

Optimization in Machine Learning (ACM 40990) – Introduction

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1 Overview

In this brief document, I explain the format of ACM 40990 in the Spring Trimester 2023, starting in Week 1, Monday January 22nd 2024.

Version history:

- First version, 1st December 2023

2 Mode of Delivery

The instruction in this module is planned to be primarily face-to-face.

Format of module

In the first **seven weeks**, the module will be taught by Dr Lennon Ó Náraigh. This part of the module will deal with the theoretical foundations of numerical optimization. The format in these weeks will be as follows:

- Three face-to-face lectures per week:
 - Tuesdays at 09:00 (possibly to be replaced with a recorded lecture, subject to student demand)
 - Thursdays at 15:00 (two hours).

This will take us up to the midterm break. In the second part of the module, which will last **five weeks**, students will look at the practical applications of optimization algorithms, in Machine Learning. This part of the module will be taken by Dr Marco Viola, and will be more 'hands-on' in its approach.

VLE

Very little information will be posted on Brightspace for the first seven weeks. Instead, during those weeks, the module website will be the main point of contact for students, and all materials relevant to those weeks will be posted there:

<https://maths.ucd.ie/~onaraigh/optimization.html>

Already, there is a complete set of **typed notes** available there. Again, these typed notes refer to the first **seven weeks** of the module; the lectures in those weeks will follow the typed notes closely.

The second part of the module might use Brightspace a bit more frequently but this will be at the discretion of Dr Viola.

3 Assessment

The assessment structure is as follows:

- One hour-long written exam, which will assess the materials from the first seven weeks of the module. The exam will take place during the trimester, probably just after the midterm break. This will be worth **50%** of the final grade.
- Second part of the module (five weeks):
 - Short regular assignments worth **25%** of the final grade.
 - Coding exam, worth **25%** of the final grade.

4 How to succeed in the first part of the module

The Lecturer will give out four sets of exercises. These are not for credit. Model answers will be provided. We will work through some of the model answers in class. These exercises are a bit like training, if you can do all of the exercises you will really understand the first part of the module. With that in mind, some of the questions in the written exam will be drawn from the exercises. To be more precise, the written exam will be based on the following topics:

- A selection of questions drawn from Exercises 1–4.
- A selection of theorems from the lecture notes (the list will be provided in due course).

Integrity in assessment

The usual rules around plagiarism and copying apply to all elements of assessment in the module. There is a university plagiarism policy; students are encouraged to familiarize themselves with it:

<https://www.ucd.ie/governance/resources/policypage-plagiarismpolicy/>

Please don't fail the module!

If you do, there will be a resit exam in the Summer Trimester.

5 Grading

The 'maths' percentage-to-grades conversion scheme applies:

<https://maths.ucd.ie/t1/grading/en02>

6 Textbooks

For the first part of the module, the typed lecture notes are self-contained. For extra reading, students may refer to the following recommended textbook:

Nocedal, J. and Wright, S.J. eds., 1999. *Numerical Optimization*. New York, NY: Springer New York.