



Artificial Intelligence in Waste Water Management

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Presented

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Artificial Intelligence is emerging as a high potential tool nowadays which can solve many real-world problems that otherwise will be very difficult to be solved. It can solve many environmental problems created by humans. Waste water is one of the major environmental problems involving the use of freshwater in industry or in domestic applications and cause much problem to aquatic life. Treatment of waste water is very important to promote equality in water environment. Waste water management includes many uncertainties and that results fluctuations in waste water. These uncertainties introduce difficulties in its management. Artificial intelligence can remove or help to minimize these uncertainties. In this article we gave a point of view that how artificial intelligence can help to manage waste water and pollutant removal. Numerous Artificial Intelligence models are doing well in prediction of how the absorbents can remove pollutants from waste water by absorbing them. Artificial Intelligence also helps industries to meet higher standards and remove pollutants. This work is somewhat tricky in selection of data and also has different results in different situations. But its difficulties are very less as compared to its benefits. Artificial Intelligence perform exponentially well in waste water management. Artificial Intelligence optimizes water reuse by analyzing its consumption patterns, predicting demands and automating efficient irrigation thereby minimizing its wastage and promoting sustainable water management practices. Artificial Intelligence helps in controlling pollutant levels and also helps water life to grow and enrich.



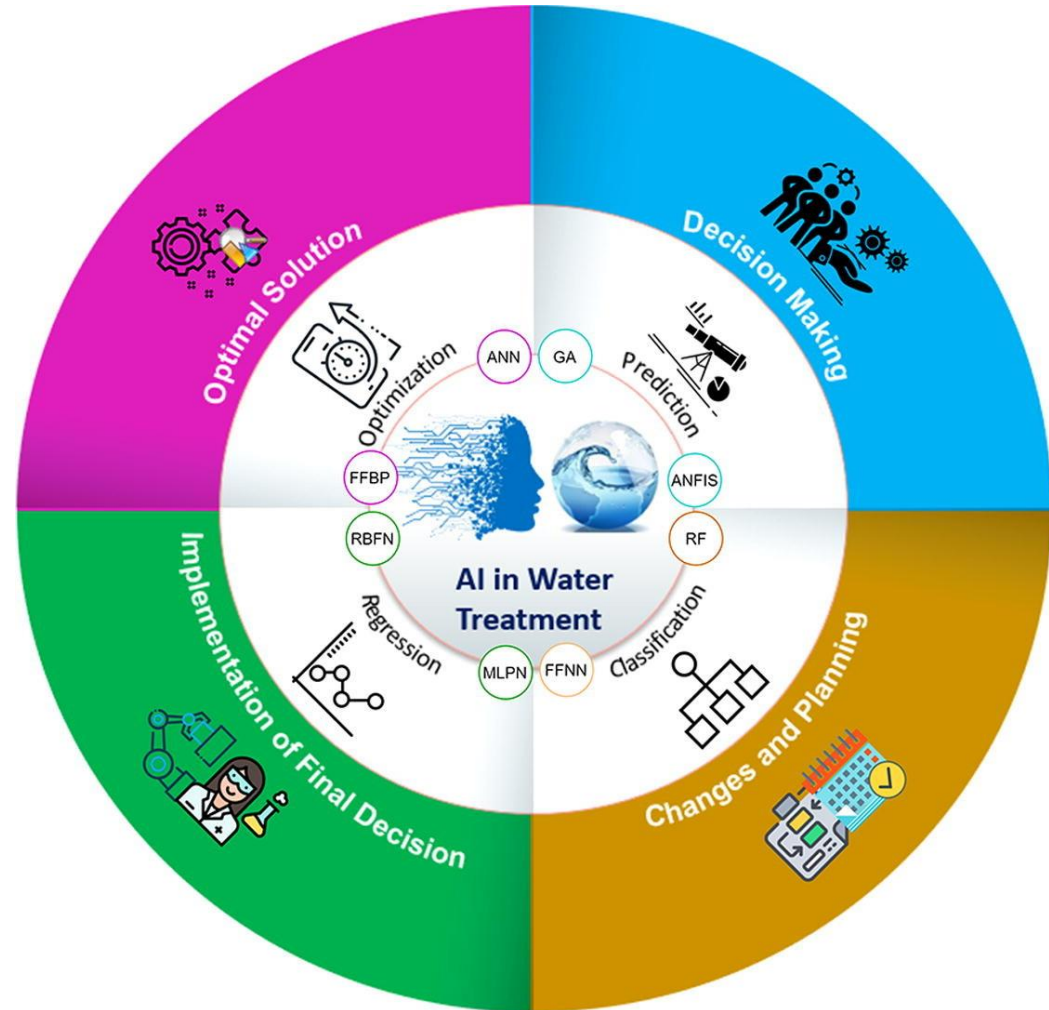
PROBLEMS:

