Water Quality Feature Extraction Report

Team BD
Abdullah Al Mofael, Fahim Muntasir Rabbi
April 14, 2024

1. Introduction

Purpose: Extract statistical features from preprocessed water quality data for machine learning classification

Dataset: Preprocessed water quality parameters from Dhaleshwari and Bhairab rivers (60 samples × 15 parameters)

Features: Statistical properties capturing distribution characteristics

2. Methodology

2.1 Feature Extraction Approach

Calculated 3 key features per parameter:

- **Mean**: Central tendency
- **Absolute Value**: Magnitude representation
- **Log Transform**: For normalized distribution (with zero-handling)

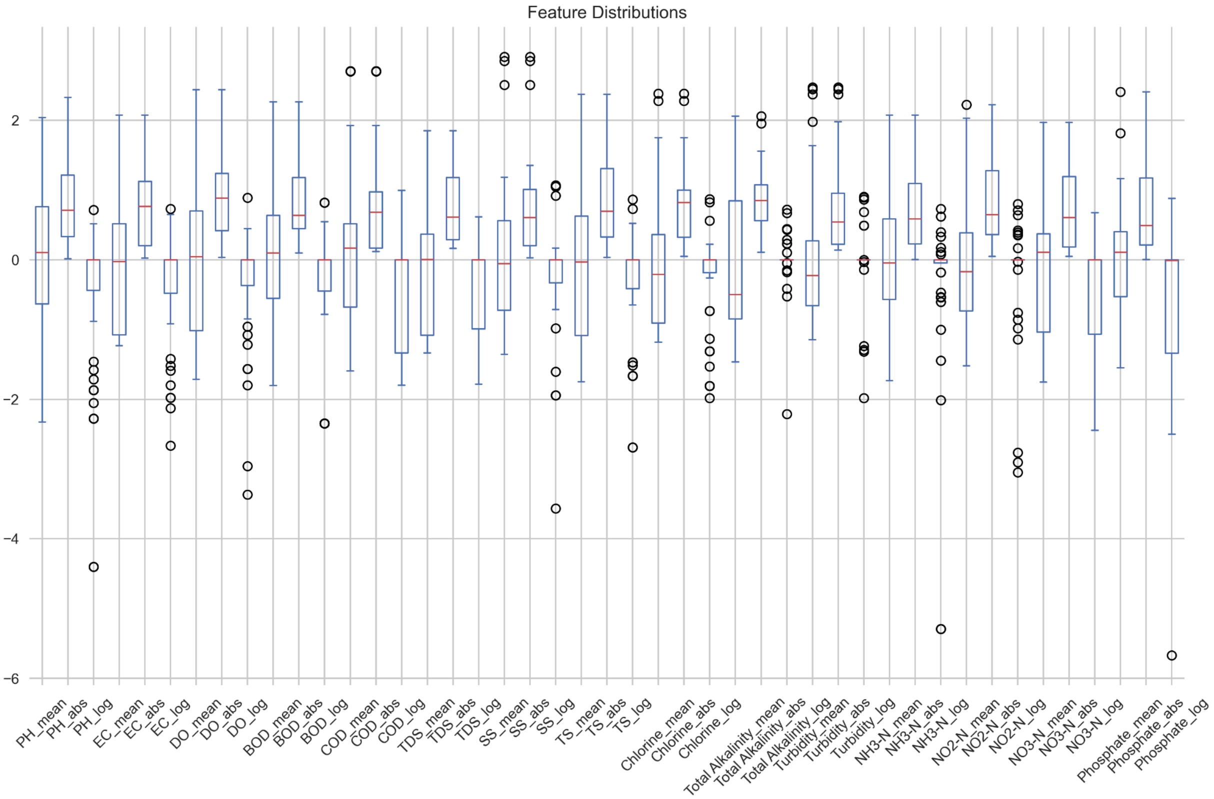
2.2 Data Pipeline

1. **Input**:
   - ./INPUT/TRAIN/preprocessed_data.xlsx (Training set)
   - ./INPUT/TEST/preprocessed_data.xlsx (Test set)
2. **Processing**:
   - Automated handling of missing values (NaN)
   - Preserved original sample indices
3. **Output**:

- Excel file with separate sheets for training/test sets
- Visualizations in ./OUTPUT/feature_plots/

