

EEC4400 Data Engineering and Deep Learning

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Introduction

- Data Engineering
 - covers system architecture and performance aspects
- Deep Learning
 - covers techniques and algorithms
- For effective deployment of machine learning in enterprise systems, these two aspects need to be studied together

Module Description

- This module teaches students data engineering and machine learning techniques and their operationalization in IT systems for deployment in many industries.
- The module covers advanced machine learning concepts and algorithms such as feature engineering, deep learning and reinforcement learning.
- These algorithms require data and produce models that are incorporated into data engineering pipelines involving IoT, edge and cloud.
- Students will be exposed to case studies of data engineering and Machine Learning Operations (MLOps) scenarios with realistic datasets and data flows, and perform data engineering and machine learning operations using software tools.

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Timeline

- 27 October to 8 November 2025 (except Sunday)
- 9.00am-12.00pm on most days, 4 days 2.00-5.00pm

Mon	Tue	Wed	Thu	Fri	Sat	Sun
27 Oct	28 Oct	29 Oct	30 Oct	31 Oct	1 Nov	2
EEC4400 14:00-17:00	EEC4400 9:00-12:00	EEC4400 14:00-17:00		EEC4400 9:00-12:00		
3	4	5	6	7	8	9
EEC4400 14:00-17:00	EEC4400 9:00-12:00	EEC4400 14:00-17:00		EEC4400 9:00-12:00		

- Lectures
- Tutorials/Discussions
 - problem-solving and Python programming with TensorFlow
- Assignment
- Examination
- more details on a later slide

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Learning Outcomes

- Explain concepts in data engineering and Machine Learning Operations (MLOps)
- Apply deep learning and reinforcement learning algorithms
- Validate and improve machine learning model quality
- Design and implement data engineering pipelines involving IoT, edge and cloud which incorporate machine learning
- Tackle real-world problems with realistic datasets and data flows, and perform data engineering and machine learning operations using software tools

Module Syllabus

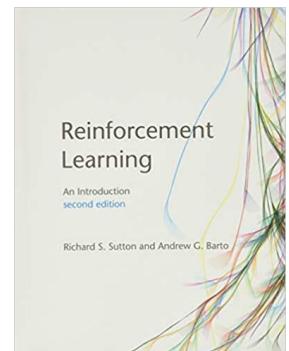
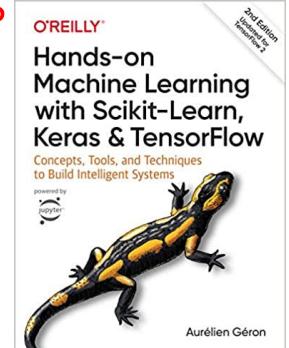
- Data engineering and Machine Learning Operations (MLOps)
- Data engineering pipelines involving IoT, edge and cloud
- Data preparation and Feature engineering
- Deep learning: recurrent neural networks (RNN) and LSTM
- Deep learning: convolutional neural networks (CNN)
- Deep reinforcement learning
- Hyperparameter optimization, Model quality validation and retraining
- Distributed machine learning
- Case studies and industry applications of data engineering and MLOps

Assessments

- Assignment (50%) – release details around **Friday 31 October 2025**
 - Reinforcement Learning with simulated environment
 - Python with numpy, pandas, scikit-learn, TensorFlow and TensorBoard
 - Skeleton Jupyter notebook is provided
 - Work in groups of 4 students
 - Deadline for submission: **11:59pm, Saturday 15 November 2025**
- Examination (50%)
 - **Monday 24 November 2025, 2:00-4:00pm (2 hours)**
 - Consultation session: (to be decided)

References: Books and Online Resources

- Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, 2nd Edition (2019), 3rd edition (2022)
 - by Aurélien Géron
- Reinforcement Learning: An Introduction, second edition (Adaptive Computation and Machine Learning series)
 - by Richard S. Sutton and Andrew G. Barto
- + online resources on Data Engineering, MLOps, TensorFlow etc.



Thank You

Questions?

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