Module Definition Form (MDF)

Module code: MOD009702	**Version:** 1 **Date Amended:** 07/Feb/2024

1. Module Title
Machine Learning for Imaging

2a. Module Leader
Leila Muresan

2b. School
School of Computing and Information Sciences

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:	None		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

Image and video data is ubiquitous in everyday life, medicine, science, robotics, media and digital art being just a few of the fields that rely heavily on processing this type of information. Machine learning and, more specifically, deep learning provide state-of-the-art solutions to fundamental problems related to processing image and video data.

This module presents the fundamental principles of machine learning, with focus on deep learning. You will study the details of convolutional neural networks and how they connect to classical image processing algorithms. Main categories of problems in digital signal processing will be tackled with appropriate deep learning solutions. Applications considered range from natural image processing to medical and microscopy image analysis.

6b. Outline Content

The module is designed to present fundamental problems in image processing and computer vision, focusing on state-of-the-art solutions based on machine learning, and more specifically, deep learning. Together with a brief overview of linear algebra and probability, basic concepts of digital image processing are covered, and their main applications, such as pre-processing (denoising), image classification, object detection, segmentation are discussed. Principles of neural networks and deep learning are presented, as well as the most popular network architectures. Students will acquire hands-on experience in setting up deep learning solutions for real world problems, including data pre-processing, design, training, testing, troubleshooting, hyperparameter search and data augmentation, making use of the Python eco-system.

6c. Key Texts/Literature

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

6d. Specialist Learning Resources

Laboratory with computers and relevant software packages

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 understanding of the principles of machine learning techniques, tailored for image analysis and computer vision tasks (object detection, image segmentation, classification, denoising)
2	Knowledge and Understanding	Critically analyse deep learning solutions, including their advantages and limitations
3	Intellectual, practical, affective and transferrable skills	Demonstrate competent skills in using modern environments for deep machine learning to solve practical image processing and image analysis problems
4	Intellectual, practical, affective and transferrable skills	Apply the acquired toolset to evaluate, troubleshoot and optimise deep learning solutions to real world problems

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	24	1-4	Lecture 2 hr x 12 weeks
Other teacher managed learning	12	1-4	Practical 1 hr x 12 weeks
Student managed learning	114	1-4	Self-study and research. Online course materials, supporting lectures, supplementary reading and tutorials are provided on Canvas.
TOTAL:	150		

9. Assessment for the above Module Occurrence

The assessment for some modules includes a presentation (see below for details on how this particular module is assessed). We recognise that presenting, especially to a large group, can cause significant anxiety or distress for some students. If this may affect you, please contact your Module Leader or the Disability and Neurodiversity Service as early as possible. We will work with you to consider appropriate reasonable adjustments. Depending on your individual needs, these might include, for example, presenting to a smaller group or presenting only to a member of academic staff.

Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
010	Practical	1-4	50 (%)	Fine Grade	40 (%)
Timed in-lass test (45 minutes - equivalent to 1000 words)					

Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
011	Coursework	1-4	50 (%)	Fine Grade	40 (%)
Coursework (Report/Project), 1,500 words equivalent					

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]