Computer Science (COMP) 452

Artificial Intelligence for Game Developers (Revision 2)

Status:	Replaced with new revision, see the **course listing** for the current revision
Delivery mode:	**Individualized study online**
Credits:	3
Area of study:	Science
Prerequisites:	**COMP 308** or **COMP 369** or **COMP 390** or professor approval.
Precluded:	None
Challenge:	COMP 452 is not available for challenge.
Faculty:	**Faculty of Science and Technology**
Notes:	Students who are concerned about not meeting the prerequisites for this course are encouraged to contact the **course coordinator** before registering.

Instructor: Larbi Esmahi

Overview

Artificial Intelligence is widely regarded in the computer game industry as the area where the most development will be made in the coming decades. This course equips students for a career in the rapidly growing game industry. Students will gain knowledge and skills in AI techniques that also apply to other domains, such as business planning and engineering.

The primary focus of this course is on the use of AI techniques for generating efficient, intelligent behaviour in games. Additional attention is given to AI algorithms for improving game play experience. The programming language used in the course is Java.

Outline

- Unit 1: Introduction to Game AI
  This unit discusses the kind of AI used in game development, presents the model of game AI and explains the AI engine structure.
- Unit 2: Movement Algorithms and Steering Behaviour
  This unit presents some kinematic movement algorithms. It discusses the problems related to the steering behaviour of objects and presents some solutions.
- Unit 3: Coordinated Movement and Motor Control
  This unit discusses the concepts related to coordinated movements and motor control mechanisms.
- Unit 4: Pathfinding.
  This unit presents the main pathfinding algorithms used in game

development (i.e., A*, Dijkstra).

- Unit 5: Advanced Pathfinding
  This unit presents advanced techniques for pathfinding in complex situations.
- Unit 6: Decision-Making and Uncertainty
  This unit presents different models used for implementing decision-making in games, such as decision trees and state machines. It also discusses the models for implementing knowledge uncertainty, such as fuzzy logic and Markov systems.
- Unit 7: Advanced Decision-Making Systems
  This unit discusses the implementation of advanced decision-making behaviour, such as goal-oriented behaviour, reasoning and coordinating.
- Unit 8: Introduction to Learning Mechanisms
  This unit introduces board game theory and discusses the implementation of some key algorithms, such as minimax and negamax.
- Unit 9: Random Number Generation and Minimaxing
  This unit discusses the basic concepts of learning mechanisms and presents some algorithms for implementing action prediction, decision learning and reinforcement learning.

Learning outcomes

Upon successful completion of this course, you will be able to

- identify tasks that can be tackled using AI techniques.
- select the appropriate AI technique for the problem under investigation.
- design and implement efficient and robust AI algorithms for game tasks.
- develop AI game engines.
- evaluate performance and test the implemented algorithms.

Evaluation

To **receive credit** for COMP 452, you must achieve a course composite grade of at least **D (50 percent)**, an average grade of at least 50 percent on the assignments, and a grade of at least 50 percent on the final examination. The weighting of the composite grade is as follows:

Activity	Weight
Assignment 1	20%
Assignment 2	20%
Assignment 3	30%
Final Online Exam	30%
Total	**100%**

The **final examination** for this course must be taken online with an AU-approved exam invigilator at an approved invigilation centre. It is your responsibility to ensure your chosen invigilation centre can accommodate online exams. For a list of invigilators who can accommodate online exams, visit the **Exam Invigilation Network** .

To learn more about assignments and examinations, please refer to Athabasca University's **online Calendar** .

Materials

Millington, I. (2019). *AI for games* (3rd ed.). Taylor & Francis. (Print)

Other Materials

The remainder of the learning materials for COMP 452 is distributed in electronic format.

At this time, those materials include:

- COMP 452 study guide and study schedule
- detailed description of the requirements for the individual assignments
- course evaluation form
- links to a variety of resources on the Web

Additional supporting materials of interest to students in COMP 452 may be available in the online course.

Students are required to have a Java compiler or Java IDE installed on their computer.

Special Course Features

COMP 452 is offered only by World Wide Web-based computer mediated communications (CMC) mode, and can be completed at the student's workplace or home.

Important links

- **Academic advising**
- **Program planning**
- **Request assistance**
- **Support services**

Athabasca University reserves the right to amend course outlines occasionally and without notice. Courses offered by other delivery methods may vary from

their individualized study counterparts.

Updated April 19, 2023

View **previous revision**