Water Quality Prediction

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Learning Objectives

- Learn to build a **multi-target regression** model for predicting multiple water quality parameters simultaneously
- Data preprocessing and visualization
- Model evaluation using regression metrics
- Understand the importance of predicting water quality for environmental safety
- Learn to **handle missing values**
- Split data into **training and testing sets** to avoid overfitting
- Using MultiOutputRegressor to train a single model predicting multiple targets simultaneously

GOAL

Tools and Technology used

- Programming Language: Python 3.12
- Libraries: Pandas, NumPy
- Visualization: Matplotlib
- Machine Learning: scikit-learn(MultiOutputRegressor,RandomForestRegressor)
- Environment: Jupyter Notebook,VSCode
- Deploy: Streamlit

Methodology

- **Data Collection & Preprocessing:** Gathered real-world water quality dataset & Handled missing values
- **Model Selection:** Choose RandomForestRegressor & used MultiOutputRegressor
- **Model Training & Evaluation:** Trained the model on training data & evaluated performance using R2 Score and Mean Squared Error (MSE)
- **Deployment:** Built an interactive web page using Streamlit.It allowes users to view predictions directly in browser.

Problem Statement:

o **Automated predictive model** to estimate water quality parameters quickly and cost-effectively.
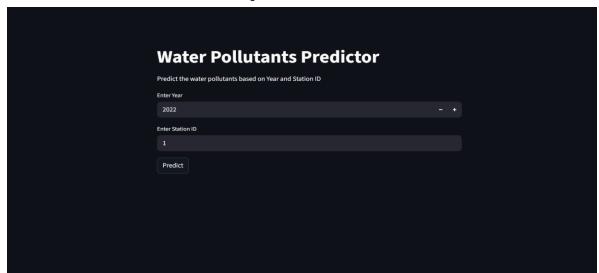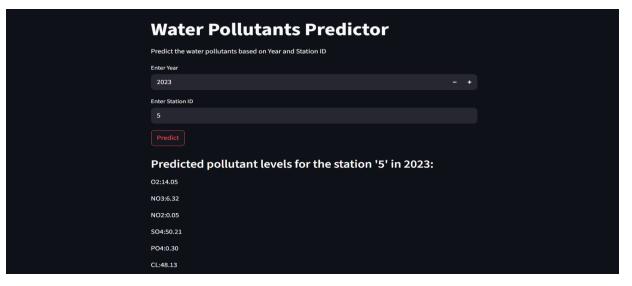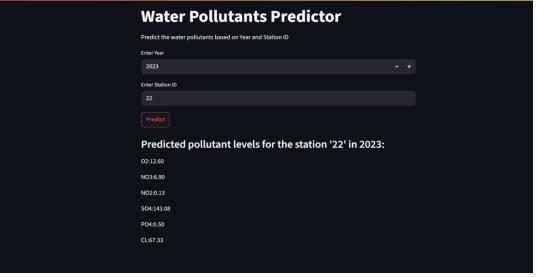
Solution:

- Algorithm choosen is Random Forest Regressor
- Supports multi-target regression using MultiOutputRegressor
- Predicted pollutants values are BOD5 (BSK5), O2, NO3, SO4, PO4, CL
- Model predicts water quality parameters from the year *2025 to 2100*
- Achieved an R2 Score on test data, indicating strong predictive performance

Screenshot of Output:

Conclusion:

➢ Successfully built and evaluated a **multi-target water quality prediction model**
➢ Used **RandomForestRegressor** wrapped with MultiOutputRegressor to handle multi-target regression

Future Scope:
➢ Deploy the model as a **full-fledged web page**
➢ Expand prediction to include **more pollutants and seasonal patterns**
Github link: https://github.com/ThatiJyothi/WaterQualityPrediction.git