

ARTIFICIAL INTELLIGENCE: A MULTIDISCIPLINARY APPROACH TOWARDS TEACHING AND LEARNING



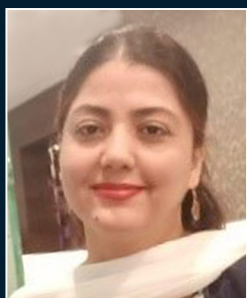
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CHAPTER 4

Integrating AI Approaches in Teaching-Learning Associated with the Mitigation of Air Pollution: A Comprehensive Analysis

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Abstract: Pollution is a major hazard to ecosystems, human health, and the stability of the global climate. Acknowledging the shortcomings of traditional methods, this thorough examination investigates the incorporation of Artificial Intelligence (AI) as a revolutionary instrument for reducing air pollution. A summary of the current situation of air pollution is given in this chapter, with a focus on its significant effects. It provides an overview of AI's ability to address environmental issues and lays the groundwork for a full investigation of its uses. This chapter uses satellite technology, sensor networks, and remote sensing to demonstrate how AI is revolutionising air quality monitoring, predictive modelling, and early warning systems. It also emphasizes AI's ability to identify pollution sources, presenting methods for measuring pollution sources and incorporating AI findings into urban planning. It clarifies AI's critical role in influencing public involvement, awareness, and evidence-based policymaking. It provides examples of AI-driven air pollution solutions from around the world, together with best practices and insights into successful projects. It discusses privacy and equality issues as well as ethical issues related to AI in environmental monitoring. It also points the way for upcoming discoveries and lines of inquiry, enabling ongoing progress.

Keywords: Artificial Intelligence, Air pollution, remote sensing, satellite technology.

INTRODUCTION

Air pollution is a serious worldwide issue that has an impact on climate change, environmental sustainability, and public health. The complexity and scope of air pollution are too great for traditional techniques of monitoring and managing the problem, especially as urbanization and industries continue to grow [1]. Within

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this framework, AI manifests as a revolutionary force, providing creative answers and perspectives to counteract the deleterious impacts of air pollution. AI which includes machine learning, data analytics, and sensor technologies, is revolutionizing our capacity to track, comprehend, and anticipate problems with air quality [2]. Through the use of AI, our goal is to investigate a wide range of applications, ranging from source identification and predictive modelling to real-time monitoring and policy advice.

This investigation explores the difficulties and moral dilemmas surrounding the use of AI in air pollution prevention in addition to evaluating the field's present stage of application. We aim to systematically analyze the possibilities, constraints, and future prospects of AI-driven solutions in creating a more hygienic and salubrious environment for future generations. Come along on this adventure with us as we explore the available AI solutions to reduce air pollution and work towards a resilient and sustainable future.

OVERVIEW OF THE CURRENT STATE OF AIR POLLUTION AND ITS IMPACT

Air pollution is a worldwide environmental problem mostly caused by toxic compounds found in the Earth's atmosphere as a result of human activity. The main pollutants that are released from sources like industrial facilities, automobile emissions, and agricultural operations are particulate matter, nitrogen oxides, sulphur dioxide, carbon monoxide, and volatile organic compounds. Air pollution poses a serious risk to people who have respiratory conditions, such as asthma, bronchitis, and chronic obstructive pulmonary disease (COPD) [3]. Heart Attacks, strokes, and hypertension are among the cardiovascular problems associated with pollution exposure. It is well established that certain air pollutants, such as formaldehyde and benzene, raise the risk of developing cancer [4].

Air pollution damages plant and animal life in habitats, which lowers biodiversity. Pollutants have the ability to accumulate on land and in bodies of water, which can have an impact on aquatic ecosystems and soil quality [5]. Methane and carbon dioxide are two examples of atmospheric pollutants that contribute to the greenhouse effect, which causes climate change and global warming. Both locally and globally, air pollution can impact precipitation and weather patterns, which in turn affects the climate [6].

APPLICATIONS OF AI IN ENVIRONMENTAL CHALLENGES

In a variety of fields, AI has shown to be a potent instrument for tackling environmental problems. Its uses are found in many different industries depicted in Fig. (1), such as:

Environmental Monitoring

Artificial Intelligence is used to analyze massive volumes of data from sensors, satellites, and other sources in order to monitor environmental factors in real time, including deforestation, water quality, and air quality [7].

Climate Modeling

AI algorithms enhance climate models by processing complex data sets, improving accuracy in predicting climate patterns, and assisting in understanding the impacts of human activities on the environment [8].

Biodiversity Conservation

AI uses picture recognition and data analysis to help identify and track endangered species, which supports efforts to conserve biodiversity [9].

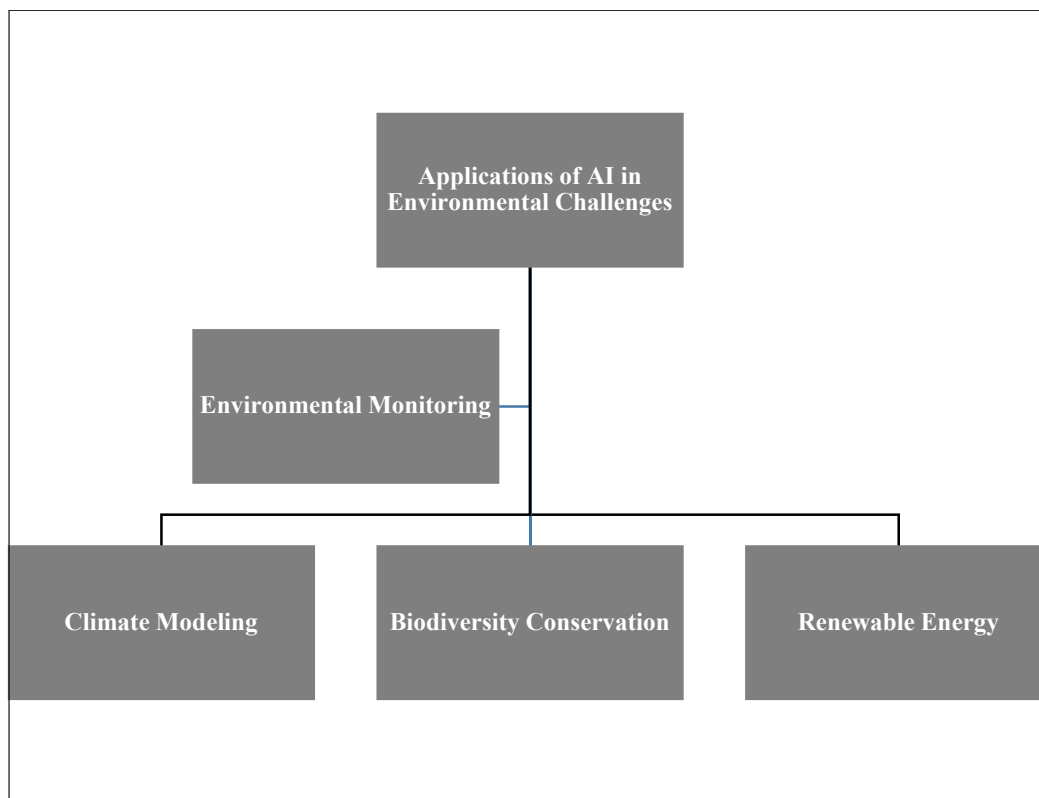


Fig. (1). Application of AI in different industries.