MODULE TITLE	**Fundamentals of Machine Learning**	**CREDIT VALUE**	**15**
MODULE CODE	**COM1011**	**MODULE CONVENER**	**Dr Riccardo Di Clemente (Coordinator)**

DURATION: TERM	**1**	**2**	**3**
DURATION: WEEKS	**11**	**0**	**0**

Number of Students Taking Module (anticipated)	**30**

DESCRIPTION - summary of the module content

Differently from traditional software, artificially intelligent software can improve performance upon ingesting increasing quantities of data. This module will introduce you to the core concepts that are needed to understand the field of Artificial Intelligence and Machine Learning. You will learn about the principal paradigms from a theoretical point of view and gain practical experience through a series of workshops. In this module we will emphasize the notion and importance of data and you will learn how machines can deal with different types of data sources, ranging from images and text to networks and user preferences.
Co-requisite Modules: ECM1400, MTH1002, MTH1004, or equivalent.
This module is suitable for students with sufficient preparation in Mathematics and Programming.

AIMS - intentions of the module

This module aims to equip you with the fundamental notions to understand and identify the compromises and trade-offs that must be made when using a machine learning approach. It will provide the foundations to understand the principal flavours of machine learning techniques. Emphasis will be placed on how to work effectively with different information sources.

INTENDED LEARNING OUTCOMES (ILOs) (see assessment section below for how ILOs will be assessed)

On successful completion of this module, ***you should be able to:***
Module Specific Skills and Knowledge:
1 Understand and identify the compromises and trade-offs that must be made when using a machine learning approach;
2 Analyse problems from a data-centric point of view, choose among a range of supervised and unsupervised machine learning techniques and use relevant software libraries to solve them;
Discipline Specific Skills and Knowledge:
3 State the importance and difficulty of establishing machine learning solutions;
4 Use a modern programming language for scientific analysis and simulation;
Personal and Key Transferable/ Employment Skills and Knowledge:
5 Identify the compromises that must be made when translating theory into practice;
6 Critically read and report on research papers.

SYLLABUS PLAN - summary of the structure and academic content of the module

- Introductory Material: history of Artificial Intelligence and Machine Learning;
- Data: the nature of data, how to represent data sources: text, sound, images, networks;
- AI and ML applications to real world cases;
- Data Representation: feature selection, feature construction;
- Machine Learning Paradigms: supervised, unsupervised, reinforcement learning;
- Error Measures for Different Machine Learning Tasks: classification, regression, ranking, clustering;
- Algorithms: k-nearest neighbours, linear models, naïve Bayes, k-means, neural networks;
- Theoretical Notions in Machine Learning: model capacity and overfitting, curse of dimensionality.

LEARNING AND TEACHING

LEARNING ACTIVITIES AND TEACHING METHODS (given in hours of study time)

Scheduled Learning & Teaching Activities	50.00	**Guided Independent Study**	100.00	**Placement / Study Abroad**	0.00

DETAILS OF LEARNING ACTIVITIES AND TEACHING METHODS

Category	Hours of study time	Description
Scheduled Learning and Teaching Activities	24	Lectures
Scheduled Learning and Teaching Activities	26	Workshops/tutorials
Guided Independent Study	50	Individual assessed work
Guided Independent Study	50	Individual assessed work

ASSESSMENT

FORMATIVE ASSESSMENT - for feedback and development purposes; does not count towards module grade

Form of Assessment	Size of Assessment (e.g. duration/length)	ILOs Assessed	Feedback Method
Workshops will have formative assessment			

SUMMATIVE ASSESSMENT (% of credit)

Coursework	40	**Written Exams**	60	**Practical Exams**	0

DETAILS OF SUMMATIVE ASSESSMENT

Form of Assessment	% of Credit	Size of Assessment (e.g. duration/length)	ILOs Assessed	Feedback Method
Written Exam – Closed Book	60	1 hour – Winter Exam Period	All	Oral on request
Coursework 1	20	25 hours	All	Written
Coursework 2	20	25 hours	All	Written

DETAILS OF RE-ASSESSMENT (where required by referral or deferral)

Original Form of Assessment	Form of Re-assessment	ILOs Re-assessed	Time Scale for Re-assessment
All Above	Written exam (70%)	All	August Ref/Def Period
All Above	Coursework (30%)	All	Completed over summer with a deadline in August

RE-ASSESSMENT NOTES

Referred and deferred assessment will normally be by examination. For referrals, only the examination will count, a mark of 40% being awarded if the examination is passed. For deferrals, candidates will be awarded the higher of the deferred examination mark or the deferred examination mark combined with the original coursework mark.

RESOURCES

INDICATIVE LEARNING RESOURCES - The following list is offered as an indication of the type & level of information that you are expected to consult. Further guidance will be provided by the Module Convener

Basic Reading:
ELE: http://vle.exeter.ac.uk
Reading list for this module:

Type	Author	Title	Edition	Publisher	Year	ISBN	Search
Set	Bishop, C.	Pattern Recognition and Machine Learning	1	Springer	2006	978-0387310732	[Library]
Set	Duda, R.O. and Hart, P.E.	Pattern Classification	2nd	Wiley	2000	978-0471056690	[Library]
Set	Webb, A.	Statistical Pattern Recognition	2	Wiley	2002	0-470-84513-9	[Library]
Set	Murphy, K.	Machine Learning: A Probabilistic Perspective	1st	MIT Press	2012	978-0-262-018029	[Library]

CREDIT VALUE	15	**ECTS VALUE**	7.5
PRE-REQUISITE MODULES	None		
CO-REQUISITE MODULES	None		
NQF LEVEL (FHEQ)	6	**AVAILABLE AS DISTANCE LEARNING**	No
ORIGIN DATE	Friday 12 April 2019	**LAST REVISION DATE**	Thursday 16 July 2020
KEY WORDS SEARCH	Data; Machine Learning; Pattern Recognition; Probability		