# CSC4007 Advanced Machine Learning
# 2018-19 Handbook

# Lecturer

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  - ECIT (Institute of Electronics, Communications and Information Technology), and
  - i-AMS (Centre for Intelligent Autonomous Manufacturing Systems)


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# Teaching

- Lectures (three hours):
  - Tuesday : 13:00 – 15:00
    - 13:00 – 14:00 David Keir Building/0G/336
    - 14:00 – 15:00 David Keir Building/01/403
  - Thursday: 13:00 – 14:00
    - David Keir Building/01/403
- Practical (two hours): Optional
  - Thursday: 15:00 – 17:00
  - We will go through programming examples that are useful to understand the content of the module and to do assignments.
  - Using **Python**, **Numpy** (for linear algebra), and **Matplotlib** (for plotting)

# Lectures and Video Recording

- Lecture notes will be available on QOL

- Video lectures will be recorded and available on Mediasite

# Course Contents

- Introduction to learning problem

- Basics on linear algebra

- Regression

- Classification

- Kernel methods, support vector machine

- Unsupervised learning

- Ensemble methods

- Neural networks and deep learning

# Learning Outcomes

- Explain when and how ML is useful in real-world problems

- Know and apply state-of-art ML techniques.

- Demonstrate the ability to understand and describe the underlying mathematical framework behind these operations.

- Formulate and evaluate novel hypothesis

- Evaluate the performance of proposed machine learning solutions through rigorous experimentation

- Analyse quantitative results and use them to refine initial solutions

- Communicate finding effectively and in a convincing manner based on data, and compare proposed systems against existing state-of-art solutions

# Assessment

- Assignment (60% module marks):
  - Assignment 1: Release at week 15 (30% module marks), deadline at week 19
    - Linear regression
  - Assignment 2: Release at week 19 (30% module marks), deadline at week 23
    - K-means clustering
- Final exam (written, 2 hours): 40% module marks in April-May
- Compulsory Element. To pass this module, you need to pass both parts: Course work, written examination
- Re-sit exam in the summer of 2019

# Availability for Queries

- I am happy to meet after lectures.

- Open Office: 10:00→17:00 on Tuesday and Thursday.

- **NOTE**: Because I am not normally based in the CSB, email me to schedule a meeting if you are unable to meet me at above time.

# Recommended Textbooks

[1] Trevor Hastie, Robert Tibshirani and Jerome Friedman: The Elements of Statistical Learning: Data Mining, Inference, and Prediction  Springer, Second Edition, 2009.
[publicly online at http://www-stat.stanford.edu/~tibs/ElemStatLearn/]
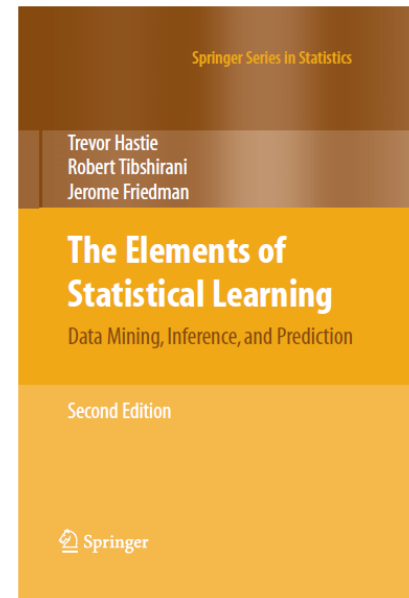
[2] Ian Goodfellow, Yoshua Bengio, Aaron Courville, Francis Bach: Deep Learning (Adaptive Computation and Machine Learning Series), 2017
[publicly online: https://www.deeplearningbook.org/]