



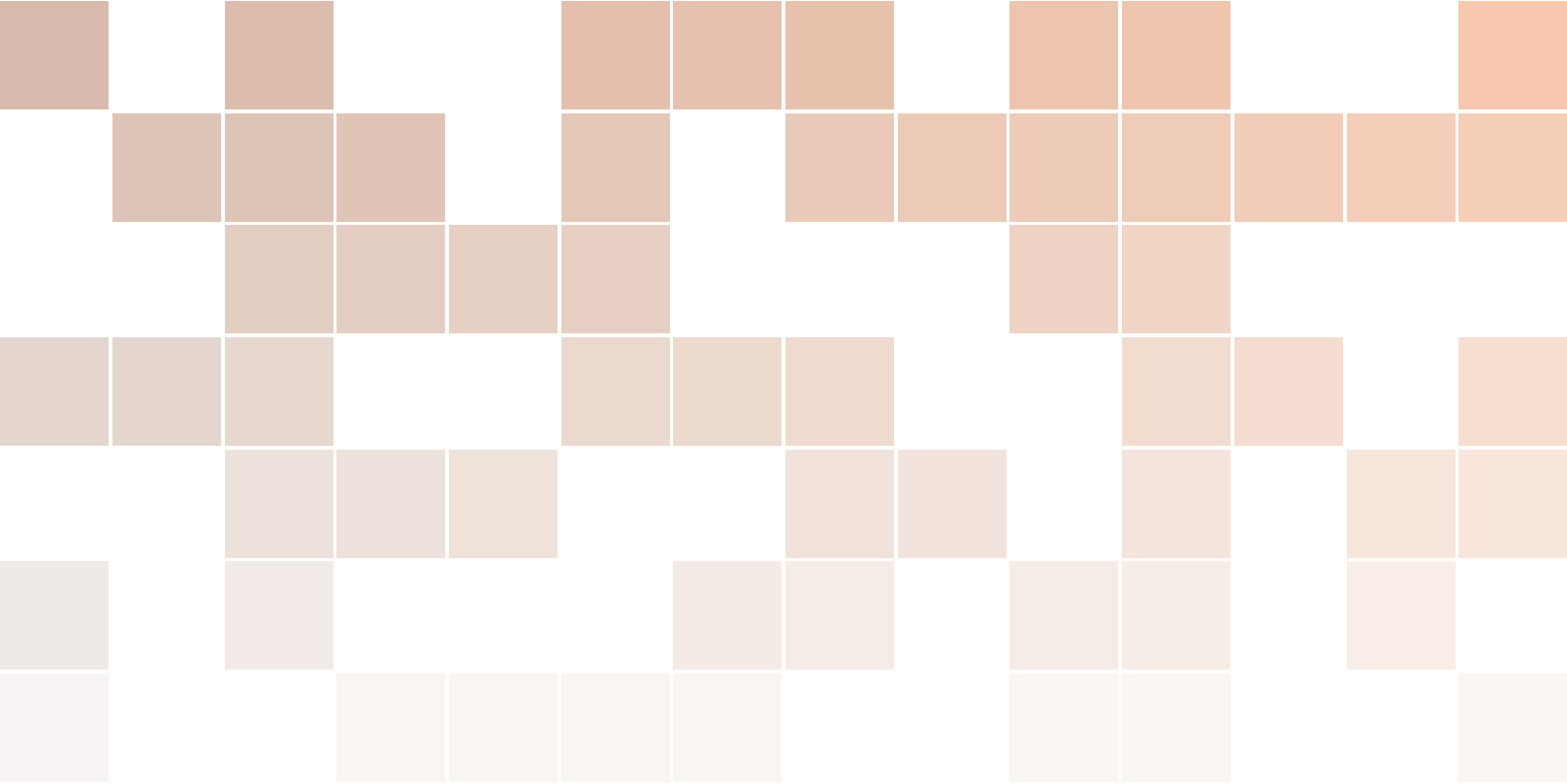
# ARTIFICIAL INTELLIGENCE

*An Ethical, Spiritual and  
Philosophical Approach*

Amelia Ritahani Ismail  
Amir Aatieff Amir Hussin  
Mohamad Fauzan Noordin

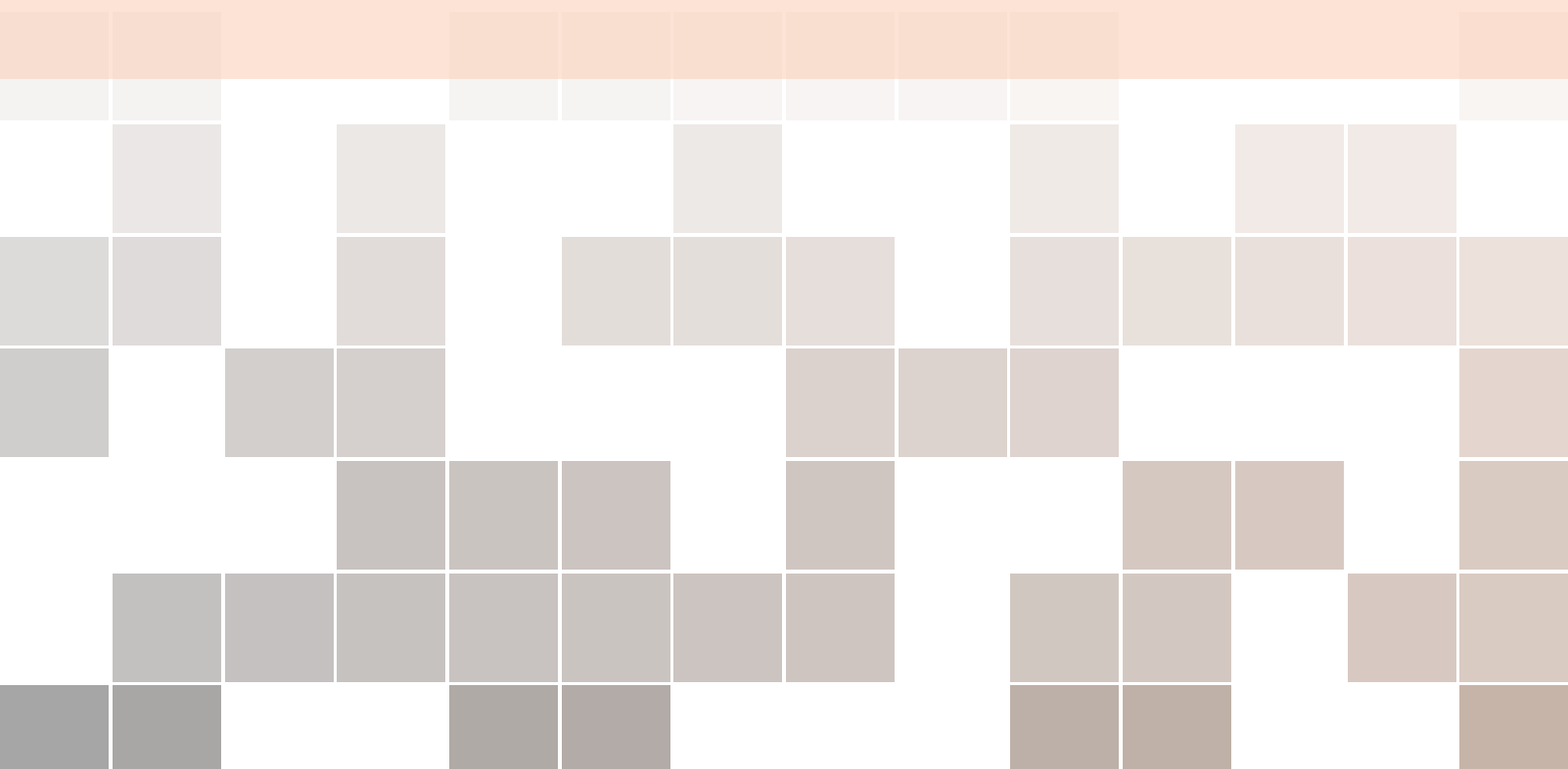






# **ARTIFICIAL INTELLIGENCE**

## **An Ethical, Spiritual and Philosophical Approach**



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# Contents

Table of Contents .....	i
Introduction .....	v
Author's Profile .....	vii
List of Figures .....	x
List of Tables .....	xi
List of Algorithms .....	xiii
List of Python Source Code .....	xv
List of Abbreviations .....	xvii