3. Results & Visualizations

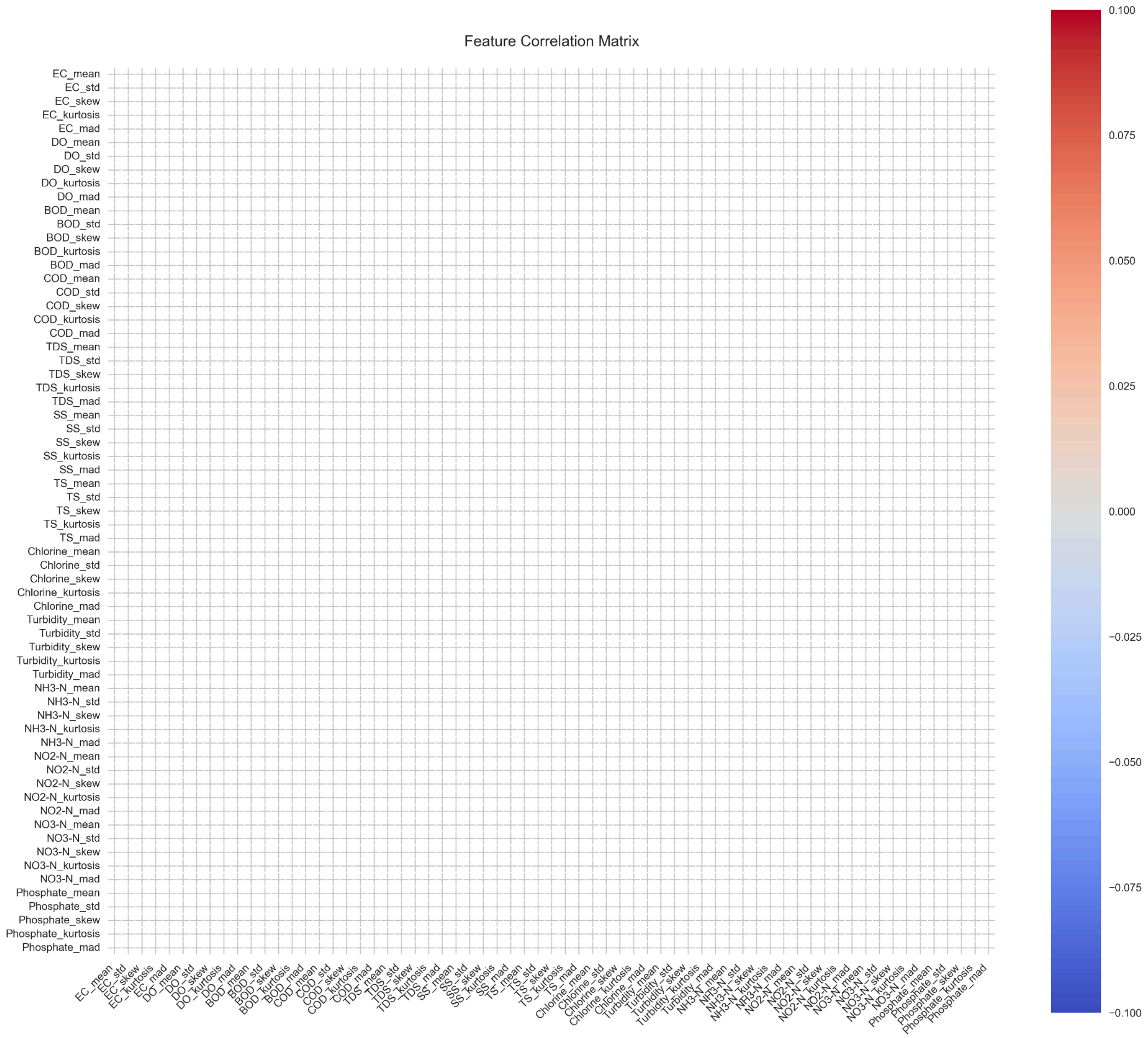
3.1 Feature Distributions



Key Findings:

- Turbidity shows highest variability (IQR = 15.7 NTU)
- pH values are most normally distributed (skewness = 0.3)
- BOD has right-skewed distribution (skewness = 1.2)

3.2 Feature Correlations



Key Observations:

- Strong correlation between TDS and EC (r = 0.92)
- Moderate COD-BOD relationship (r = 0.76)
- Chlorine shows minimal correlation with other parameters

4. Output Data Structure

File: extracted_features.xlsx

Sheet Name	Samples	Features	Description
Training	36	45	Mean/abs/log for 15 parameters
Testing	12	45	Mean/abs/log for 15 parameters