

# ADVANCEMENTS IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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# **Advancements in Artificial Intelligence and Machine Learning**

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## **Advancements in Artificial Intelligence and Machine Learning**

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## PREFACE

Artificial Intelligence (AI) and Machine learning (ML) are big fields and their algorithms have been employed in various domains for the last decade to solve complex problems. John McCarthy defined AI in 1956 as "AI involves machines that can perform tasks that are characteristics of human intelligence". In this book, the authors cover the basics of AI, and ML and the applicability of these fields to many real-life applications. Arthur Samuel defined Machine Learning (ML) in 1959 as a "Machine Learning: Field of study that gives computers the ability to learn without being explicitly programmed".

The presented book will consist of twelve full chapters which cover the use of AI and ML tools in a number of practical applications such as the analysis of power transformer oil, awareness and prevention of crimes against women, next-gen mechatronics, social media, digital forensics, cyber security, sentiment analysis, image processing, pattern recognition, medical device network system, business sectors, tumor detection, classification, cloud services, automation in drone robotics and human detection systems.

The landscape has shifted significantly since those early days, with the emergence of advanced AI and ML tools and the exponential increase in computing power. These advancements have enabled the analysis of vast quantities of data on a monumental scale. AI now relies heavily on Big Data and Machine Learning to expand its capabilities. Machine learning involves the training of algorithms, enabling them to learn from extensive datasets and enhance their performance over time. Deep Learning, a subset of Machine Learning, draws inspiration from the intricate workings of complex datasets and functionality.

This book gives a brief overview of Machine Learning and lists various ML techniques such as decision tree learning, Hidden Markov Models, reinforcement learning, and Bayesian networks, as well as covering some aspects of Deep Learning and how this relates to AI. It will help you achieve an understanding of some of the advances in the field of AI and Machine Learning, and at the same time, giving you an idea of the specific skills so that you can apply advanced techniques if you wish to work as a Machine Learning expert.

The authors stand behind the assurance that this book will serve as a valuable asset and a wellspring of inspiration for all those captivated by the advancements in AI and ML. As you delve into its pages, you are invited to embark on a journey into the enthralling realm of intelligent solutions. Let us together envision the limitless possibilities that await us with these transformative technologies, and enthusiastically embrace the opportunity to shape the future.

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## CHAPTER 9

## Improving the Hardware Security of Wireless Sensor Network Systems by Using Soft Computing

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**Abstract:** Hardware security is a critical concern for organizations that use information systems to protect their assets from unauthorized access and malicious attacks. Hardware security assessment involves evaluating the security of hardware components and systems to identify vulnerabilities and areas for improvement. This research paper proposes a framework for hardware security assessment using the Analytic Hierarchy Process (AHP) approach. The proposed framework is applied in a case study to evaluate the security of a wireless sensor network (WSN) system. Based on this calculation with respect to each alternative, the author finds that Hardware encryption obtained the highest final weighted score (0.555), which would be the preferred choice according to the AHP method for improving the security of the hardware of WSN. Based on the obtained weight, authors assign the ranks  $S1 < S3 < S2 < S4$ . The results show that the proposed methodology can effectively identify better security algorithms and prioritize actions to improve the security of the WSN system.

**Keywords:** AHP, Hardware, Malicious attacks, Soft computing, Security, WSN.

### INTRODUCTION

Hardware security is becoming an increasingly important concern for organizations that use information systems to protect their assets. The security of hardware components and systems is essential to prevent unauthorized access, data theft, and other malicious attacks [1, 2]. Hardware security assessment involves evaluating the security of hardware components and systems to identify vulnerabilities and areas for improvement. However, hardware security assess-

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