
- ✓ **Introduction to data structures in R**
- ✓ **Vectors in R**

October 2nd, 2024

Lectures (*online*):

08:30 – 09:45 1st Session

- ✓ **Matrices in R**
  - Introduction to matrices
  - Creating matrices
  - Performing basic operations on matrices

09:45 – 10:15 Coffee break

10:15 – 11:30 2nd Session

- ✓ **Data frames in R**
- ✓ **Reading data into R (CSV, EXCEL)**

11:30 – 12:30 Lunch break

12:30 – 13.45 3rd Session

- ✓ **User defined functions in Python**
- ✓ **Control structures in Python**
- ✓ **Arrays in Python**

13:45 – 14:15 Coffee break

14:15 – 15:30 4th Session

- ✓ **Matrices in Python**
- ✓ **Operations with matrices in Python**
- ✓ **Lists - elements of different types in Python**
- ✓ **Tuple in Python**

October 8th, 2024

Lectures (*online*):

08:30 – 09:45 1st Session

- ✓ **Data input and output using pandas in Python**
  - Installing pandas
  - Importing data from Excel to Python using pandas
  - Exporting data from Python to Excel using pandas

09:45 – 10:15 Coffee break

10:15 – 11:30 2nd Session

- ✓ **Data visualization using seaborn in Python**
  - Importing seaborn in Python
  - Creating plots using seaborn in Python

11:30 – 12:30 Lunch break

12:30 – 13.45 3rd Session

- ✓ **Introduction to data manipulation with *'dplyr'* in R**
  - Overview of data manipulation
  - Introduction to *'dplyr'*
  - Hands-On Practice

13:45 – 14:15 Coffee break

14:15 – 15:30 4th Session

- ✓ **Advanced *'dplyr'* Functions in R**
  - Grouping and summarizing data
  - Joins: Introduction to different types of joins
  - Applying *'dplyr'* functions to a real-world dataset

October 9th, 2024

Lectures (*online*):

08:30 – 09:45 1st Session

- ✓ **Introduction to Data Visualization with *'ggplot2'* in R**
  - Principles of data visualization
  - Basic plotting with *'ggplot2'*
  - Customization of plot aesthetics

09:45 – 10:15 Coffee break

10:15 – 11:30 2nd Session

- ✓ **Advanced data visualization techniques with *'ggplot2'* in R**
  - Faceting and multiple plots
- ✓ **Integration of *'dplyr'* and *'ggplot2'***

11:30 – 12:30 Lunch break

12:30 – 13.45 3rd Session

- ✓ **Data visualization using matplotlib in Python**
  - Importing matplotlib in Python
  - Creating graphs using pyplot of matplotlib in Python
  - Creating multiple plots in one graph in Python

13:45 – 14:15 Coffee break

14:15 – 15:30 4th Session

- ✓ **Data visualization using matplotlib in Python**
  - Creating bar chart in Python
  - Creating histogram in Python
  - Creating Pie Chart in Python

October 15th, 2024

Lectures (*online*):

08:30 – 09:45 1st Session

- ✓ **Introduction to machine learning**
- ✓ **Architecture of machine learning model**
- ✓ **Hidden layers in machine learning**

09:45 – 10:15 Coffee break

10:15 – 11:30 2nd Session

- ✓ **Neurons in machine learning**
- ✓ **Activation functions in machine learning**
- ✓ **Python libraries for machine learning**

11:30 – 12:30 Lunch break

12:30 – 13.45 3rd Session

- ✓ **Introduction to statistics**
- ✓ Descriptive statistics
  - Data visualization for descriptive analysis

13:45 – 14:15 Coffee break

14:15 – 15:30 4th Session

- ✓ **Probability distributions**
  - Discrete and continuous distributions
  - Explanation of common probability distributions

October 16th, 2024

Lectures (*online*):

08:30 – 09:45 1st Session

- ✓ **Inferential statistics: hypothesis testing**
  - Introduction to hypothesis testing
  - Confidence intervals

09:45 – 10:15 Coffee break

10:15 – 11:30 2nd Session

- ✓ **Regression analysis**
  - Simple linear regression

11:30 – 12:30 Lunch break

12:30 – 13.45 3rd Session

- ✓ **Supervised learning algorithms**
  - Linear regression
  - Logistic regression

13:45 – 14:15 Coffee break

14:15 – 15:30 4th Session

- ✓ **Supervised learning algorithms**
  - Decision trees
  - Random forest

October 25th, 2024

On-site (University of Novi Sad):

08:30 – 09:30 Opening ceremony

09:30-11:00 Revising knowledge in Python programming language

- Python functions
- Manipulation with arrays in Python
- Data manipulation in Python
- Data visualization in Python
- Machine learning and supervised learning algorithms

11:00 – 11:30 Coffee break

11:30-13:00 Revising knowledge in R programming language

- Data manipulation in R
- Data visualization in R
- Descriptive statistics
- Inferential statistics

13:00 – 14:00 Lunch break

14:00-15:30 Q&A

October 26th, 2024

On-site (University of Novi Sad):

08:30 – 10:30 Final Project in Python

- ✓ First part of Final project in Python includes:
  - Verifying acquired knowledge of Python functions
  - Verifying acquired knowledge in manipulation with arrays in Python
  - Verifying acquired knowledge in data manipulation in Python
  - Verifying acquired knowledge of data visualization in Python
  - Verifying acquired knowledge in machine learning and supervised learning algorithms

10:30 – 11:00 Coffee break

11:00 – 13.00 Final Project in R

- ✓ First part of Final project in R includes:
  - Verifying acquired knowledge in data manipulation in R
  - Verifying acquired knowledge in data visualization in R
  - Verifying acquired knowledge of descriptive statistics
  - Verifying acquired knowledge of inferential statistics

13:00 – 15:00 Social event

15:00 – 15:30 Closing ceremony