WM9B7-15 Artificial Intelligence & Deep Learning

27/28

Department
WMG
Level
Taught Postgraduate Level
Module leader
Boda Li
Credit value
15
Module duration
4 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module provides an intensive, applied approach to advanced Deep Learning (DL), prioritising the hands-on engineering of neural architectures to solve complex, real-world challenges. Rather than focusing solely on theoretical abstractions, students will engage directly with practical deployment scenarios, such as building applications or optimising models in computer vision, natural language processing, or other areas. Students will investigate foundational principles and architectures, comparing traditional machine learning with deep learning approaches while critically engaging with real-world use cases. Students will have the opportunity to develop algorithms to solve real-world problems, building the skills needed to design, implement, and evaluate AI systems. The module combines theoretical knowledge with hands-on experience to prepare students for both research and applied roles in the field of AI.

Module aims

This module aims to equip students with advanced knowledge and practical skills in Artificial Intelligence and Deep Learning, enabling them to design and evaluate AI solutions for various complex, real-world problems. Students will gain a critical understanding of modern AI architectures and frameworks, explore state-of-the-art developments in the field, and apply their

learning collaboratively through model development, analysis, and technical communication. This module supports the development of research-informed and industry-relevant expertise in areas such as computer vision or natural language understanding.

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.

- Foundations of Artificial Intelligence and Deep Learning: Deep Learning Overview; Deep Learning vs Traditional Learning; Introduction of Ethical and Societal Implications; Emerging Trends; and Overview of Model Interpretability and Explainability (XAI).
- Foundations of Neural Networks: Perceptron; Backpropagation; Activation and Loss Functions; Hyperparameters; Model Evaluation and Comparison.
- Deep Learning Architectures and Applications: Model Deployment and Comparison (e.g., CNN, RNN, LSTM, Variational Autoencoders, or Generative Adversarial Networks (GANs)) for different applications, such as image or text analysis;

Learning outcomes

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

- Critically evaluate and explain the key differences between traditional machine learning and deep learning approaches.
- Critically evaluate deep learning and artificial intelligence solutions and their implications.
- Demonstrate an understanding of emerging trends and research development in AI.
- Design and evaluate deep learning models for practical applications.
- Collaborate effectively as part of a group to develop and communicate a practical AI solution by presenting findings through reproducible code, visualisations, or technical reporting.

Indicative reading list

Reading lists can be found in Talis

Specific reading list for the module

Interdisciplinary

In particular, combining computer science and mathematics/statistics

Subject specific skills

- Ability to evaluate Artificial Intelligence and Deep Learning techniques.
- Design and implementation of deep learning models.

- Model evaluation and performance analysis, including the use of appropriate metrics, validation techniques, and comparative analysis.
- Understanding and critical appraisal of current research trends.
- Working with AI model pipelines, including data preprocessing, fine-tuning, testing, and reporting.
- Ability to use Python Libraries and Frameworks to implement Deep Learning applications.

Transferable skills

- Critical thinking and analytical reasoning.
- Problem-solving in complex and uncertain environments, with an emphasis on practical experimentation and iteration.
- Collaboration and teamwork.
- Effective technical communication.
- Independent learning and self-direction.
- Time and project management.
- Adaptability and digital literacy.

Study

Study time

Type	Required
Lectures	10 sessions of 1 hour (7%)
Seminars	20 sessions of 1 hour (13%)
Online learning (independent)	30 sessions of 1 hour (20%)
Private study	30 hours (20%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

Private study will include preparing for lectures and seminars, reviewing lecture notes, and engaging with required readings and multimedia resources.

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	Eligible for self-certification
Assessment component			
Group Assessment	40%	24 hours	No

Students will collaboratively explore an applied AI use case, propose and implement a solution using Deep Learning techniques, and present it. This assessment includes a Peer Review Activity.

Reassessment component
Individual Presentation — No

Students will explore an applied AI use case, propose and implement a solution using Deep Learning techniques, and present it. Additionally, the student will reflect on the possible impacts of collaboration in developing a proposed solution. This presentation will be recorded and submitted.

Assessment component			
Individual Assignment	60%	36 hours	Yes (extension)

Students are required to analyse and "diagnose" limitations or flaws in a deep learning solution for a real-world problem. For this purpose, they will propose and evaluate implementation fixes for the Deep Learning application, along with a reflective report.

Reassessment component
Individual Assignment — No

Students are required to analyse and "diagnose" limitations or flaws in a deep learning solution for a real-world problem. For this purpose, they will propose and evaluate implementation fixes for the Deep Learning application, along with a reflective report.

Feedback on assessment

Verbal feedback for group assessment with a written summary; written feedback for the individual assignment.

Availability

Courses

This module is Core for:

- Year 1 of TWMS-H60X MSc Applied Artificial Intelligence (Full Time)