F21DL Data Mining and Machine Learning

COURSE DETAILS
Course Code: F21DL
Full Course Title: Data Mining and Machine Learning
SCQF Level: 11
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL
Undergraduate: Yes
Postgraduate Taught: Yes
Postgraduate Research: Yes

COURSE AIMS
In this course, students will develop:

• An understanding of the fundamental concepts and techniques used in data mining and machine learning.
• An understanding of the mathematics underpinning data mining and machine learning.
• A critical awareness of the appropriateness of different data mining and machine learning techniques and the relationships between them.
• Familiarity with common applications of data mining and machine learning techniques.

LEARNING OUTCOMES – SUBJECT MASTERY

• Extensive understanding of the data mining process and machine learning algorithms.

• Detailed understanding of the mathematics underpinning the data mining and machine learning methodologies.

• Critical awareness of the appropriateness and performance of the different techniques, as well as the relationships between them.

• Critical awareness of data quality and the appropriate use of data mining and machine learning for decision making.

• Ability to apply this knowledge for practical data mining and machine learning purposes

The students will develop their research abilities, and in particular:

• Ability to conduct quantitative and qualitative research on real-life, complex data sets
• Ability to ask own research questions about the hidden properties of data
• Ability to ask own research questions about suitability of certain machine learning methods and algorithms for
the given data

- Demonstrate originality and creativity in the application of knowledge

LEARNING OUTCOMES – PERSONAL ABILITIES

The students will be expected to:

- Show capacity for rational problem identification and definition.

- Show capacity for critical analysis and solution selection, deal with complex issues and make informed judgements.

- Use appropriate computer software to process data, and to support and enhance the research tasks.

The students will be expected to:

- Demonstrate the ability to learn independently and demonstrate leadership/initiative in tackling research problems.

- Manage time, work to deadlines, and prioritise workloads.

The students will be expected to:

- Use a wide range of resources to present results in a way that demonstrates a good understanding of the technical and broader issues of data mining and machine learning.

- Communicate with peers and more senior colleagues

SYLLABUS
**Basic Concepts:** datasets, dealing with missing data, classification, supervised vs unsupervised learning.

**Generative Models:** naïve Bayes, probabilistic graphical models, cluster analysis (such as k-means clustering, EM algorithm).

**Discriminative Learning:** linear regression, decision tree learning, perceptron, advanced models such as multi-layer perceptron and deep learning architectures.

### COURSE RELATIONSHIPS
N/A

### LOCATION AND ASSESSMENT METHODS

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