

MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME977 MACHINE LEARNING FOR SATELLITE DATA

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| Module Registrar: Dr A. Riccardi annalisa.riccardi@strath.ac.uk | Taught To (Course): MSc. Satellite Data for Sustainable Development for whom the class is compulsory | |
| Other Lecturers Involved: | Credit Weighting: 10 | Semester: 2 (spring) |
| Compulsory/ elective class | Academic Level: 5 | Suitable for Exchange: N |

Required prerequisites

Note: It is the responsibility of ALL students to ensure that they satisfy the prerequisite knowledge for this module BEFORE adding as part of curriculum selection. If unsure, please contact the Module Registrar or discuss with your Programme/Year Adviser of Studies.

Fundamentals of Satellite Image Processing
Knowledge of Google Earth Engine environment

Module Format and Delivery (HOURS i.e. 1 credit = 10hrs of study):

| Lecture | Tutorial | Laboratory | Groupwork | External | Online | Project | Assignments | Private Study | Total |
|---------|----------|------------|-----------|----------|--------|---------|-------------|---------------|-------|
| 10 | | 10 | | | | 40 | 10 | 30 | 100 |

Educational Aim

This class is designed to provide the students with the theoretical and practical foundations on the applications of machine learning methods to satellite data for prediction, classification, clustering and time series analysis.

Learning Outcomes

On completion of the module the student is expected to be able to:

LO1 Assess and determine the difference between machine learning methods and their applicability to practical problems

LO2 Understand and analyse the computational cost and parallelisation options for processing satellite data with machine learning methods

LO3 Objectively select, train and test a machine learning method for a given problem

Syllabus

This module is taught as a two-week intensive block during the month of April.

The module will teach the following:

- Machine Learning fundamentals (supervise, unsupervised learning)
- Machine learning methods for prediction (regression), clustering, classification and time series analysis
- Satellite data preprocessing for machine learning applications
- Cloud GPU computing for training machine learning algorithms on satellite data
- Use of heterogeneous datasets
- Data preprocessing
- Image classification and segmentation
- Ethical use of satellite and ground data

Assessment of Learning Outcomes

Criteria

LO1

- C1 Communicate clearly the difference between machine learning methods used in assignments
- C2 Communicate clearly which machine learning method can be used and for which task

LO2

- C1 Successfully train machine learning algorithms on GPU cloud computing resources
- C2 Communicate clearly the computational cost involved in training large machine learning models and the choice of computational resources

LO3

- C1 Produce code to retrieve, process satellite data and train a machine learning method for a given problem
- C2 Communicate clearly the reasoning behind the choice of data and algorithms

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

Principles of Assessment and Feedback

(within Assessment and Feedback Policy at: <https://www.strath.ac.uk/professionalservices/staff/policies/academic/>)

The students are assessed with 5 practical exercises sketch out during laboratories sessions and completed at home, plus an individual project. For individual projects, students are provided with source of data and problem description. They will need to select the most suitable machine learning model for the problem, train the model, generate the results and write a report.

Feedback for the practical assessment is provided in terms of oral feedback during laboratory sessions. Written feedback on submitted project is provided together with the mark.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams (*individual weightings*)

| Examination | | | | Coursework | | Practical | | Project | |
|-------------|----------|----------|-----------|------------|-----------|-----------|-----------|---------|-----------|
| Number | Month(s) | Duration | Weighting | Number | Weighting | Number | Weighting | Number | Weighting |
| | | | | 5 | 25% | | | 1 | 75% |
| * | | | | LO1-3* | | | | *LO1-3 | |

* **L/Os:** Indicate which Learning Outcomes (L01, L02, etc) are to be assessed by exam/coursework/practical/project as required.

Coursework / Submissions deadlines (*academic weeks*):

Submission of the 5 practical laboratories at the end of the two teaching weeks in April.
Submission of project at end of April/May exam weeks

Resit Assessment Procedures:

Submission of alternate ^{^^}project prior to commencement of the August exam diet.

^{^^}Students must contact the module Registrar for project details as soon as they know that they are required to resit this class.

PLEASE NOTE:

Students must gain a summative mark of 50% to pass the module. Students who fail the module at the first attempt will be re-assessed before the August diet. This re-assessment will consist entirely of a project. No marks from any previous attempts will be transferred to a new resit attempt

Recommended Reading

No set texts or recommended for the class. Relevant material provided during tutorials or on the Myplace module page

Additional Student Feedback

(Please specify details of when additional feedback will be provided)

| | | |
|------|------|--------------------------------------|
| Date | Time | Room No |
| | | Check timetable webpages for details |

Session: 2021/22

Approved:

Course Director Signature: E Henderson

Date of Last Modifications: 08/09/2021

(Updated July 2021-MAE)

MODULE TIMETABLE

Module Code:

ME977

Module Title:

Machine Learning for Satellite Data

Brief Description of Assessment:

5 practical exercises to be submitted at the end of the teaching weeks (April) - 25%
 1 project to be submitted at the end of the April/May exam diet - 75%

Assessment Timing:-

Indicate on the table below the start/submission dates for each assignment/project and the timing of each exam/assessment using the dropdowns provided. Dropdowns can be left blank. Add extra notes below the dropdowns.

Please note: Timings can and will change, this should only be used as a guide.

| Semester One | W&D Wk | WK1 | WK2 | WK3 | WK4 | WK5 | WK6 | WK7 | WK8 | WK9 | WK10 | WK11 | Exam Period |
|--------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
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| Semester Two | C&D Wk | WK1 | WK2 | WK3 | WK4 | WK5 | WK6 | WK7 | WK8 | WK9 | WK10 | WK11 | End Spring Break/ End Exam Period |
|--------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
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