## I

## Part One

<b>1</b>	<b>Humanising Artificial Intelligence .....</b>	<b>1</b>
1.1	Human Intelligence and Artificial Intelligence	1
1.2	Advancement and Progress in Artificial Intelligence	4
1.3	Ethic, Values and Islamic Issues in Humanising Artificial Intelligence	8
1.4	Summary	12
<b>2</b>	<b>Biological and Artificial Neural Network .....</b>	<b>15</b>
2.1	God's Most Honorable Gift - Human Intelligence and the Brain	15
2.2	From Biological Neurons to Artificial Neural Network	18
2.2.1	Artificial Neural Network[	
2.3	From Neural Network to Deep Neural Network	26
2.3.1	How Artificial Neural Network Mimick the Brain[	
2.4	Applications of Neural Network	30

2.5	Summary	33
<b>3</b>	<b>Human and Artificial Immune Systems</b>	<b>35</b>
3.1	Miracle of the Human Immune Systems	35
3.2	From Biological to Artificial Immune Systems	38
3.3	Immune System Algorithms	40
3.3.1	How Artificial Immune Systems Mimick the Immune Systems[	
3.4	Applications of Artificial Immune Systems	45
3.5	Summary	47
<b>4</b>	<b>Biological and Artificial Collective Systems</b>	<b>49</b>
4.1	Animals in the Quran	50
4.2	Collective Behaviours of Animals: The Swarm	50
4.3	Artificial Collective Systems: The Metaheuristic Approaches	53
4.3.1	How Metaheuristic Approaches Mimick Biological Collective Systems[	
4.4	Applications of Metaheuristic Algorithms	63
4.5	Summary	65
<b>II</b>	<b>Part Two</b>	
<b>5</b>	<b>Machine Learning</b>	<b>71</b>
5.1	Human vs. Machine Learning	71
5.2	The Human in the Qur'an	73
5.3	Machine Learning Experiment	74
5.4	Supervised, Unsupervised Learning and Reinforcement Learning	79
5.5	Issues in Machine Learning	82
5.6	Summary	85
<b>6</b>	<b>Deep Learning</b>	<b>89</b>
6.1	From Machine Learning to Deep Learning	89
6.2	Training Deep Learning Models	92
6.3	Advanced Architectures and Techniques in Deep Learning	94
6.4	Summary	97

<b>7</b>	<b>Ummatic Applications of Artificial Intelligence I</b>	<b>99</b>
7.1	Makkeiyah and Madaniyah Surah Classification	99
7.1.1	Converting Bags of Words[	
7.1.2	Model Training[	
7.1.3	Model Creation using Multi-Layer Perceptron[	
7.1.4	Model Evaluation[	
7.2	Mosque Image Classification	103
7.2.1	Image Pre-processing[	
7.2.2	Model Creation of VGG16[	
7.2.3	Model Training[	
7.2.4	Model Evaluation[	
7.3	Traffic Monitoring and Object Detection	111
7.4	Summary	117
<b>8</b>	<b>Ummatic Applications of Artificial Intelligence II</b>	<b>121</b>
8.1	Generative AI and Large Language Model	121
8.2	Utilising Large Language Models for Keyword Extraction	122
8.3	Fine-tuning a Large Language Model for Domain Specific	127
8.3.1	Create the knowledge base[	
8.3.2	Image Text Extraction and Sentiment Analysis[	
8.3.3	Fine tuning GPT 3.5 using OpenAI API[	
8.4	Summary	136

