UNIVERSITY of NICOSIA

# Course Syllabus

| Course Code | Course Title | ECTS Credits |
|---|---|---|
| META-525DL | Data Science for the Metaverse | 10 |
| **Prerequisites** | **Department** | **Semester** |
| None | Digital Innovation | Fall/Spring |
| **Type of Course** | **Field** | **Language of Instruction** |
| Elective | Metaverse | English |
| **Level of Course** | **Lecturer** | **Year of Study** |
| 2nd Cycle | Dr. Stylianos Kampakis | 1st |
| **Mode of Delivery** | **Work Placement** | **Corequisites** |
| Distance Learning | N/A | N/A |

**Course Objectives:**

The main objectives of the course are to:

1. Explain the basic concepts of data science and how it can be applied in Metaverse.
2. Analyze the role of data science and artificial intelligence in the metaverse through case studies and practical applications.
3. Apply statistical methods to analyze trends, compare projects, and make forecasts.
4. Evaluate the applications of data science in the Metaverse, including machine learning, agent-based modeling, tokenomics, digital land valuation, DeFi protocols, and GameFi.

**Learning Outcomes:**

After completion of the course students are expected to be able to:

1. Understand the role of data science and statistical methods in the Metaverse:
2. Demonstrate how machine learning can be applied in Metaverse.
3. Illustrate how to use Python libraries for machine learning algorithms
4. Develop a data strategy for metaverse projects

**Course Content:**

1. **Data analysis and data science**
   - What is data science?
   - History of data science
   - Basic concepts in data analysis, types of data and types of data scientists
2. **Artificial intelligence and data science in the metaverse**
   - How is data science used in the metaverse?

- Data science and its applications in metaverse
- Case studies for AI and data science in the metaverse

3. **Statistical methods**
   - Exploratory data analysis
   - Summary metrics
   - Linear regression
   - Hypothesis testing for linear regression
   - Introduction to R for statistics
   - Introduction to Hypothesis testing
   - Other advanced statistical models
4. **Exploring the metaverse through statistics**
   - Studying metaverse project data from coinmarketcap, coingecko and NFTValuations.com
   - Forecasting and analysing trends using the R programming language
   - Comparing blockchain projects
   - Creating interesting visualisations and dashboards
5. **Machine learning and the metaverse**
   - What is machine learning?
   - Types of machine learning
   - Supervised learning
   - Unsupervised learning
   - Active learning
   - Recommender systems
   - Reinforcement learning
6. **Data strategy and data products**
   - What is data strategy?
   - Examples of how to approach data strategy in a new venture
   - Data strategy for metaverse projects
   - Creating data products
   - Data science in decision making
   - Data science in entrepreneurship
   - Data products in the metaverse
7. **Agent-based modelling for complex systems**
   - What is agent-based modelling?
   - History of agent-based modelling
   - Modelling simple economies and agents
   - Agent-based modelling
8. **Applications of data science in tokenomics**
   - Statistical models for tokenomic valuations
   - Agent based modelling for simulating token economies
   - Forecasting project growth
   - Valuing NFTs
9. **Applications of data science in digital land**
   - Valuing digital land
   - Agent based modelling for games and economies
10. **Applications of data science in DeFi and GameFi**
    - Designing DeFi protocols

- GameFi and Play2Earn

**11. Frameworks for using data science in the metaverse**

- Frameworks for data science applications
- Frameworks for data products
- Frameworks for tokenomics
- Frameworks for data strategy

**12. Summary: Recap and case studies**

- Putting it all together
- Case studies in metaverse games

**Learning Activities and Teaching Methods:**

- Faculty Lectures
- Guest-Lectures Seminars
- Directed and Background Reading
- Case Study Analysis
- Academic Paper Discussion
- Simulations
- Student-led Presentations
- In-Class Exercises

**Assessment Methods:**

- Interactive activities
- Assignment
- Final exams

**Assessment Methods in alignment with Intended Learning Outcomes:**

| | | Intended Learning Outcomes to be assessed | | | |
|---|---|---|---|---|---|
| **Assessment Method** | **Weighting** | LO1 | LO2 | LO3 | LO4 |
| Interactive activities | 30% | ✓ | ✓ | ✓ | |
| Assignment | 10% | ✓ | ✓ | ✓ | ✓ |
| Exams | 60% | ✓ | ✓ | ✓ | ✓ |

**Student Study Effort Expected:**

| Student Study Effort Expected | Hours |
|---|---|
| Lectures | 12h |
| Assignment | 30h |
| Interactive activities and forum participation | 65h |
| Reading and research | 140h |
| Exam | 3h |
| Total | 250h |

**Required Textbooks / Readings:**

| Title | Author(s) | Publisher | Year | ISBN |
|---|---|---|---|---|
| The Decision Maker's Handbook to Data Science: A Guide for Non-Technical Executives, Managers, and Founders. | Stylianos Kampakis, | APress | 2019 | 978-1484254936 |

**Recommended Textbooks / Readings:**


- David L. Olson & Majid Nabavi , Introduction to business analytics, Business Expert Press, 2020
- Kieth A. Carlson & Jennifer R. Winquist, An Introduction to Statistics: An Active Learning Approach, SAGE Publicatins, 2021
- Sara Guido & Andreas C. Mueller, Introduction to Machine Learning with Python: A Guide for Data Scientists, O'Reilly Media, 2016
- Steven F. Railsback, Agent-Based and Individual-Based Modeling: A Practical Introduction, Princeton University Press, 2019
- Wattenhofer, Roger. The science of the blockchain. CreateSpace Independent Publishing Platform, 2016.