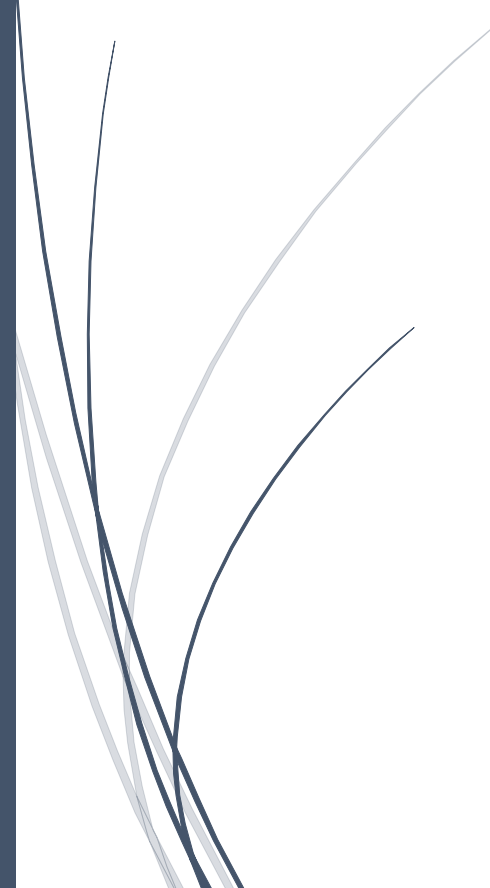


The logo for RADemics, featuring the text "RADemics" in white on a blue arrow-shaped background pointing to the right. The arrow is part of a larger blue graphic element on the left side of the page.

RADemics

# IoT and Machine Learning for Smart Agriculture under Climate Change Conditions

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# AI Applications in Public Health Risk Assessment due to Environmental Pollution

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## Abstract

Environmental pollution has become a significant global concern due to its detrimental effects on public health. The integration of Artificial Intelligence (AI) with environmental monitoring systems offers a promising solution to assess and mitigate pollution-related health risks. This chapter explores the potential of AI in real-time health risk prediction, early warning systems, and personalized health assessments based on environmental pollutant data. By combining multi-source data from IoT sensors, health records, and environmental monitoring systems, AI-driven models can provide real-time insights into the health impacts of pollutants, forecast long-term health outcomes, and identify vulnerable populations. The chapter delves into the challenges of integrating heterogeneous data, ensuring data privacy, and creating explainable AI models for public health decision-making. Furthermore, it highlights the role of AI in improving the accuracy and efficiency of health surveillance systems, offering predictive capabilities to manage the dynamic nature of pollution and its effects on public health. Through case studies and real-world applications, this chapter demonstrates the transformative potential of AI in pollution-related health risk assessments, emphasizing its role in enhancing public health outcomes and informing policy decisions.

Keywords: Artificial Intelligence, Environmental Pollution, Health Risk Assessment, IoT, Real-Time Monitoring, Predictive Analytics.

## Introduction

Environmental pollution is an escalating global issue with significant ramifications for public health [1]. Air, water, and soil pollution, driven by rapid industrialization, urbanization, and increasing vehicular emissions, contribute to a range of health issues, including respiratory diseases, cardiovascular conditions, cancer, and neurological impairments [2]. In recent years, the scale and complexity of pollution-related health risks have grown exponentially, necessitating more advanced methods to monitor, predict, and manage these threats [3]. Traditional approaches to assessing pollution's impact on human health, such as manual monitoring and static risk models, are insufficient for the dynamic and widespread nature of the problem [4]. The integration of Artificial Intelligence (AI) with environmental monitoring systems provides an opportunity to

revolutionize pollution-related health risk assessments, enabling a more comprehensive and proactive approach to safeguarding public health [5].

AI-driven solutions have emerged as a promising tool for managing the complexities of pollution health risks [6]. By processing vast amounts of data from IoT sensors, satellite imagery, health records, and environmental monitoring systems, AI models can generate real-time insights that identify pollution hotspots, predict health outcomes, and issue early warnings of potential health threats [7]. These predictive models offer a significant improvement over traditional methods, which often rely on periodic data collection and retrospective analysis [8]. AI's ability to analyze complex datasets and detect patterns in real-time allows for a more dynamic and personalized approach to health risk prediction, offering timely and actionable information for healthcare providers, policymakers, and the public [9, 10].

One of the key benefits of AI in pollution health risk assessments is its ability to integrate diverse sources of data into a cohesive model [11]. Environmental data from various sources, such as air quality sensors, satellite-based measurements, and weather stations, can be combined with health data from hospitals, clinics, and electronic health records (EHRs) to create a more accurate picture of how pollution affects specific populations [12]. For example, AI can analyze the correlation between high levels of particulate matter in the air and increased hospital admissions for asthma or cardiovascular diseases [13]. By combining health data with environmental data, AI models can identify vulnerable populations, such as children, the elderly, and individuals with pre-existing conditions, who are more likely to be affected by pollution [14]. This integrated approach enables more targeted public health interventions, ensuring that resources are directed where they are needed most [15].