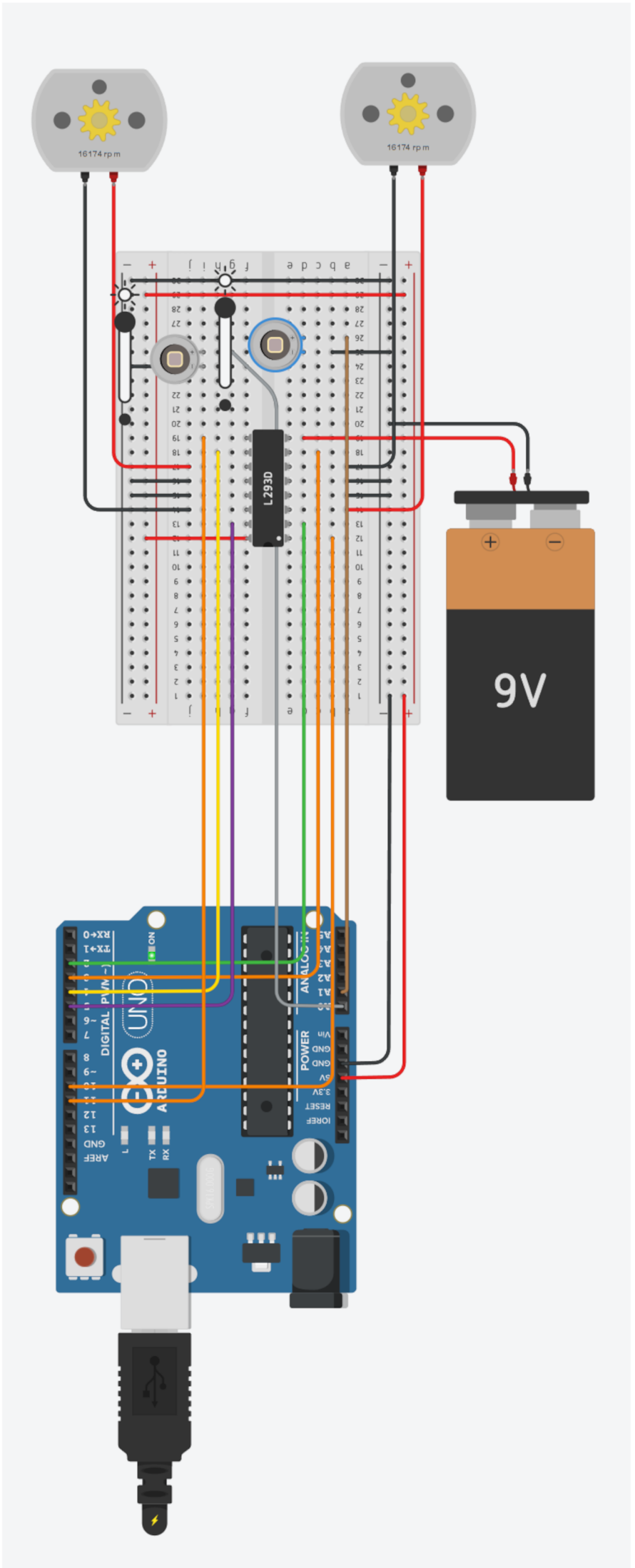
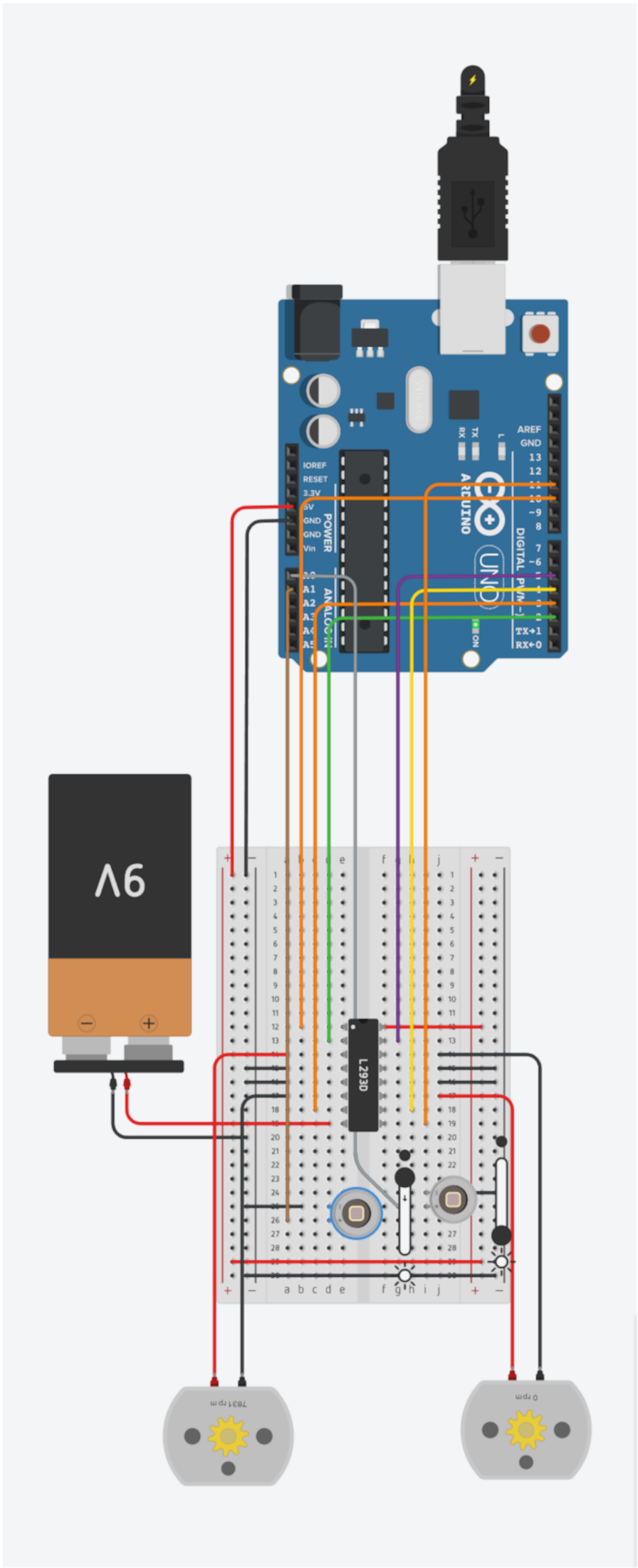

