


# Chapter 9

## Edge AI and Blockchain Integration: A Review of Renewable Energy Optimization

**Slimane Hadjab**


 <https://orcid.org/0009-0005-8388-7958>

*Faculty of Sciences Exacts and  
Computer Science, Mohammed Seddik  
Ben Yahia-Jijel University, Algeria*

**Amol D. Vibhute**

*Symbiosis Institute of Computer Studies  
and Research, Pune, India*

**Imane Aitouhanni**


 <https://orcid.org/0009-0004-1400-8027>

*ENSIAS, SSLAB, Mohammed V  
University in Rabat, Morocco*

**Fatima Zahra Aoujil**


*Biotechnology, Materials, and  
Environment Team, Faculty of Sciences  
Agadir, Ibn Zohr University, Morocco*

**Marouane Marhoun**

 <https://orcid.org/0000-0001-5938-5601>


*National School of Applied Science,  
Abdelmalek Essaadi University,  
Tetouan, Morocco*

**Brahim El Ouardi**

 <https://orcid.org/0009-0000-4559-6141>

*Faculty of Sciences, Ibn Tofail  
University, Kenitra, Morocco*

**Serkan Deric**


 <https://orcid.org/0000-0003-2581-6770>

*Nevşehir Hacı Bektaş Veli University,  
Turkey*

**Yasmine El-Bakkouri**

*Research Laboratory in Management  
Sciences of Organizations, National  
School of Business and Management,  
Ibn Tofail University, Kenitra, Morocco*

**Yassine Mouniane**

 <https://orcid.org/0000-0002-6037-5301>

*Faculty of Sciences, Ibn Tofail  
University, Kenitra, Morocco*

**Mohamed El Bakkali**

*Faculty of Sciences, Ibn Tofail  
University, Kenitra, Morocco*

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## ABSTRACT

*In this paper, the impact of AI in energy analysis and management are elaborated along with providing an intelligent approach to make better the functionality of AI at renewables keeping along with edge intelligence integrated to blockchain for smart implementation as required. Moreover, the research gives an elaborated study on blockchain technology and edge intelligence areas along with advanced smart fields. The research further outlines on several AI techniques, such as machine learning and federated learning. This study utilizes a specialist literature review, examining recently published scientific publications and peer-reviewed literature from the last couple of years. Abstract The key results show significant progress in AI techniques for predicting and assessing RES to improve their performance. AI has proven to be very effective in accurately predicting the trends of energy consumption, allowing them to improve energy management strategies. This paper provides guidance to academia and practitioners on deploying AI for more sustainable and efficient energy-related analytics.*

## INTRODUCTION

Artificial intelligence (AI) has evolved into a groundbreaking force poised to transform multiple industries and spheres of technology. Foundational research by pioneers such as Alan Turing and John McCarthy, laid the groundwork for the development of systems that were able to carry out previously human- Requiring cognitive functions Since then, AI has advanced to a substantial level mainly due to an increase in computing power and access to extremely large datasets (the set of sample pieces of information utilized with regard to developing the ML algorithms) which allowed for the advancement of machine learning (ML), deep learning algorithms that are capable to learn and do adjustments with unprecedented accuracy (Russell et al., 2010; Hu et al., 2024).

For the last few decades, AI has been rightly proved to be successful for innovation and operational efficiency in domains like healthcare, robotics, automotive, and telecommunications. Its ability to process huge amounts of information in real-time and make independent decisions has transformed businesses that rely on resource optimization and complex behavioral prediction (Goodfellow et al., 2016; Li et al., 2024). This can be illustrated by the energy sector, and AI has already begun to play a crucial role in renewable energy production and management.

AI is particularly fascinating in the production of renewable energy such as solar and wind due to their intermittent nature, requiring significant management to be optimally integrated within the electrical grid. Meteorological data allows for the

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