- Waste water is one of the major environmental problems involving the use of freshwater in industry or in domestic applications and cause much problem to aquatic life.
- Waste water management includes many uncertainties and that results fluctuations in waste water. These uncertainties introduce difficulties in its management.[1]



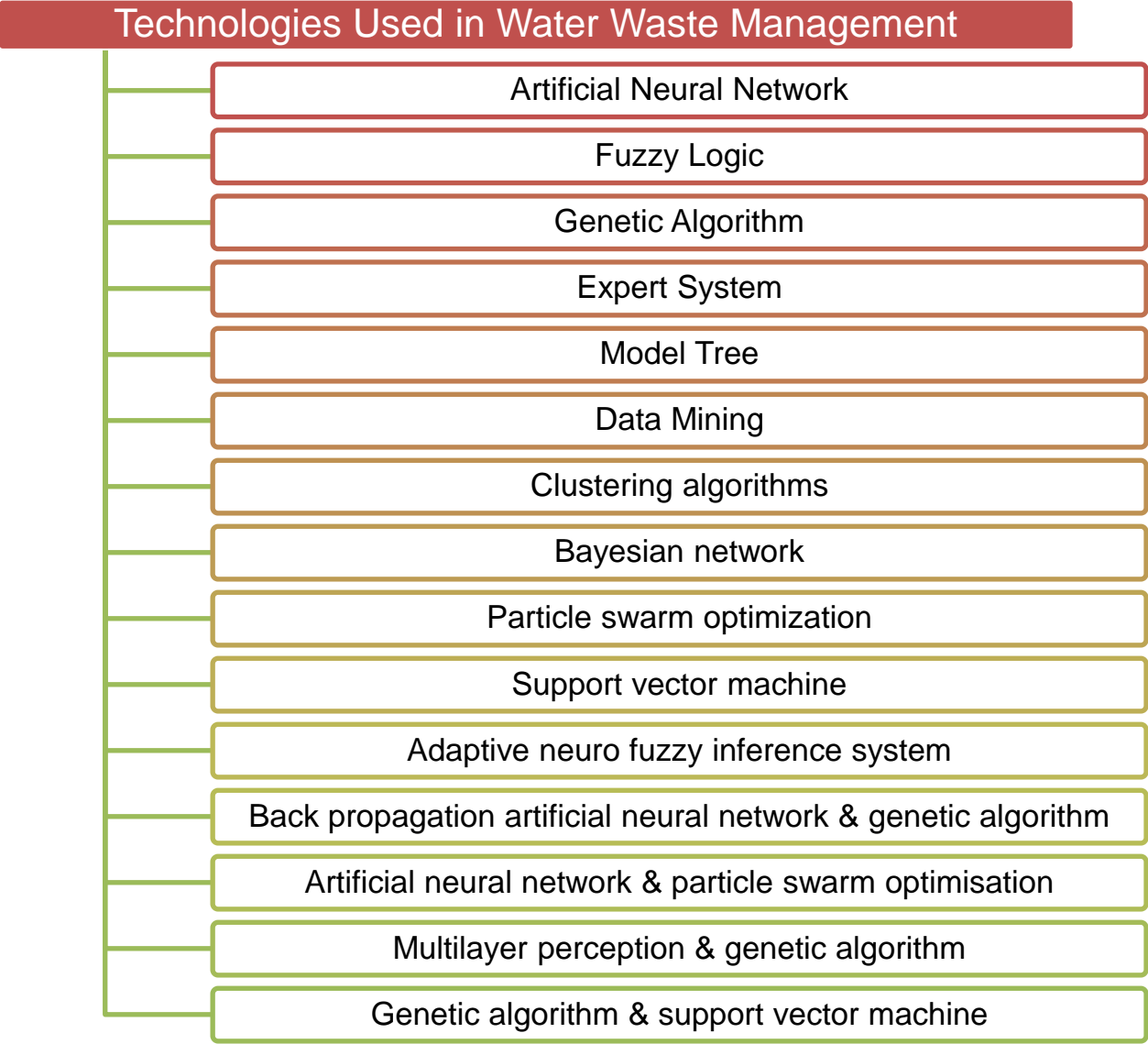
Proposed Solution:

- Artificial Intelligence helps in reducing these uncertainties and helps to manage water waste.
- Artificial Intelligence help to choose absorbents by prediction of their absorbing properties.
- Help Industries to manage water waste to meet new standards.
- Utilizing Artificial Intelligence, water reuse is enhanced through the analysis of consumption patterns, anticipation of demands, and the automation of efficient irrigation. This approach minimizes water wastage and advocates for sustainable water management practices.



This study aimed at water waste management with the help of Artificial Intelligence. Artificial Intelligence helps in various way to manage water waste. The water waste is a very complex process as it contains many factors like chemicals, physical, microbial, etc. Aqueous pollutant reduction and water environment quality promotion has very important step which is waste water treatment. This process includes many uncertainties and Artificial Intelligence helps to reduce these. This technology is applied to WWTPs to overcome this problem.[1]

Artificial Intelligence has many application to overcome the complications of traditional methods. Commonly used techniques of Artificial Intelligence are Recurrent Neural Network (RNN), Convoluted Neural Network (CNN), Decision Tree (DT), Feed Forward Back-Propagation Neural Network (FFBPNN), and Adaptive Network Based Fuzzy Inference System (ANFIS). The availability of data in this field is major issue in applications as Artificial Intelligence predicts based on past events or facts.[2]



- Artificial Intelligence helps to solve many environmental problems and Water Waste Management is one of them. Using various techniques Artificial Intelligence can help in treatment of water waste.
- This aims in improvement of aquatic life and water environment.
- This process is affected by complex chemicals, physical and microbial factors.
- To conduct appropriate operational controls on the system operators are required by stochastic perturbations and influent variability.[1]
- Various natural phenomena and waste treatment process creates many uncertainties in treatment system of waste water.[1]
- Due to modern standards water waste treatment plants (WWTPs) face various problems and hence they take help of Artificial Intelligence to manage this problem.[1]
- Various machine learning and deep learning techniques are employed to do all these works. GA, RNN, CNN, DNN, etc. are the main technologies used for water waste management.[2]
- Artificial intelligence models uses experimental data to simulate, predict, provide confirmation and optimization in contaminant removal in waste water treatment process.
- Data is usually divided into training, validation and testing parts.[2]

Industrial Wastewater Treatment Technology Database (IWTT)

IWTT allows you to access industrial wastewater treatment technology performance data identified from data sources meeting data quality criteria. Data sources include peer-reviewed journals, conference proceedings, industry-specific organizations, and government reports. Please see [About IWTT](#) for more information and [Help](#) for instructions on how to use the tool.

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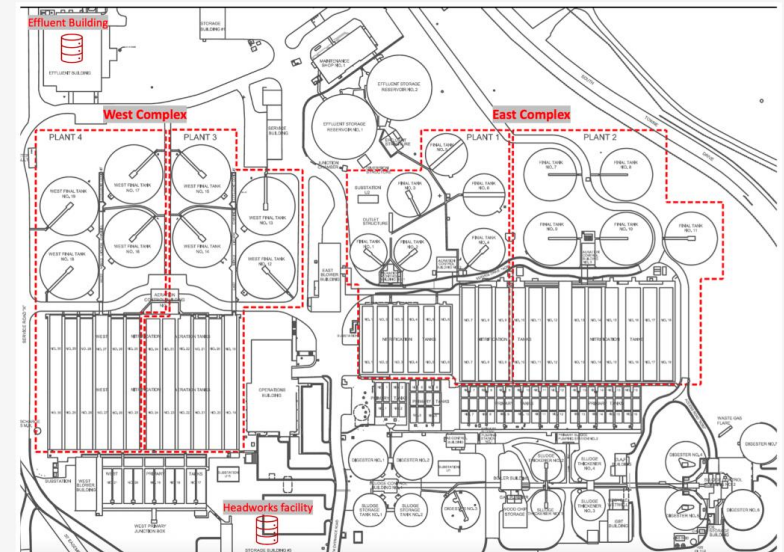
The IWTT data set is available for download as a compressed ZIP file containing several comma-delimited text files. The IWTT data dictionary is available for download as an XLSX file and provides a description of the fields in the IWTT data set.