16174 rpm
16174 rpm
L293D
9V
UNO
ARDUINO
DIGITAL (PWM~)
POWER
ANALOG IN


AREF
GND
13
12
~9
8
7
~6
~5
4
~3
2
TX→1
RX←0
DIGITAL (PWM~)
ON
L
TX
RX
ARDUINO
UNO
IOREF
RESET
3.3V
5V
GND
GND
Vin
POWER
A0
A1
A2
A3
A4
A5
ANALOG IN
A6
L293D
783 rpm
0 rpm

Artificial Intelligence in Waste Water Management

Abhishek Kapoor 1,a) and Ayush Mahajan 1,b) and Bhavyan Gupta 1,c)

1) Department of Computer Science & Engineering, Chitkara University Institute of Engineering Technology,Chitkara University, Rajpura, Punjab – 140401

a) Corresponding author: abhishek3764.beai23@chitkara.edu.in

Presented

by

Abhishek Kapoor

(2310993764)

Paper ID: PI-30

Abstract

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.

Introduction

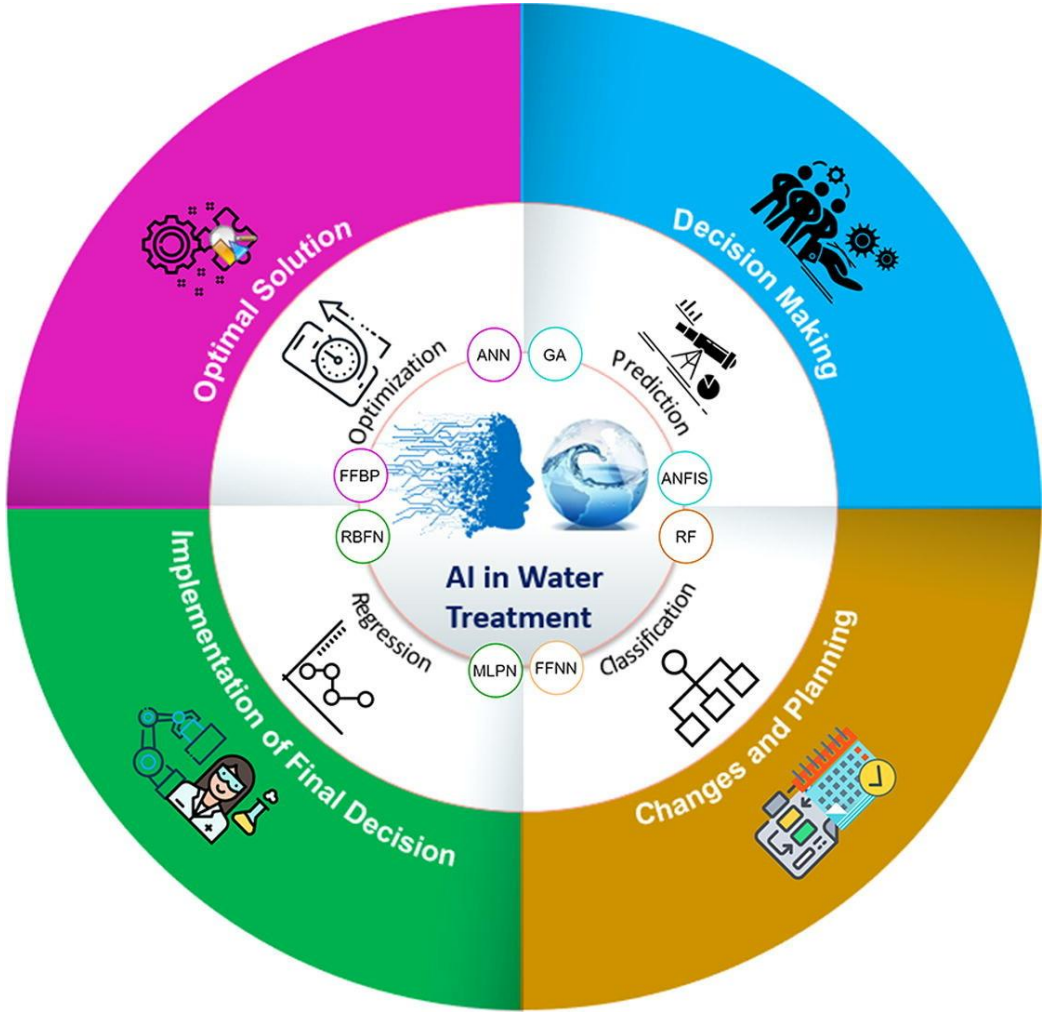
PROBLEMS:

- 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 Solutions

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]

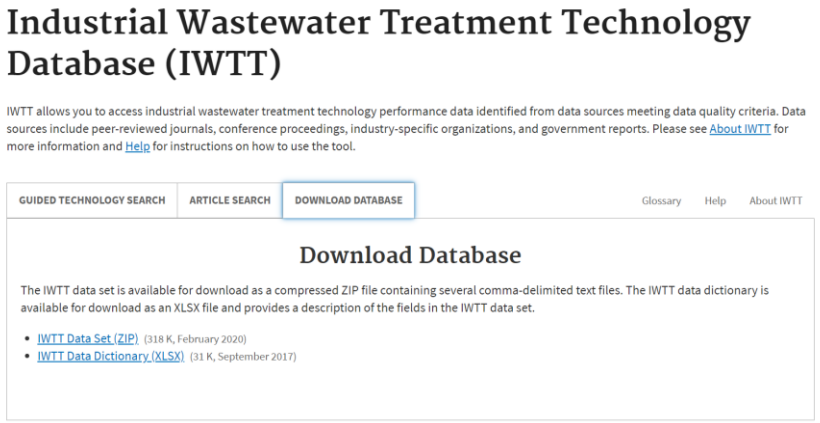
Artificial Intelligence has many application to overcome the complications of traditional methods. Commonly used techniques of Artificial Intelligence are Recurrent Neural Network (RNN), Convoluted Neural Network (CNN), Decision Tree (DT), Feed Forward Back-Propagation Neural Network (FFBPNN), and Adaptive 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]

Technologies Used in Water Waste Management

- Artificial Neural Network
- Fuzzy Logic
- Genetic Algorithm
- Expert System
- Model Tree
- Data Mining
- Clustering algorithms
- Bayesian network
- Particle swarm optimization
- Support vector machine
- Adaptive neuro fuzzy inference system
- Back propagation artificial neural network & genetic algorithm
- Artificial neural network & particle swarm optimisation
- Multilayer perception & genetic algorithm
- Genetic algorithm & support vector machine

Artificial Intelligence for Water Waste Management: Techniques

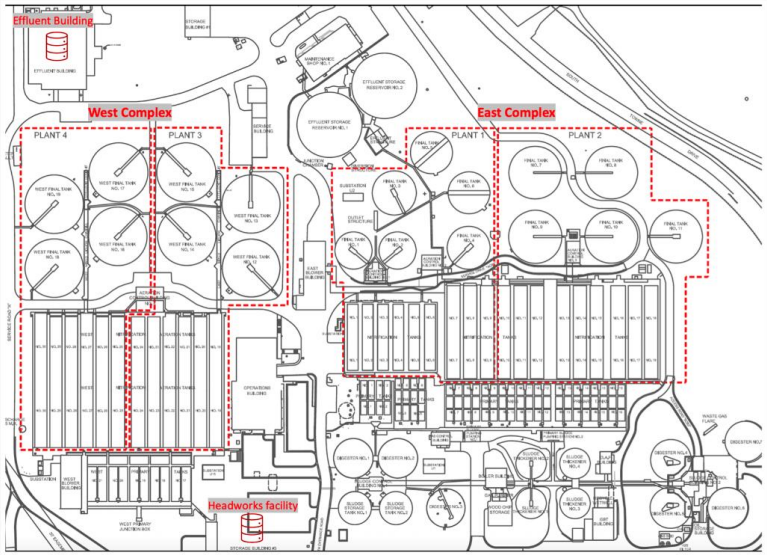
- Artificial Intelligence helps to solve many environmental problems and Water Waste Management is one of them. Using various techniques Artificial Intelligence can help in treatment of water waste.
- This aims in improvement of aquatic life and water environment.
- This process is affected by complex 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]



