PERFORMANCE ANALYSIS OF SEWAGE TREATMENT PLANT AT AMBERPET USING MACHINE LEARNING MODELS

INTRODUCTION

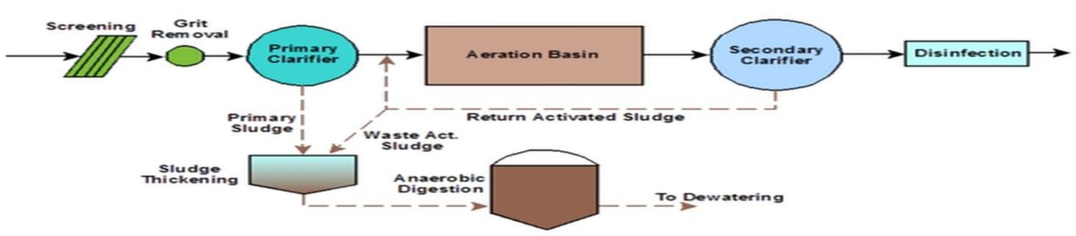
Hyderabad has an estimated population of 8.7 million with a population **density** of 18,480 people per square kilometer (47,000/sq mi) which shows clear increase in population. Many of the new standard techniques like UASB, Anaerobic Sludge blanket, Membrane Bio-Reactor, Anaerobic Filter, Airbag (FAB) have been developed for treating wastewater in India. UASB technology is developed in Amberpet Sewage Treatment Plant which is most cost-effective.

OBJECTIVES

- To estimate the concentration of effluents from wastewater treatment plant at Amberpet, Hyderabad using machine learning models like Artificial Neural Networks (ANN), Support Vector Machine (SVM), and Decision Trees (DT).
- To determine the seasonal variation in the wastewater treatment system.
- Evaluation of the performance and efficiency of the Amberpet plant by collecting 156 samples for a period of 12 months (From January 2018 – December 2018).

STUDY AREA AND METHODOLOGY

The process of treatment includes Screening and Grit Removal, Primary Treatment, Secondary Treatment, Activated Sludge Process, UASB, Disinfection. Coarse Screening is the first unit operation employed to remove large floating objects. Skimming tanks are employed to remove oil and grease from wastewater flow. Grit Chamber is aimed to remove grit particles from wastewater. Secondary treatment of waste water is carried out to remove soluble BOD. An aeration tank is a rectangular tank where microorganisms are exposed to oxygen and food followed by disinfection (adding chlorine to water)



RESULTS AND DISCUSSIONS

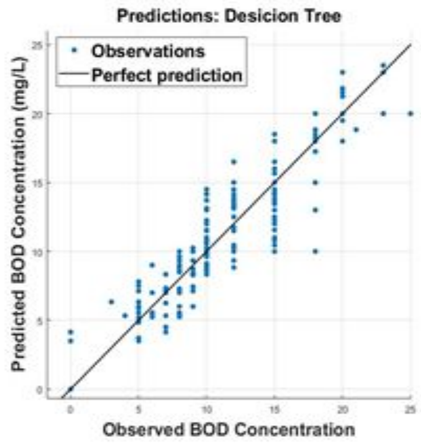


Figure 1: Decision Tree Model to predict the concentration of BOD

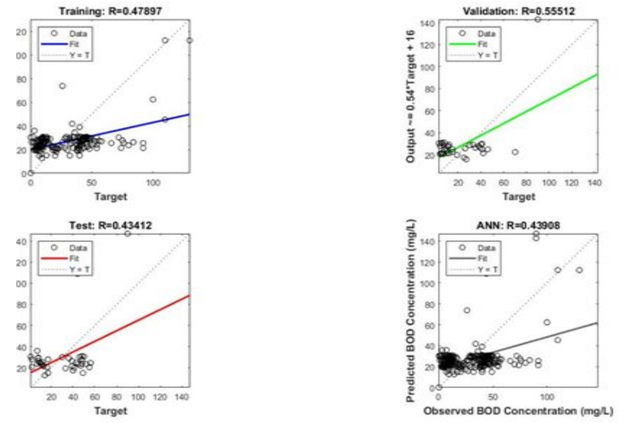


Figure 2: ANN Model to predict the concentration of BOD.

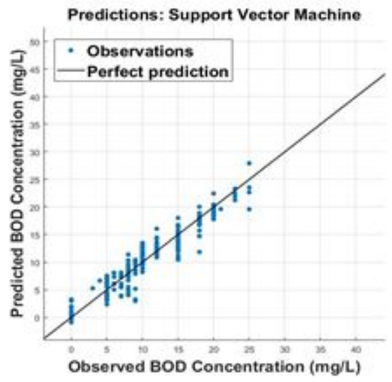


Figure 3: Support Vector Machine Models to predict the Concentration of BOD

ML MODEL	Parameters	RMSE	R^2	MSE
ANN	BOD	5.34	0.29	28.54
DT	BOD	20.86	-0.38	435.29
SVM	BOD	17.79	0.01	316.61

Table 1: To show the RMSE, R^2, MSE using ANN,DT and SVM.

CONCLUSIONS

- The performance of the models is evaluated in terms of R^2, MSE, and RMSE. All the machine learning models performed well. ANN model performed well to estimate the concentration of the BOD. The prediction accuracy of the ANN was slightly higher than the accuracy of the Decision Tree and Support Vector Machine.
- The level of BOD(Biochemical oxygen demand) and COD(Chemical Oxygen Demand) are under limits after the treatment. In pre-summer and summer seasons, the level of COD is high compared to monsoon season

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