### III

## Part Three

<b>9</b>	<b>Artificial Intelligence and Madani</b>	<b>141</b>
9.1	History of Madani	142
9.1.1	MADANI and Deen (Civilisation)[	
9.1.2	The Concept of Madani[	
9.1.3	Issues and Problems in Artificial Intelligence[	
9.2	Artificial Intelligence and Quranic Approach	144
9.3	Artificial intelligence and MADANI	149
9.4	Summary	151

<b>10</b>	<b>Conclusion: The Value-based Artificial Intelligence .....</b>	<b>153</b>
10.1	The Journey of AI: From Machines to Almost-Human	153
10.2	Humanising AI: The Need and Challenges	154
10.2.1	Ethical AI: The Imperative of Doing Right[	
10.2.2	The Road Ahead: Coexistence and Collaboration[	
10.3	Towards Maqasid al-Shariah	157
10.4	Enhancing the AI Applications with Value-based AI approach	158
10.5	Summary	161
	<b>References .....</b>	<b>165</b>
	<b>Index .....</b>	<b>179</b>



## **PREFACE**

The International Institute of Islamic Thought was established as an educational trust in 1981 to promote research and publications to aid in the education of the ummah. As part of its IOK agenda, the IIIT has consistently called for a critical evaluation of existing disciplines and their methodologies - a call for epistemological reform based on twin sources of knowledge i.e. revelation and the universe. The aim was to re-mould disciplines taught in universities that would project the Islamic worldview in those disciplines for the betterment of the ummah and humanity at large.

The late Ismail Raji al-Faruqi, one of the founders of the IIIT, in his IOK- Principles and Workplan (1982) talked about the need to develop textbooks that required ‘mastery of both modern knowledge and Islamic heritage’ and based on a critical evaluation of both — to have creative synthesis. More recently, another co-founder of the IIIT — the late AbdulHamid Abu Sulayman (who was the 2<sup>nd</sup> Rector of the International Islamic University Malaysia from 1988–1998) — initiated the Textbook/Teaching Materials Project (TMP), that was meant to produce books to be utilised for courses being taught at the IIUM. This was backed up with generous research funding from the IIIT

Since late 2017, the TMP has been introduced not only in the IIUM, but also in a few other institutions of higher learning. Funds are granted to academics teaching a specific course/s to produce a course-book that would be used as a main reference in a particular course/s. Proposals and manuscripts were reviewed and feedback conveyed to the author. In many ways, these books are still ‘a work in progress’. They are not meant for commercial purposes and have rather limited distribution. The aim is to utilise these materials in class, to receive further feedback from scholars and others and to keep improving these books until they do become standard textbooks to be used in the courses taught.

The book that you have in your hands now is a result of these efforts. The IIIT East and Southeast Asia Office is pleased to contribute to this project to realise the goals of its founders.

We look forward to constructive inputs for further improvement.

IIIT East and Southeast Asia Office

IIUM Gombak, Kuala Lumpur



# Introduction

## Purpose of the Book

This book aims to provide undergraduate and postgraduate students with a comprehensive, accessible introduction to the fields of Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL). It integrates perspectives from Islamic philosophy, enabling readers to explore the ethical, epistemological, and spiritual dimensions that underpin the development and application of contemporary intelligent systems. The goal is to demystify complex concepts and offer practical insights into these rapidly evolving fields. By covering foundational theories, practical applications, and hands-on examples, the book is designed to equip students with the knowledge and skills needed to pursue further study or enter the workforce in AI-related fields.

## Target Audience

This book is primarily targeted at undergraduate and postgraduate students in computer science, engineering, or related disciplines with an interest in AI, ML, and DL. The content assumes basic familiarity with programming and mathematical concepts, but no prior specialised knowledge in AI or machine learning is required. Whether you are new to the field or seeking to deepen your understanding, this book is designed to guide you through the key principles, techniques, and challenges in these areas.