Results and Discussion

- Artificial Intelligence hybrid techniques are new ones that uses combination of more than one Artificial Intelligence techniques to provide predictions and helps 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 do 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 reduce 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 goes 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.

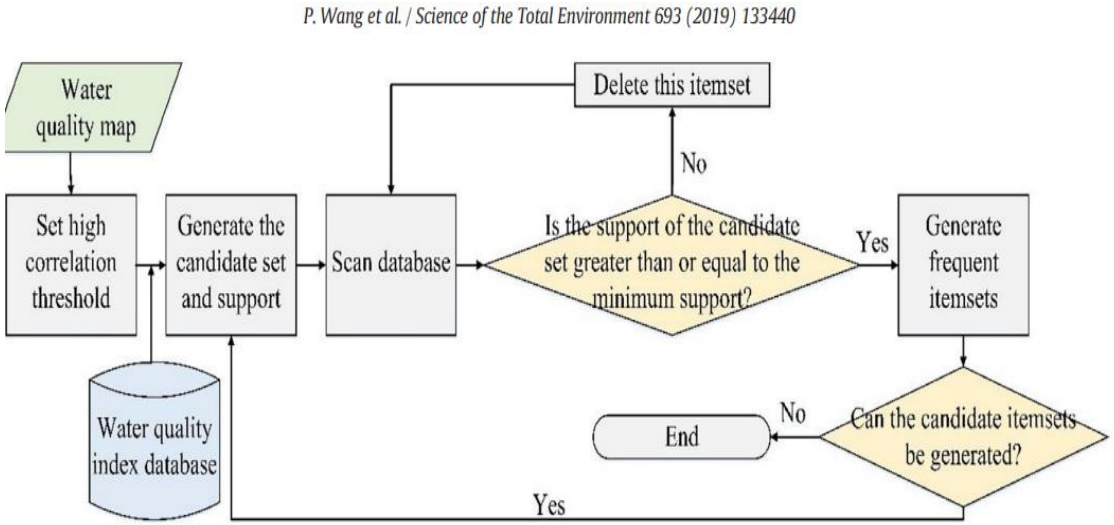


Fig. 3. Flow chart for the frequent water quality indicator itemsets.

[5]

References

[1] Lin Zhao, Tianjiao Dai, Zhi Qiao, Peizhe Sun, Jianye Hao, Yongkui Yang, “Application of artificial intelligence to wastewater treatment: A bibliometric analysis and systematic review of technology, economy, management, and wastewater reuse”, doi: https://doi.org/10.1016/j.psep.2019.11.014

[2] Gulzar Alam, Ihsanullah Ihsanullah, Mu. Naushad, Mika Sillanpä ä, “Applications of artificial intelligence in water treatment for the optimization and automation of the adsorption process: Recent advancesandprospects”, doi: https://doi.org/10.1016/j.cej.2021.130011

[3] Bhagat, Suraj Kumar; Tung, Tran Minh; Yaseen, Zaher Mundher (2019). *Development of artificial intelligence for modeling wastewater heavy metal removal: State of the art, application assessment and possible future research. Journal of Cleaner Production, (), 119473–*. doi:10.1016/j.jclepro.2019.119473

[4] Abdallah, Mohamed; Abu Talib, Manar; Feroz, Sainab; Nasir, Qassim; Abdalla, Hadeer; Mahfood, Bayan (2020). Artificial intelligence applications in solid waste management: A systematic research review. Waste Management, 109(), 231–246. doi:10.1016/j.wasman.2020.04.057

[5] Wang, Puze; Yao, Jiping; Wang, Guoqiang; Hao, Fanghua; Shrestha, Sangam; Xue, Baolin; Xie, Gang; Peng, Yanbo (2019). *Exploring the application of artificial intelligence technology for identification of water pollution characteristics and tracing the source of water quality pollutants. Science of The Total Environment, 693(), 133440–.* doi:10.1016/j.scitotenv.2019.07.246

[6] Prediction of Wastewater Treatment Plant Effluent Water Quality Using Recurrent Neural Network (RNN) Models by Praewa Wongburi 1,*ORCID andJae K. Park 2, doi: https://doi.org/10.3390/w15193325

shutterstock.com · 1729370272