**MBA – Focusing on Entrepreneurship, Innovation & Technology Management**

# Syllabus

Introduction to Machine Learning in Python (MBA)

Mini Semester 1, 2024

Faculty of Data and Decision Sciences, Classroom 112

14:00 – 17:30

Teaching Staff:

Instructor:           Shahaf Arica; email: ssarica@campus.technion.ac.il

Office Hours:      By appointment

TA's:                   Ori Meiraz; e-mail: ori.meiraz@campus.technion.ac.il

Office Hours:      By appointment

Credits: 2 points

Study hours per week: 3.5 Lecture hours

**Course Goals and Description**

This course introduces students to advanced Machine Learning techniques in Python. Our focus will be on classification algorithms (SVM, Logistic Regression), regression algorithms (Linear Regression, Lasso, Ridge), and ensemble methods (Random Forest). Moreover, we will explore the software tools that constitute the Python data science ecosystem.

**Learning Outcomes**

By the end of the course, the student will know how to: (1) Write basic code in Python; (2) Use standard data science packages in Python, e.g., Pandas, Numpy and Scikit-learn; (3) Conduct

exploratory data analysis; (4) Employ predictive algorithms for regression and classification; (5) Understand and analyze the challenges in model evaluation.

**Course Content/Topics**

1. Introduction to Python programming
2. Exploratory Data Analysis (EDA)
3. Supervised learning
4. If time permits, one or more of the following subjects: Deep learning, Unsupervised learning, Natural Language Processing (LLMs), Computer Vision.

**Assignments and Grading Procedures**

Your grade will be composed of classwork grade (10%), proficiency exam (40%), and individual course project (50%).

- The exam will encompass questions on Python's syntax, implementation of simple algorithms (e.g., matrix multiplication), and foundations of Machine Learning techniques.
- In the Analytics project, you will apply algorithms learned in class to a dataset of your choice (preferably related to your domain of expertise). Your goal is to explore the data to gain insights and develop a predictive model for a problem or question that arises in the context of your data. More information will be given in the first week.

**Course Schedule (Topics, assignments, Exams)**

| Week 1 | 31.10 | Introduction to Python programming: overview, basic syntax, variable types, containers, objects, data structures | HW 1 |
|---|---|---|---|
| Week 2 | 7.11 | | HW 2 |
| Week 3 | 14.11 | Intro to supervised learning framework, Model complexity, Linear Models | |

| | | | |
|---|---|---|---|
| **Week 4** | 21.11 | Classification with Linear and Non-Linear Models, Model evaluation | Project proposal |
| **Week 5** | 28.11 | Random Forest, Cross Validation, Data Exploration & Visualization | |
| **Week 6** | 5.12 | Neural Networks (and intro to Deep Learning) | |
| **Week 7** | 12.12 | **TBD** | |
| **Week 8** | 22.12 **Sunday** | | Exam A |
| **Week 9** | 5.1 **Sunday** | | Exam B + Project submission |

**Course Requirements & Course Policies**

As the course is highly applicative, potential candidates must be proficient in at least one programming language (preferably a dynamic one). Advanced mathematical background (linear algebra, probability) is also assumed.

**Text book(s) and/or other materials**

- https://stackoverflow.com
- Python data science handbook: essential tools for working with data (Jake VanderPlas).
- Python for Data Analysis (Wes McKinney)