In addition to the theoretical foundations, the book integrates Islamic principles and philosophical perspectives to foster a holistic understanding of intelligent systems. This includes discussions on ethical responsibility, the nature of knowledge, inspirations of AI models, and the moral implications of technological advancement. By combining scientific rigor with Islamic epistemology, this book aims to cultivate both technical proficiency and ethically grounded decision-making.



## Author's Profile



**Amelia Ritahani Ismail** is a Professor in the Department of Computer Science, Kulliyah of Information and Communication Technology, International Islamic University Malaysia (IIUM). She holds a PhD in Computer Science from the University of York, United Kingdom, an MSc (Computer Science) from Universiti Teknologi Malaysia and a Bachelor Degree (MIS) from International Islamic University Malaysia. With over a decade of academic experience, she is recognised for her expertise in Artificial Intelligence specifically in Machine Learning, Deep Learning and Swarm Intelligence. Her current research explores the integration of agent-based models with Retrieval-Augmented Generation (RAG) and Language Models (LLMs), with a particular focus on healthcare applications, multi-agent systems, swarm intelligence and other deep learning applications.



**Amir Aatieff Amir Hussin** is an Assistant Professor at the Kulliyah of Information and Communication Technology, International Islamic University Malaysia (IIUM). He earned his Ph.D. in Computer Science from Loughborough University, UK, focusing on Artificial Intelligence (AI) and coalition structure generation in multi-agent systems. He also holds a Master of Software Engineering from Open University Malaysia and a Bachelor's in Computer Science from the University of Portsmouth, UK. His research interests focus on AI areas such as deep learning, multi-agent systems, and optimization algorithms. He is particularly focused on AI applications in healthcare, industrial automation, and environmental monitoring, as well as AI ethics.



**Mohamad Fauzan Noordin** received his Ph.D. from the University of Wales, U.K. 1997; MBA from the Central Missouri State University, USA 1991; and B.Sc.(Computer Science) from the University of Missouri Kansas City, USA 1989. He is a professor of knowledge technology at Kulliyah of Information and Communication Technology, International Islamic University Malaysia. His book entitled "ICT and Islam" has been used as a textbook in several universities. He was awarded the Darjah Setia Pangkuan Negeri Award (DSPN) Pulau Pinang, which carries the title Dato, by TYT Yang Di-Pertua Negeri Pulau Pinang on 23 July 2022. Prof. Dato' Dr. Mohamad Fauzan Noordin was the Advisor of Artificial Intelligence and Digitalization for the Minister of Higher Education. He has been invited as a speaker to talk about Artificial Intelligence (AI) in various universities.



# List of Figures

2.1	Biological Neural Networks. ....	19
2.2	Artificial Neural Network. ....	20
2.3	Single layer Neural Network. ....	21
2.4	Multi layer Neural Network. ....	22
2.5	Feedforward and backpropagation Neural Network. ....	23
2.6	Recurrent network with no self-feedback loops and no hidden neurons. ....	24
2.7	Recurrent network with self-feedback loops and hidden neurons. ....	25
2.8	Basic Architecture of Convolutional Neural Network. ....	27
2.9	Basic Architecture of Recurrent Neural Network. ....	28
2.10	Basic Architecture of Autoencoder. ....	29
3.1	Detector Generation(training phase) and Detector Application(testing phase) of the NSA ....	42
3.2	The basic of Clonal Selection Algorithm ....	43
5.1	The Machine learning experimental process. ....	75
5.2	The training dataset in Machine Learning. ....	75
5.3	The testing dataset in Machine Learning. ....	76
5.4	Training vs test dataset. ....	77
5.5	Dividing the dataset to training, validation and testing. ....	78
5.6	The supervised, unsupervised learning and reinforcement learning. ....	79
5.7	Underfitting and overfitting of machine learning model. ....	83
6.1	The feature selection process on deep learning. ....	90
7.1	The output from model prediction of surah classification. ....	103
7.2	The augmented mosque data. ....	107
7.3	The confusion matrix. ....	110
7.4	The mosque classification apps. ....	112
7.5	The Image Detection. ....	116
8.1	The Pdf Document. ....	126
8.2	The Generated Text. ....	126
8.3	The Sample of Input Image. ....	131
8.4	The Sentiment Analysis Output Distribution. ....	131
8.5	The Sample of Output of the Sentiment. ....	132
8.6	The Output Generated from Fine-Tuning Model. ....	135
9.1	Prof. Dr Syed Muhammad Naquib al-Attas, ....	142

