H8MLF: Machine Learning Fundamentals

Module Code:		H8MLF	H8MLF					
Long Title		Machine Learning Fundamentals APPROVED						
Title		Machine Lo	Machine Learning Fundamentals					
Module Level:		LEVEL 8	LEVEL 8					
EQF Level:		6	6					
EHEA Level:		First Cycle	First Cycle					
Credits:		5	5					
Module Coordinator:								
Module Author:		Isabel O'C	abel O'Connor					
Departments:		School of 0	hool of Computing					
Specifications of the qualifications and experience required of staff		MSc and/o	and/or PhD degree in computer science or cognate discipline. May have industry experience also.					
Learning Outcomes								
On successful	completion of this modu	le the learne	er will be able to:					
#	Learning Outcome	ome Description						
LO1	Recognize the ethica	cal implications of machine learning						
LO2	Apply appropriate da	ropriate data sourcing and handling principles						
LO3	Build and evaluate a	Build and evaluate advanced machine learning models in various problem domains						
LO4	Extract, interpret and	nterpret and evaluate information and knowledge from non-trivial real-world data sets						
LO5	Comprehend, analyz	d, analyze and evaluate key concepts in machine learning						
Dependencies	.							
Module Recommendations								
No recommend	dations listed							
Co-requisite Modules								
No Co-requisite modules listed								
Entry requirements			See section 4.2 Entry procedures and criteria for the programme including procedures recognition of prior learning.					

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Module Content & Assessment

Indicative Content

Data Mining Methodologies and Ethics in Machine Learning

KDD, CRISP-DM, SEMMA. Ethics in data sourcing & handling. Regulatory & Privacy Components (including Data Protection Act). Ethical implications of machine learning

Data pre-processing and transformation (I)

Identifying and Handling Missing Values. Handling Outliers. Dimensionality Reduction (PCA, MCA, etc.)

Factors Affecting a Machine Learning Model (I)

Bias-Variance Trade-off. Curse of Dimensionality

Factors Affecting a Machine Learning Model (II)

Understanding Factors that can affect model performance; e.g. Type III errors, selection bias, measurement errors, improper variable encoding. Ethically assessing biases

Regression (I)

What is a Regression Problem?. Simple Linear Regression

Regression (II)

Multiple Linear Regression. Linear Model Selection and Regularization

Data pre-processing and transformation (II)

Measuring Predictor Importance. Feature Engineering. Understanding, Detecting and Handling (massive) class imbalance

Classification (I)

What is a Classification Problem?. Logistic Regression

Classification (II)

K-Nearest Neighbours (kNN). Naïve Bayes (NB)

Decision Trees

Decision Trees. Appropriate Use Cases. Measuring Node Purity. Pruning

Ensembles

Random Forest. Bagging and Boosting Methods (e.g. XGBoost)

Clustering

Notions of distance and similarity. Clustering methods: k-means, k-medoids, hierarchical. Cluster evaluation measures: DBIndex, WSSSE, scree plots

Assessment Breakdown	%		
Coursework	60.00%		
End of Module Assessment	40.00%		

Assessments

Full Time

C	ou	rs	e١	N	or	k

 Assessment Type:
 Formative Assessment
 % of total:
 Non-Marked

 Assessment Date:
 n/a
 Outcome addressed:
 1,2,3,4,5

Non-Marked: Yes

Assessment Description:

Formative assessment will be provided on the in-class individual or group activities.

Assessment Type: Project % of total: 60
Assessment Date: n/a Outcome addressed: 1.2.3.4

Non-Marked: No

Assessment Description:

Project focusing on the practical application of data processing and machine learning techniques to data sets in order to extract insights and perform predictive analytics. Component parts of this project may be assessed at different dates.

End of Module Assessment

 Assessment Type:
 Terminal Exam
 % of total:
 40

 Assessment Date:
 End-of-Semester
 Outcome addressed:
 5

Non-Marked: No

Assessment Description:

The end of semester examination will contain essay-style questions examining the theory behind machine learning techniques covered during the semester, and may require some calculation. Marks will be awarded based on clarity, structure, relevant examples, depth of topic knowledge and an understanding of the potential and limits of solutions.

No Workplace Assessment

Reassessment Requirement

Repeat examination

Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.

Reassessment Description

Repeat examination Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework

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Module Workload										
Module Target Workload Hours 0 Hours										
Workload: Full Time										
Workload Type	Workload Description	Hours	Frequency	Average Weekly Learner Workload						
Lecture	Classroom & Demonstrations (hours)	24	Per Semester	2.00						
Tutorial	Other hours (Practical/Tutorial)	24	Per Semester	2.00						
Independent Learning	Independent learning (hours)	77	Per Semester	6.42						
Total Weekly Contact Hours										

Module Resources

Recommended Book Resources

Brett Lantz. (2019), Machine Learning with R - Third Edition, Packt Publishing, p.458, [ISBN: 9781788295864].

Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani. (2014), An Introduction to Statistical Learning, Springer, p. 426, [ISBN: 9781461471370].

Christian Heumann, Michael Schomaker, Shalabh. (2017), Introduction to Statistics and Data Analysis, Springer, p.456, [ISBN: 978-3-319-46162-5].

Supplementary Book Resources

Kartik Hosanagar. (2019), A Human's Guide to Machine Intelligence, Penguin, p.272, [ISBN: 9780525560890].

This module does not have any article/paper resources

This module does not have any other resources

Discussion Note: