WM919-15 Machine Intelligence and Data Science

24/25

Department
WMG
Level
Taught Postgraduate Level
Module leader
Karim El Haloui
Credit value
15
Module duration
2 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

The module introduces key concepts related to Machine Learning (ML) and Artificial Intelligence (AI). Through exploring Linear and Logistic Regression techniques, students will embark on learning critical skills to tackle more advanced Neural Networks architecture. Key focus will be made on data management workflow to enhance performance and robustness of ML algorithms. Relevant AI techniques that are widely used in development of automated vehicles and related areas will be explored including: Supervised and Unsupervised Learning, Artificial Neural Networks, Convolutional Neural Networks, Recurrent Neural Networks and Reinforcement Learning.

Module aims

The aim is to equip students with a solid knowledge of key AI techniques pervasive to the development of advanced driving systems and related areas. The module will focus on practical aspects of AI where the students will gain a strong high level understanding of the underlying theory. The emphasis will be on Machine Learning and Deep Learning techniques that are at the nexus of the development of future technologies.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

- A general overview of AI systems and their applications
- Data science basis for machine intelligence:
- Understanding experimental data and fitting
- Clustering and classification
- Deep learning systems
- Introduction to neural networks
- Convolutional neural networks
- Recurrent neural networks
- Reinforced learning
- Tutorials on tools and examples

Learning outcomes

By the end of the module, students should be able to:

- Critique advanced AI architectures in a given operational design domain [AHEP:4, M1, M2, M4, M5, M7]
- Implement Machine Learning algorithms by mastering relevant tools [AHEP:4, M1, M2, M3, M4]
- Choose, develop and evaluate critically neural networks [AHEP:4, M1, M2, M3, M4, M5, M7]
- Critically analyse data sets and techniques to train and test machine learning algorithms [AHEP:4, M1]
- Demonstrate a critical understanding of Machine Learning algorithms and their architecture [AHEP:4, M1, M2, M3]

Indicative reading list

- GOODFELLOW, Ian; BENGIO, Yoshua; COURVILLE, Aaron. Deep learning (adaptive computation and machine learning series). Adaptive Computation and Machine Learning series, 2016, 800.
- RUSSELL, Stuart Jonathan, et al. Artificial intelligence: a modern approach. Upper Saddle River: Prentice hall, 2003.
- URMSON, Chris, et al. Tartan racing: A multi-modal approach to the darpa urban challenge. 2007.
- GUTTAG, John V. Introduction to computation and programming using Python. Mit Press,

1.

- SAMARASINGHE, Sandhya. Neural networks for applied sciences and engineering: from fundamentals to complex pattern recognition. CRC Press, 2016.
- ASIMOV, Isaac. I, Robot, Robot series. 1950.

A variety of up-to-date sources including:

- Latest government / UK Automotive Council roadmaps for autonomous vehicles
- Latest automotive legislation and standards
- Current academic research in the field of smart connected autonomous vehicles

View reading list on Talis Aspire

Subject specific skills

Basic knowledge of AI techniques that are widely used in development of automated vehicles and related areas, Deep Learning techniques that are heavily used, including: Supervised and Unsupervised Learning, Artificial Neural Networks, Convolutional Neural Networks, Recurrent Neural Networks.

Transferable skills

Critical Thinking, Problem solving, Communication, Information literacy (research skills), Digital literacy, Professionalism

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Study

Study time

Type	Required
Lectures	22 sessions of 1 hour (15%)
Seminars	1 session of 1 hour (1%)
Tutorials	9 sessions of 1 hour (6%)
Private study	58 hours (39%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

In-depth reading around the subject

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A4

	Weighting	Study time
Assessed work as specified by department	80%	42 hours
A collection of 3 to 4 problems depending on their length and complexity to be solved by students.		
In-module assessment	20%	18 hours
Based on self-study hours on basic concepts of Machine Learning and neural networks.		

Feedback on assessment

Individual written feedback. Formative assessment during group activities, tutorials and class quizzes.

Availability

Courses

This module is Core optional for:

- Year 1 of TWMS-H33L Postgraduate Award Smart, Connected and Autonomous Vehicles
- Year 1 of TWMS-H33M Postgraduate Certificate Smart, Connected and Autonomous Vehicles
- Year 1 of TWMS-H33N Postgraduate Diploma Smart, Connected and Autonomous Vehicles
- Year 1 of TWMS-H33P Postgraduate Taught Smart, Connected and Autonomous Vehicles