9.2	PM launched the MADANI book. ....	144
9.3	Geoffrey Hinton. ....	145



# List of Tables

3.1	The Summary of Immune Systems. . . . .	39
8.1	Key Monitoring Tasks During Fine-Tuning . . . . .	134



# List of Algorithms

1	Ant Colony Optimization (ACO)	55
2	Particle Swarm Optimisation (PSO)	56
3	Whale Optimization Algorithm (WOA)	58
4	Bees Algorithm	58
5	Dragonfly Algorithm	60
6	Firefly Algorithm	60



# List of Python Code

1	Converting Bags of Words. . . . .	101
2	Training and Validation Training Set. . . . .	102
3	Neural Network Model Training. . . . .	102
4	Prediction Results . . . . .	103
5	Image Data Generator . . . . .	104
6	Image resizing . . . . .	105
7	Image Augmentation . . . . .	105
8	Image Storing. . . . .	106
9	Model Creation. . . . .	108
10	Model Training. . . . .	109
11	Model Evaluation. . . . .	109
12	Importing modules. . . . .	112
13	Model Loading. . . . .	113
14	Model Calculation. . . . .	114
15	Running the Model. . . . .	114
16	Capturing Video. . . . .	115
17	Line-Crossing Detection and Object Counting. . . . .	115
18	Library for Large Language Model . . . . .	123
19	Extracting the Text from PDF . . . . .	124
20	Providing the Paragraphs. . . . .	125
21	Printing the Output. . . . .	125
22	Library for Sentiment Analysis. . . . .	128
23	Extracting Text Functions. . . . .	129
24	Extracting Text Functions and Sentiment Analyser. . . . .	130
25	Fine-tuning the Model with Islamic Dataset. . . . .	133
26	Training the Model. . . . .	134



# List of Abbreviations

<b>AINE</b>	Artificial Immune Network
<b>AI</b>	Artificial Intelligence
<b>AIS</b>	Artificial Immune Systems
<b>ANN</b>	Artificial Neural Network
<b>CLONALG</b>	Clonal Selection Algorithm
<b>CNN</b>	Convolutional Neural Network
<b>CSA</b>	Clonal Selection Algorithm
<b>DCA</b>	Dendritic Cell Algorithm
<b>DCs</b>	Dendritic Cells
<b>DNN</b>	Deep Neural Network
<b>GAN</b>	Generative Adversarial Networks
<b>IoT</b>	Internet of Things
<b>INT</b>	Immune Network Theory
<b>LLM</b>	Large Language Model
<b>NSA</b>	Negative Selection Algorithm
<b>NLP</b>	Natural Language Processing
<b>PSO</b>	Particle Swarm Optimisation
<b>RNN</b>	Recurrent Neural Network
<b>XAI</b>	Explainable AI





# Part One

<b>1</b>	<b>Humanising Artificial Intelligence .....</b>	<b>1</b>
1.1	Human Intelligence and Artificial Intelligence	
1.2	Advancement and Progress in Artificial Intelligence	
1.3	Ethic, Values and Islamic Issues in Humanising Artificial Intelligence	
1.4	Summary	
<b>2</b>	<b>Biological and Artificial Neural Network</b>	<b>15</b>
2.1	God's Most Honorable Gift - Human Intelligence and the Brain	
2.2	From Biological Neurons to Artificial Neural Network	
2.3	From Neural Network to Deep Neural Network	
2.4	Applications of Neural Network	
2.5	Summary	
<b>3</b>	<b>Human and Artificial Immune Systems ..</b>	<b>35</b>
3.1	Miracle of the Human Immune Systems	
3.2	From Biological to Artificial Immune Systems	
3.3	Immune System Algorithms	
3.4	Applications of Artificial Immune Systems	
3.5	Summary	
<b>4</b>	<b>Biological and Artificial Collective Systems</b>	<b>49</b>
4.1	Animals in the Quran	
4.2	Collective Behaviours of Animals: The Swarm	
4.3	Artificial Collective Systems: The Metaheuristic Approaches	
4.4	Applications of Metaheuristic Algorithms	
4.5	Summary	

