

1 Listing the key targets in each chapter

1.1 Chap 1 Introduction

1.2 Chap 2 Literature Review

- Water reclamation in wastewater treatment plant.
 - To talk about what has been done for recovering water from wastewater.
- Water quality forecasting in wastewater treatment plant.

2.1 Water quality forecasting in wastewater treatment plant 2.1.1 Tools and technologies for parameter forecasting in wastewater treatment plant 2.2 Machine learning models for water quality forecasting 2.1.1 Introduction to time-series data 2.1.1 Machine learning models and comparison 2.1.2 Review of existing cases of applying machine learning for water quality forecasting 2.3 Techniques for improving model forecasting performance 2.3.1 Data pre-processing with smoothing and outlier removal 2.3.1 Implementation of weight regularization to avoid model overfittings 2.3.2 Other regularization methods to avoid model overfittings

1.3 Chap 3 Materials and Methods

1. Data collection
 - Collecting **ammonia data** from the on-line ammonia sensor
 - Collecting **colour data** from the modified colour spectrophotometer
2. Data discovery and profiling
 - Identifying patterns, relationships, and other attributes in the data, including the inconsistencies, anomalies, missing values and other issues so they can be addressed.
3. Data cleansing
 - Smoothing data with polynomial curve and exponentially moving average.
 - Identifying abnormal days with peak detection analysis.
4. Data structuring
 - Organize data into the accessible form to python script.
5. Data transformation and enrichment
 - Adding ammonia/colour data as new features.
 - Creating new features (feature engineering).
 - Transforming data into training/testing format.
6. Model training
 - Select baseline models.
 - RF, DNN, LSTM, Transformer
 - Train model with different training input.
 - 2 filters.
 - Remove abnormal days
 - With/without colour/ammonia features.

- With/without engineering features.
- 7. Model evaluation
 - Compare results in RMSE, R2, train/test loss.
 - Show the attention layer map.
- 8. Results
 - Generate the optimized method to forecast ammonia/colour. ##
 Chap 4 Results and Discussion ## Chap 5 Conclusions and Recommendations