

## MODULE DESCRIPTOR

### Module Title

Advanced Algorithms and Datasets

Reference	CMM301	Version	2
Created	December 2020	SCQF Level	SCQF 11
Approved	April 2019	SCQF Points	15
Amended	March 2021	ECTS Points	7.5

### Aims of Module

To introduce the students to real-time analysis of streaming data, showing how data mining techniques can be adapted to address the challenges posed by the streaming nature of some applications.

### Learning Outcomes for Module

On completion of this module, students are expected to be able to:

- 1 Critically appraise the challenges posed by the volume, variety and velocity of modern data sources.
- 2 Justify the selection of data analysis approaches and data structures for application to a given problem through appraisal of established literature.
- 3 Construct and defend an experimental analysis of a dataset through the application of advanced data analysis algorithms.
- 4 Critically evaluate state-of-the-art data science algorithms and data structures and their application to complex problems in the computing industry or computing science research fields.

### Indicative Module Content

Supervised and unsupervised learning. Advanced data structures. Examples of problems requiring advanced algorithms and data structures. Specific topics to be drawn from: linear and logistic regression; classification and regression trees; Naive Bayes methods, kNN, SVM, PCA, Random Forest, advanced Neural Network techniques; deep learning; gradient-based optimisation; advanced algorithms for graphs and trees; fundamentals of data stream mining.

### Module Delivery

This is a lecture-based module with associated practical exercises that will involve a number of advanced data analysis algorithms and data structures.

**Indicative Student Workload**

	Full Time	Part Time
Contact Hours	40	N/A
Non-Contact Hours	110	N/A
Placement/Work-Based Learning Experience [Notional] Hours	N/A	N/A
TOTAL	150	N/A
Actual Placement hours for professional, statutory or regulatory body		

**ASSESSMENT PLAN**

If a major/minor model is used and box is ticked, % weightings below are indicative only.

**Component 1**

Type:	Examination	Weighting:	50%	Outcomes Assessed:	1, 2
Description:	A written exam.				

**Component 2**

Type:	Coursework	Weighting:	50%	Outcomes Assessed:	3, 4
Description:	A practical coursework to select, design and implement a network management solution.				

**MODULE PERFORMANCE DESCRIPTOR****Explanatory Text**

The calculation of the overall grade for this module is based on equal weighting of C1 and C2 components. An overall minimum grade D is required to pass the module.

		Examination:						NS
		A	B	C	D	E	F	
Coursework:	A	A	A	B	B	C	E	
	B	A	B	B	C	C	E	
	C	B	B	C	C	D	E	
	D	B	C	C	D	D	E	
	E	C	C	D	D	E	E	
	F	E	E	E	E	E	F	
NS		Non-submission of work by published deadline or non-attendance for examination						

**Module Requirements**

Prerequisites for Module	None.
Corequisites for module	None.
Precluded Modules	None.

**INDICATIVE BIBLIOGRAPHY**

- 1 Lantz, B (2019) Machine Learning with R: Expert techniques for predictive modeling, 3rd Edition. Packt Publishing
- 2 Sayed-Mouchawek, M. (2018) Learning from Data Streams in Evolving Environments: Methods and Applications. Springer-
- 3 Verlag. Raschka, S. (2019) Python Machine Learning. Packt
- 4 Leskovec, J., Rajaraman, A., and Ullman, D. (2020) Mining of Massive Datasets. Cambridge University Press.
- 5 Steele, Chandler, Reddy. (2016) Algorithms for Data Science. Springer.