- [IWTT Data Set \(ZIP\)](#) (318 K, February 2020)
- [IWTT Data Dictionary \(XLSX\)](#) (31 K, September 2017)



- Artificial Intelligence hybrid techniques are new ones that use combination of more than one Artificial Intelligence techniques to provide predictions and help in waste water management.
- Usually four commonly used techniques GA, PSO, RNN, SVM are used in combination with other techniques to attain accuracy in field.
- Artificial Intelligence also does modelling and optimisation of treatment process, for example modelling of pollutant removal from water.
- Predicts efficiency of absorbents and helps to increase absorbing capacity by providing some ways to do this
- Removal of Dyes, Heavy Metals, Pollutants are done using Artificial Intelligence as it reduces experimental costs.[3]
- There are also many drawbacks of these technologies such as ANNs has poor reproducibility and sometimes results in locally optimal solution. These techniques also require sufficient training and testing data for finding local minima and overfitting.[3]
- A sudden change in parameters results in wrong prediction and results go wrong.

Figure 2. The general layout of the Nine Springs Wastewater Treatment Plant and the data sampling locations.



[6]

Conclusion

- The transformative potential of Artificial Intelligence helps to revolutionize the water waste management process.
- Various Artificial Intelligence tools like RNN, CNN, DNN, SVM, etc. both single and hybrid helps to successfully predict the performance of absorbents for removal of wastes in water.[4]
- These tools reduces uncertainties of environment and hence simplifies the process.[1]
- The main element of this process is data which is used for experimental testing and training of Artificial Intelligence Models.
- Adaptability of these models have to be taken in mind to make them future ready
- Although the difficulties these models will help in bright future of waste water treatment applications.

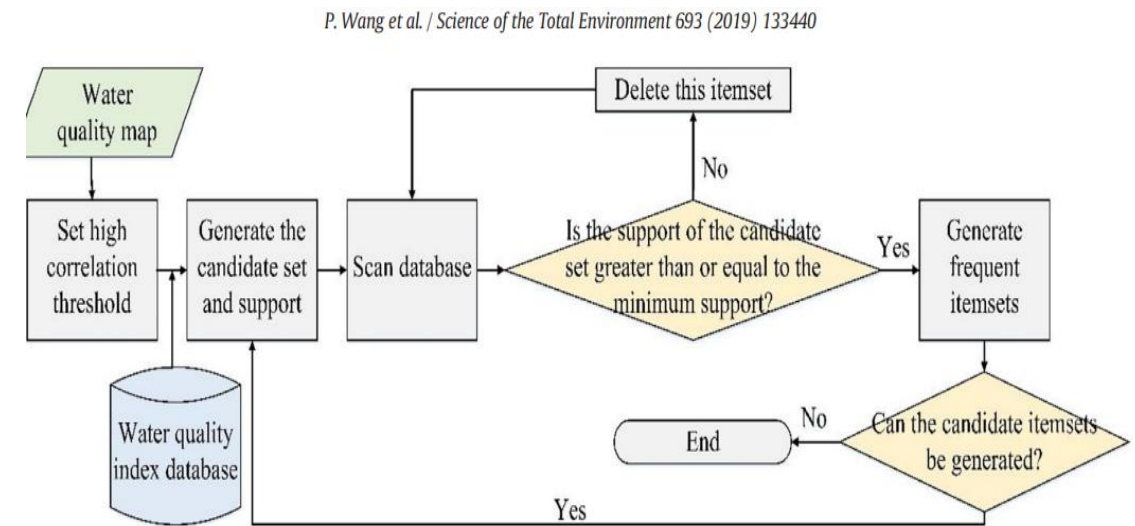


Fig. 3. Flow chart for the frequent water quality indicator itemsets.

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