# Chapter 6
# Implementation of AI Techniques for Bioremediation and Wastewater Treatment

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## ABSTRACT

*Two environmental problems that affect human society are pollution and improper rubbish management. This can happen as a result of common household and commercial activities, and it could have an impact on every environment on the world. From effluent runoff to the disposal of industrial waste and oil spills, human activity has a significant long-term impact on rivers and oceans. Waste and toxins can spread for decades once they enter natural cycles, causing long-term damage. In order to treat polluted media, bioremediation modifies the environment to promote the growth and breakdown of the target pollutants by microorganisms. Artificial intelligence technology has taken on a new sparkle in the current day by entering the bioremediation and wastewater treatment fields. It enables the computer to programme and carry out particular tasks using well developed and implemented mathematical methods. The chapter discusses AI techniques like artificial neural network, fuzzy logics, and genetic algorithms used for bioremediation and wastewater treatment.*

## INTRODUCTION

Pollution and poorly managed trash are two environmental issues that human society faces. This can occur because of routine residential and industrial operations, and it has the potential to affect every environment on the planet. Human activity has a significant long - term impact on rivers and oceans, from effluent runoff to industrial waste dumping and oil spills. Once waste and contaminants enter natural cycles, they can spread for decades, creating long-term harm. Oil spills, acid-contaminated soil mines,

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breakage of underground pipelines, and clean-up crime are all examples of biodiversity improvements. Enzymes found in bacteria release toxins from these harmful chemicals. Microorganisms may have been born in a contaminated environment or may have been isolated and relocated (Figure 1). Organisms convert pollutants into reactions that occur as part of their metabolic activities. The actions of several organisms often lead to chemical degradation. Only when natural conditions allow microbial growth and activity when bioremediation is successful (Kshirsagar, 2013). The application applied widely experimenting with environmental factors to speed up microbial growth and breakdown (Vidali, 2001).

## BIOREMEDIATION AND WASTEWATER

Nature has been correcting itself for thousands of years, while humans continue to demonstrate a remarkable ability to make a mess and ignore the consequences. However, by adding natural organic and utilizing their inherent qualities, research has discovered an effective technique to remediate poor soil and groundwater conditions (Kumari and Kumar, 2021). Many communities and industries throughout the world are researching bioremediation as a viable option for wastewater treatment (Figure 2). Bioremediation is a method of removing nutrients from wastewater by using naturally occurring microorganisms and other elements of the natural environment (Vaščák, and 2010). This type of approach opens the door to environmentally and economically sound treatment options. Due to the extensive time and planning required for efficient treatment, wastewater treatment and bioremediation is a cost-effective method. There are sophisticated wastewater treatment plants available today that are extremely specialized, mechanized, and costly to construct and maintain. Optional sewage water and wastewater treatment technologies are necessary in most the world's developing nations. In developing countries and rural locations, sewage water stabilization ponds, or lagoons, can provide an effective alternative for wastewater treatment. Algae is commonly utilized in bioremediation, wastewater treatment, and sewage treatment.

*Figure 1. Microorganisms that are employed in bioremediation techniques*