AutoJudge — Predicting Programming Problem Difficulty

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Overview:

Online coding platforms such Codeforces, CodeChef assign difficulty labels and scores to programming problems.
These ratings are typically based on human judgment,which can be subjective and slow.

AutoJudge is a machine learning–based system that automatically predicts **Difficulty Class**: Easy / Medium / Hard and **Difficulty Score**: A numerical difficulty score using only the textual content of a problem statement.
The system is trained on a labeled dataset and deployed through an interactive Streamlit web application.

Methodology:

1. **Data Preprocessing**
   Combined all textual fields into a single full_text feature.
   Handled missing values by replacing them with empty strings
2. Feature extraction:
   To convert text into numerical features:
   - TF-IDF Vectorization: Captures important words and phrase, using unigrams and bigrams
   - Hand-crafted features: Text length, Count of mathematical symbols (+-*/=<>)

   These features are concatenated to form the final input vector.

3. Model — Classification:

Support Vector Machine (LinearSVC) is used to predict the 3 difficulty classes- Easy, Medium and Hard. SVM was chosen as it performs well on high-dimensional text data and is robust for classification tasks.

Evaluation Metrics

- Accuracy
- Confusion Matrix
- Precision / Recall / F1-Score

4. Model- Regression:

Random Forest Regressor is used to predict numerical difficulty score.
It captures non-linear relationships and is robust to noisy and subjective labels

Evaluation Metrics

- Mean Absolute Error (MAE)
- Root Mean Squared Error (RMSE)

Results

Achieved a classification **accuracy of 48.48** % and **MAE ~1.7, RSME~2.04.**

This shows reasonable MAE and RMSE given subjective difficulty scores.

Deployment

The trained models are deployed using **Streamlit**, allowing users to:

1. Paste a new problem description
2. Click predict
3. Instantly see predicted difficulty class and predicted difficulty score

For Local run- run streamlit run app.py on your terminal.