# 1. Humanising Artificial Intelligence

## Chapter Objectives

The objectives of this chapter are to :

1. Introduce the field of Artificial Intelligence and provide an overview of its historical development.
2. Explain how human intelligence becomes an inspiration for Artificial Intelligence.
3. Discuss how humanising Artificial Intelligence can be achieved.

## Learning Outcome

By the end of this chapter, you should be able to:

1. Relate human intelligence and artificial intelligence.
2. Understand the state-of-the-art of the current advancement of artificial intelligence.
3. Describe the ethical values and issues in humanising artificial intelligence from an Islamic perspective.

## Introduction

Artificial intelligence, or AI is a cutting-edge technology that mimics human intelligence. AI, formed from computer science, mathematics, and algorithms, is reshaping industries, changing how people use technology, and solving intractable problems. As AI systems grow more incorporated into our daily lives, they are being "humanised" to match human values, emotions, and ethics. Humanising AI involves more than making machines comprehend and act like people; it also includes representing our values. This ensures that AI follows human well-being, social harmony, and ethical norms as it becomes more integrated into our world. Section 1.1 introduces Human and Artificial Intelligence. Section 1.2 discusses the advancements and progress made in Artificial Intelligence. Finally, Section 1.3 concludes with ethical, value, and Islamic issues related to humanising AI.

## 1.1 Human Intelligence and Artificial Intelligence

Human intelligence is a complex and multifaceted phenomenon encompassing various cognitive abilities such as perception, learning, reasoning, problem-solving, and creativity. It is a product of the intricate workings of the human brain, which consists of billions of neurons interconnected through neural networks. Human intelligence enables us to understand and navigate the world, adapt to new situations, and engage

# ARTIFICIAL INTELLIGENCE

## *An Ethical, Spiritual and Philosophical Approach*

Artificial Intelligence (AI), machine learning, deep learning, metaheuristics, and generative AI are reshaping the technological landscape, driving innovations that impact nearly every aspect of modern life. AI encompasses a range of technologies designed to simulate human intelligence, enabling machines to perform tasks that typically require human cognition. Machine learning (ML), a subset of AI, focuses on the ability of systems to learn from data and improve their performance over time without being explicitly programmed. Deep learning (DL), a specialised area within ML, uses neural networks with many layers to analyse vast amounts of data and identify complex patterns. Metaheuristics, on the other hand, are optimisation techniques inspired by natural phenomena, providing solutions to problems where traditional methods may not be effective. Generative AI takes this further by enabling machines to create new, original content such as text, images, and videos, offering groundbreaking possibilities in content creation and design.

This book is intended for readers interested in exploring the moral and ethical dimensions of AI, with a particular focus on how these principles can be integrated with Islamic principles. It seeks to provide a comprehensive understanding of how AI technologies can be developed and deployed in ways that align with moral responsibility and ethical integrity. By incorporating Islamic principles, which emphasize justice, fairness, compassion, and the well-being of humanity, the book offers guidance on how to create AI systems that not only push the boundaries of technological innovation, but also contribute positively to the common good, while respecting human dignity and values.

Through case studies and examples, this book explores the intersection of technology, ethics, and spirituality, illustrating how AI is inspired by the human and nature around us. Whether you are a student, researcher, or practitioner, this book provides valuable insights into the importance of understanding the fundamental concepts of AI while highlighting the need to develop AI technologies with ethical foresight, aligning with both human values and Islamic principles, ultimately fostering a more just and equitable society.

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