

ARTIFICIAL INTELLIGENCE SHORT COURSE

-H H

Short Course Specification

Modification History

Version	Revision Description
V1.0	For release

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1. About NCC Education

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With Centres in over forty countries, four international offices and academic managers worldwide, NCC Education strives to employ the latest technologies for learning, assessment and support. NCC Education is regulated and quality assured by Ofqual (the Office of Qualifications and Examinations Regulation, see www.ofqual.gov.uk).

Overview and Objectives

This **Short Course in Artificial Intelligence** will provide learners with the foundation and branches of artificial intelligence, such as search strategies, knowledge representation and reasoning techniques. This course will also introduce a range of well-known techniques and applications in artificial intelligence, such as fuzzy logic, machine learning, expert systems, natural language processing, and intelligent agents.

At the end of the course, learners should be able to:

- 1. Understand the importance of AI and its applications.
- 2. Apply a range of well-established AI search strategies and knowledge representation techniques in problem solving.
- 3. Assess a range of well-established techniques for reasoning with uncertain knowledge.
- 4. Understand a range of machine learning techniques.
- 5. Understand the range of AI techniques that are being applied in industry or research.
- 6. Implement and evaluate a range of AI models and techniques for solving real-world problems.

Hardware and Software Requirements

Hardware: Learners need access to a computer with 64-bit Windows/Mac OS/ Linux (Desktop/Laptop) with Internet access.

Software: Chapter 7: Waikato Environment for Knowledge Analysis (WEKA) <u>https://waikato.github.io/weka-wiki/downloading_weka/</u>

Chapter 8: Anaconda Python (included Jupyter Notebook, Scikit-learn) <u>https://www.anaconda.com/products/individual</u>

Chapter 10: SWI-Prolog https://www.swi-prolog.org/download/stable

Chapter 11: Anaconda Python (included Jupyter Notebook) pip install NLTK <u>https://www.anaconda.com/products/individual</u>

Short Course in Artificial Intelligence

Title:

Short Course in Artificial Intelligence

Guided Learning Hours 80 hours

Learning Outcomes;	Objectives;
The Learner will:	The Learner can:
 Understand the importance of Al and its applications. 	 1.1 Explain the meaning of AI and its origin. 1.2 Identify the characteristics of AI. 1.3 Discuss the limitations and ethics of AI. 1.4 Discuss current and future developments in the field of AI and its applications.
 Apply a range of well-established Al search strategies and knowledge representation techniques in problem solving. 	 2.1 Construct simple state spaces. 2.2 Select and apply appropriate search techniques in problem solving. 2.3 Explain and identify different types of knowledge. 2.4 Apply knowledge representation using the logical, semantic network, frame, and production rules techniques.
 Assess a range of well- established techniques for reasoning with uncertain knowledge. 	 3.1 Explain the concept of uncertainty. 3.2 Explain the source of uncertain knowledge. 3.3 Discuss and apply probabilistic reasoning using the Bayes' rule and the certainty factor theory.
4. Understand a range of machine learning techniques.	 4.1 Explain machine learning. 4.2 Compare and contrast supervised learning, unsupervised learning, and reinforcement learning. 4.3 Identify and apply suitable machine learning techniques in problem solving.
 Understand the range of Al techniques that are being applied in industry or research. 	 5.1 Describe the key players, components, characteristics, and limitations of expert systems. 5.2 Apply reasoning techniques in rule-based expert systems. 5.3 Explain natural language processing and its components. 5.4 Discuss a range of applications using natural language processing. 5.5 Explain intelligent agents and PEAS. 5.6 Discuss a range of applications using intelligent agents.
6. Implement and evaluate a range of AI models and techniques for solving real-world problems.	 6.1 Select suitable tools and techniques for use in designing AI models. 6.2 Construct an AI model. 6.3 Evaluate the performance of AI models

Syllabus

Topic No	Title	Content
1	Introduction to AI	 Definitions History of AI Characteristics of AI Limitations of AI Ethics in AI Current and future development of AI and its applications
		Learning Outcome: 1
2	Problem Solving Using Search	 Problem representation in state space Strategies for state space search Uninformed search (blind search) Informed search (heuristic Search)
3	Knowledge Representation	 Types of knowledge Logical representation Semantic network representation Frame representation Production Rules Learning Outcome: 2
4	Uncertain Knowledge	 Uncertainty and its sources Basic probability Bayes' rule Bayesian reasoning Certainty factors Learning Outcome: 3
5	Fuzzy Logic	 Fuzzy logic Linguistic variables Fuzzy sets and operations Fuzzy rules Fuzzy system Learning Outcome: 3
6	Machine Learning	 Introduction Supervised learning Unsupervised learning Reinforcement learning Applications of machine learning Learning Outcome: 4
7	Neural Networks	 Basic structure Perceptron Multilayer neural networks Backpropagation learning Accelerated learning Recurrent neural networks Learning Outcome: 4, 5

8 9	Decision Trees Genetic Algorithms	 Structure and terminologies Attribute selection measures Learning Outcome: 4, 6 Simulation of Natural Evolution Basic genetic algorithms
		Learning Outcome: 4
10	Expert Systems	 The development team of an expert system Components of an expert system Characteristics of an expert system Rule-based expert system
		Learning Outcome: 5, 6
11	Natural Language Processing	 Terminologies Components of natural language processing Phases in natural language processing Natural language processing pipeline Applications of natural language processing
		Learning Outcome: 5, 6
12	Intelligent Agents	 Agents and environments Rationality PEAS Types of intelligent agents Game Playing Algorithms in games