



**ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ  
ΤΜΗΜΑ ΠΛΗΡΟΦΟΡΙΚΗΣ  
ΠΜΣ ΚΥΒΕΡΝΟΑΣΦΑΛΕΙΑ  
ΚΑΙ ΕΠΙΣΤΗΜΗ ΔΕΔΟΜΕΝΩΝ**

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**MSc CYBERSECURITY  
AND DATA SCIENCE**

**DEPT OF INFORMATICS  
UNIVERSITY OF PIRAEUS**

# Track: Business & Data Analytics

2<sup>nd</sup> semester

<https://cybersecdatasci.cs.unipi.gr>

# Courses



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CDS207: **Mathematical Models for Business Analytics**

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CDS208: **Deep Learning (with applications in Cybersecurity and Analytics) \***

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CDS209: **Geospatial Data Management & Analytics**

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CDS210: **Visual Analytics \***

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CDS213: **Graph and Network Analytics \* &**

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CDS214: **Time-Series Analytics and Forecasting \* &**

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\* 3-ECTS course (5 lectures)

& elective course

# CDS207: Mathematical Models for Business Analytics

## ➤ Syllabus:

- Nonlinear programming; Integer programming and combinatorial optimization
- Continuous and Discrete Distributions; Sampling and sampling distribution of the mean, Central Limit Theorem; Confidence Intervals, Hypothesis Testing
- Analysis of Variance (ANOVA); Regression analysis, Least Squares ( $L_2$ ), Least Absolute Deviation ( $L_1$ ); Distribution Fitting
- Principal component analysis (PCA), Factor analysis

➤ **Lab hours:** Matlab

➤ **Prerequisite(s):** CDS109 (Optimization Techniques)

**Instructor(s):** Dr. Gregory Koronakos



# CDS208: Deep Learning (with applications in Cybersecurity and Analytics)

## ➤ Syllabus:

- Deep Learning Architectures - MLPs, Convolutional, Recurrent, GANs (A.P)
- Applications in Data Analytics / Cybersecurity / Hardware / Multimedia domains

➤ **Lab hours:** Python, Matlab, SAS

➤ **Prerequisite(s):** (none)

**Instructor(s):** Prof. Aggelos Pikrakis, Prof. Dimitris Apostolou, Prof. Panos Kotzanikolaou, Prof. Michalis Psarakis





# CDS209: Geospatial Data Management and Analytics

## ➤ Syllabus:

- Geoinformation modeling and representation
- Spatial DBMS principles (logical vs. physical level)
- Geospatial & Mobility data analytics (from preprocessing and storage to knowledge discovery)

➤ **Lab hours:** PostGIS, Apache Sedona (formerly, GeoSpark), Python libraries (GeoPandas, MovingPandas)

➤ **Prerequisite(s):** CDS110 (Big Data Management)

**Instructor(s):** Prof. Yannis Theodoridis; Prof. Nikos Pelekis



GeoPandas



# CDS210: Visual Analytics

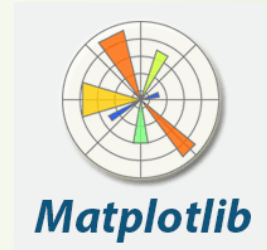
## ➤ Syllabus:

- Introduction to Visualization Analysis & Design. Data visualization design process and models – Visual problem solving.
- Visualizing tabular data, patterns over time, proportions, graphs and networks, spatial data. Visual Encodings
- Interactive visualization techniques. Visualization systems and techniques for Big Data.

➤ **Lab hours:** JavaScript (D3), Python libraries (Matplotlib, Plotly)

➤ **Prerequisite(s):** (none)

**Instructor(s):** Dr. George Papastefanatos



# CDS213: Graph and Network Analytics

## ➤ Syllabus:

- Introduction to Network Science
- Graph-Theoretic Centrality Measures; Descriptive Network Analysis
- Community Detection & Link Prediction in SNs; Network Formation Models; Opinion Formation in SNs
- Graph NNs
- **Lab hours:** Co-authorship Network Analysis; Twitter Streaming API; Sentiment Analysis on Twitter Data; Matlab & Python libraries
- **Prerequisite(s):** (none)

**Instructor(s):** Prof. Dionisis Sotiropoulos



# CDS214: Time-Series Analytics and Forecasting

## ➤ Syllabus:

- Introduction – basic concepts of time-series
  - Common time-series models (linear, autoregressive, ARMA, ARIMA, etc.)
  - Forecasting with NNs(e.g., LSTM models); Forecasting validation and quality measures
  - Selected advanced concepts and methods (e.g., Attention mechanisms and Transformers)
  - Data Science datasets and challenges (e.g., Kaggle)
- **Lab hours:** Python, Matlab
- **Prerequisite(s):** (none)

**Instructor(s):** Prof. Aggelos Pikrakis, Prof. Yannis Theodoridis







“Errors using inadequate data  
are much less than those  
using no data at all.”

Charles Babbage (Analytical Engine, 1837)

**Looking forward to a fruitful semester !!**