

WM9SL-15 AI and Games

26/27

Department

WMG

Level

Taught Postgraduate Level

Module leader

Sean Butler

Credit value

15

Module duration

4 weeks

Assessment

100% coursework

Study location

University of Warwick main campus, Coventry

Description

Introductory description

This module introduces the principles and practical applications of artificial intelligence within games. Game AI has historically been a major driver of innovation in interactive systems, combining algorithmic techniques with data-driven approaches to create believable agents, intelligent behaviours, and adaptive game systems. As modern games increasingly integrate machine learning techniques alongside traditional AI approaches, it is important that graduates understand both the classical foundations and contemporary developments in this field.

The module is structured around two complementary themes: traditional game AI techniques and modern machine learning methods used in games. Traditional techniques include pathfinding algorithms, behaviour trees, and decision systems, which form the backbone of many interactive and real-time gameplay systems. These approaches emphasise deterministic reasoning, efficient algorithms, and the design of robust decision-making systems suitable for real-time environments.

Alongside these foundations, the module introduces key concepts from modern artificial intelligence and machine learning. Students will explore neural networks and their evolution from simple architectures to more advanced models such as convolutional neural networks, recurrent networks, and transformers. The module also examines how these techniques are applied within the games industry, including AI agents, procedural content generation, rendering enhancement and denoising, physics approximation, and generative systems for textures, models, and dialogue.

The emphasis throughout the module is on understanding core principles and applying them in practice. Through this combination of theory and implementation, the module aims to provide students with both conceptual understanding and practical skills relevant to modern game development and interactive AI systems.

Module aims

The over-arching aim of this module is to provide students with the knowledge and practical skills required to understand, design, and implement artificial intelligence techniques used in digital games. The module aims to develop both an understanding of traditional game AI systems and modern machine learning approaches, and how these techniques can be applied to interactive environments.

The sub-aims of this module are:

- Develop an understanding of the fundamental algorithms and techniques used in traditional game AI, including pathfinding, decision systems, and behaviour modelling
- Explore the principles behind modern artificial intelligence and machine learning methods, including neural networks and their variants
- Understand how AI techniques are applied in contemporary games, including intelligent agents, procedural systems, rendering enhancement, and generative content
- Gain practical experience implementing AI techniques within game-related contexts
- Develop the ability to critically evaluate different AI approaches and determine their suitability for particular game design or technical problems

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.

Introduction to Artificial Intelligence in Games
Search and Pathfinding
Decision Making Systems for Game Agents
Foundations of Machine Learning
Neural Network Architectures
AI Agents and Learning in Games
AI for Game Content and Systems
Modern AI Applications in Games

Learning outcomes

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

- Critically analyse the principles and techniques used in traditional game artificial intelligence, including pathfinding, decision systems, and behaviour modelling.
- Evaluate and compare different AI approaches used in games, including rule-based systems and machine learning methods, and justify their suitability for specific design or technical problems.

- Design and implement classical game AI algorithms within an interactive environment, such as pathfinding or behaviour systems for game agents.
- Demonstrate a conceptual understanding of modern machine learning techniques, including neural networks, convolutional networks, recurrent networks, and transformer architectures.
- Develop and apply neural network–based solutions to solve practical problems relevant to games or interactive systems.
- Critically assess the role and impact of modern AI technologies in game development, including applications such as agent behaviour, content generation, rendering enhancement, and large language model integration.

Subject specific skills

Mathematical skills, programming skills, AI skills

Transferable skills

Technology literacy, adaptability

Study

Study time

Type	Required
Lectures	15 sessions of 1 hour (10%)
Seminars	(0%)
Tutorials	15 sessions of 1 hour (10%)
Online learning (independent)	20 sessions of 1 hour (13%)
Private study	40 hours (27%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

Private study will include exploration and prototyping of AI algorithms.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A

	Weighting	Study time	Eligible for self-certification
Assessment component			
Game AI Implementation Implementation of AI into a game environment	100%	60 hours	Yes (extension)

Reassessment component

Game AI Implementation Implementation of AI into a game environment			No
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Feedback on assessment

The assignment will be marked and feedback provided. Feedback will also be provided in class via the tutor demonstrating a solution to similar problems.

Availability

Courses

This module is Optional for:

- Year 1 of TWMS-H1SK Postgraduate Taught Games Engineering (Full-Time)