

H7IAIML: Introduction to Artificial Intelligence and Machine Learning

Module Code:	H7IAIML
Long Title	Introduction to Artificial Intelligence and Machine Learning APPROVED
Title	Introduction to Artificial Intelligence and Machine Learning
Module Level:	LEVEL 7
EQF Level:	6
EHEA Level:	First Cycle
Credits:	5
Module Coordinator:	
Module Author:	Alex Courtney
Departments:	School of Computing
Specifications of the qualifications and experience required of staff	MSc and/or PhD degree in computer science or cognate discipline. May have industry experience also.
Learning Outcomes	
<i>On successful completion of this module the learner will be able to:</i>	
#	Learning Outcome Description
LO1	Describe the theory and concepts underpinning Artificial Intelligence (AI), as well as discuss the seminal, current applications of AI and their implications
LO2	Apply fundamental techniques in both descriptive and inferential statistics for real world problems
LO3	Contrast fundamental data mining and machine learning concepts and techniques, and discuss their applicability to different problems
LO4	Build and evaluate simple machine learning models on various datasets and problem domains
Dependencies	
Module Recommendations	
No recommendations listed	
Co-requisite Modules	
No Co-requisite modules listed	
Entry requirements	Learners should have attained the knowledge, skills and competence gained from stage 2 of the BSc (Hons) in Computer Science

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Module Content & Assessment			
Indicative Content			
Introduction to Artificial Intelligence Foundations of AI: philosophy, maths, psychology, computing, linguistics, logic, probability theory. Historical evolution of the field. Weak vs Strong AI. Ethical implications of AI			
Agents Percepts, actions, goals, environment. Simple reflex agents. Reflex agents with state. Goal based agents. Utility based agents			
Search Strategies in AI Uninformed Search strategies: Uniform Cost, Breadth-First, Depth-First. Informed Search strategies: Greedy Best First Search, A* Search, Heuristic functions			
Selected Topics in AI High-level overview and Applications of AI Techniques such as Mathematical Optimization, Machine Learning, Natural Language Processing, Recommender Systems, Deep Learning, Computer Vision and Knowledge Representation			
Descriptive Statistics Arrangement, pre-processing and representation of data. Measures of central tendency (mode, median, mean). Measures of dispersion (range, variance, standard deviation). Statistical graphics & visuals (e.g., box-plot, histograms). Ethics in statistics. Ethics case studies			
Hypothesis Testing Null/Alternative Hypothesis. Single sample z test. One-tail tests. Two-tail tests			
Test for Normality Normal distributions. Q-Q/P-P Plots. Shapiro-Wilk Test. Kolmogorov-Smirnov Test			
Dependent and Independent Sample Tests Test for Equality of Variance. Student's t-Test			
Introduction to Machine Learning Data mining methodologies: KDD, CRISP-DM. Data security and ethical implications of machine learning. Introduction to data mining tools such as Python SciKit-Learn, R/RStudio, Weka, RapidMiner. Supervised vs Unsupervised Learning. Regression vs Classification Problems			
Introduction to Regression Simple Linear Regression. Estimating Regression Coefficients. Evaluating Regression Models (R-Squared, Mean Absolute Error, etc.)			
Introduction to Classification What is classification?. Evaluating classification models (confusion matrix). Logistic Regression. K-Nearest Neighbours			
Evaluating Predictive Models Data Splitting and Sampling Methods (Holdout, Cross-fold Validation, Stratification, etc.). Model Tuning and Overfitting			
Assessment Breakdown			%
Coursework			50.00%
End of Module Assessment			50.00%
Assessments			
Full Time			
Coursework			
Assessment Type:	Formative Assessment	% of total:	Non-Marked
Assessment Date:	n/a	Outcome addressed:	1,2,3,4
Non-Marked:	Yes		
Assessment Description: Formative assessment will be provided on the in-class individual or group activities.			
Assessment Type:	Project	% of total:	50
Assessment Date:	n/a	Outcome addressed:	2,4
Non-Marked:	No		
Assessment Description: Learners will apply descriptive statistics as well as a number of statistical tests to data sets of their choosing. Learners will also apply regression and classification models to data sets of their choosing, evaluate the performance of these models, and report on their findings.			
End of Module Assessment			
Assessment Type:	Terminal Exam	% of total:	50
Assessment Date:	End-of-Semester	Outcome addressed:	1,3
Non-Marked:	No		
Assessment Description: The end of semester examination will contain questions, with students required to answer. Questions may be essay-style (e.g. AI search strategies), or may require some calculation (e.g. computing test statistics). 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 <i>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.</i>			
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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	Every Week	24.00
Tutorial	Other hours (Practical/Tutorial)	12	Every Week	12.00
Independent Learning	Independent learning (hours)	89	Every Week	89.00
Total Weekly Contact Hours				36.00

Module Resources	
<i>Recommended Book Resources</i>	
James T. McClave,Terry T. Sincich. Statistics, Global Edition, [ISBN: 1292161558]. Gareth James,Daniela Witten,Trevor Hastie,Robert Tibshirani. (2014), An Introduction to Statistical Learning, Springer, p.426, [ISBN: 1461471370]. Stuart Russell,Peter Norvig. (2016), Artificial Intelligence: A Modern Approach, Global Edition, Pearson Higher Ed, p.1152, [ISBN: 1292153970]. Kartik Hosanagar. (2019), A Human's Guide to Machine Intelligence, Penguin, p.272, [ISBN: 9780525560890].	
<i>Supplementary Book Resources</i>	
Paul R. Daugherty,H. James Wilson. Human + Machine, [ISBN: 978-1633693869]. Rajendra Akerkar. (2018), Artificial Intelligence for Business, Springer, p.81, [ISBN: 978-3319974354]. Article/Paper List. Type. Item. Fernandez Elian, Farkhad Ihsan Hariadi, Muhammad Iqbal Arsyad, Implementation of Computer Vision Algorithms for Position Correction of Chip-Mounter Machine,. (2017), International Symposium on Electronics and Smart Devices (ISESD),. Gilles Simonin, Christian Artigues, Emmanuel Hebrard, Pierre Lopez.. (2014), , Scheduling Scientific Experiments for Comet Exploration, Constraints, 20, https://hal.fr/hal-archives-ouvertes.	
<i>This module does not have any article/paper resources</i>	
<i>This module does not have any other resources</i>	
Discussion Note:	