



Course Syllabus

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

Assessment Method	Weighting	Intended Learning Outcomes to be assessed			
		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.	Stylios 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 Publications, 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.