Module Definition Form (MDF)

Module code: MOD009173	**Version:** 1 **Date Amended:** 07/Feb/2023

1. Module Title
Machine Learning and Computer Vision

2a. Module Leader
Shabnam Sadeghi Esfahlani

2b. School
School of Engineering and the Built Environment

2c. Faculty
Faculty of Science and Engineering

3a. Level
7

3b. Module Type
Standard (fine graded)

4a. Credits
15

4b. Study Hours
150

5. Restrictions

Type	Module Code	Module Name	Condition
Pre-requisites:	None		
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:			

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

In this module, you will focus on the area of machine learning and computer vision with reference to automation and robotics. In this respect, you will gain a comprehensive overview of state-of-the-art techniques and their applications. You will also experience the capabilities of the widely used techniques, their limitations, and future trends.

You will learn the application of Machine Learning techniques in solving complex dynamic robotics-related problems. Emphasis would be given to Neural Networks, Deep Neural Networks, Recurrent Neural Networks, etc. You will apply Computer Vision techniques in negotiating time-varying complex spaces for robotic manoeuvrability. The module's emphasis will be on image processing, object location, recognition, classification, and tracking.

This module facilitates human-robot interaction in dynamic, unstructured and challenging environments by leveraging techniques from Artificial Intelligence with a focus on implementation.

6b. Outline Content

Deep Neural Networks (Convolution Neural Networks)

Recurrent Neural Networks

Image Processing

Object Location and Tracking

Object Recognition and Classification

Artificial Intelligence-based Control

6c. Key Texts/Literature

The reading list to support this module is available at: https://readinglists.aru.ac.uk/

6d. Specialist Learning Resources

Matlab, Raspberry Pi, PiCamera

7. Learning Outcomes (threshold standards)		
No.	**Type**	**On successful completion of this module the student will be expected to be able to:**
1	Knowledge and Understanding	Demonstrate advanced knowledge of machine learning and computer vision techniques for automation and robotics applications.
2	Knowledge and Understanding	Demonstrate in-depth knowledge of the application, adaptability and limitations of Deep Learning and Artificial Intelligence in facilitating Human-Robot interaction, in challenging environments.
3	Intellectual, practical, affective and transferrable skills	Use advanced mathematical and neural techniques in modelling and analysing complex environments for robotic manoeuvres and operations; make engineering judgement to work with uncertain situations.
4	Intellectual, practical, affective and transferrable skills	Use Machine Learning and Computer Vision techniques in solving real-world problems regarding automation and robotics, critically evaluating the performance and limitations of these techniques

8a. Module Occurrence to which this MDF Refers				
Year	**Occurrence**	**Period**	**Location**	**Mode of Delivery**
2026/7	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence			
Learning Activities	**Hours**	**Learning Outcomes**	**Details of Duration, frequency and other comments**
Lectures	18	1-4	1.5 hours per week for 12 weeks
Other teacher managed learning	18	3-4	1.5 hours per week for 12 weeks
Student managed learning	114	1-4	Self-study
TOTAL:	150		

9. Assessment for the above Module Occurrence					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
010	Coursework	1-2	40 (%)	Fine Grade	40 (%)
A research report on latest developments on a particular technique and its applications, maps to Engineering Council Learning Outcome M1					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
011	Coursework	3-4	60 (%)	Fine Grade	40 (%)
Maximum 1500 words project report, maps to Engineering Council Learning Outcomes M3, M4					

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:
(a) achieve the qualifying mark for each element of fine graded assessment as specified above
(b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]