AI-Powered Learning Assistant

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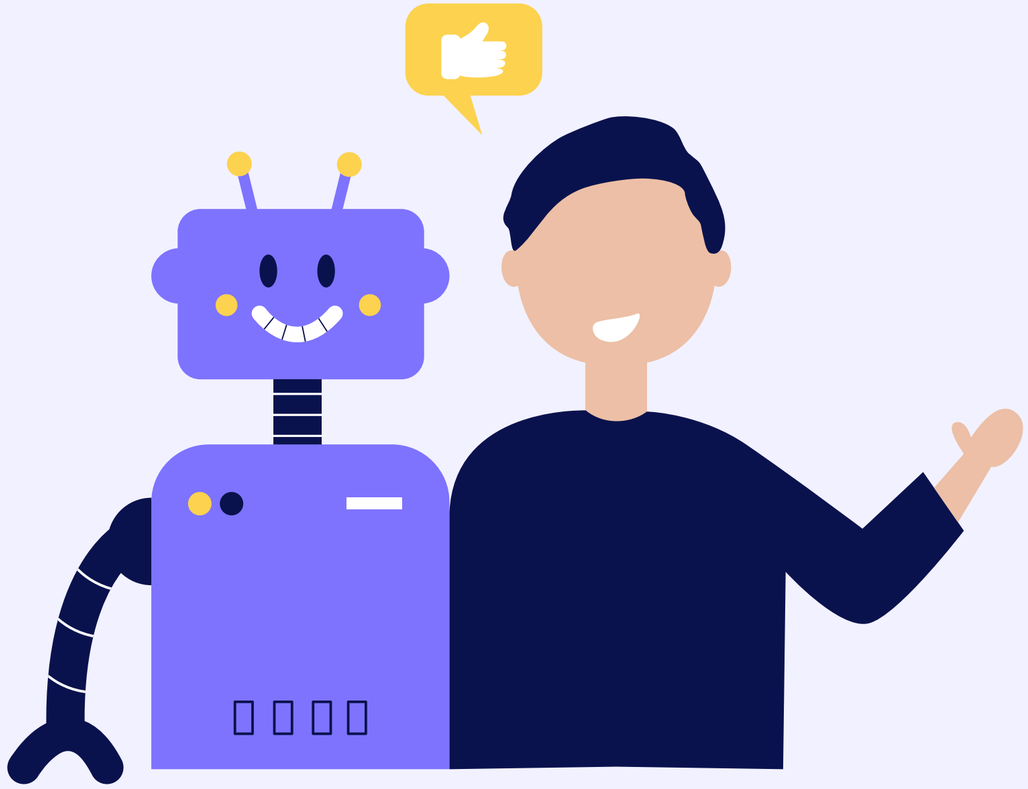
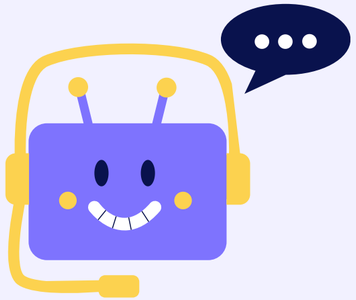
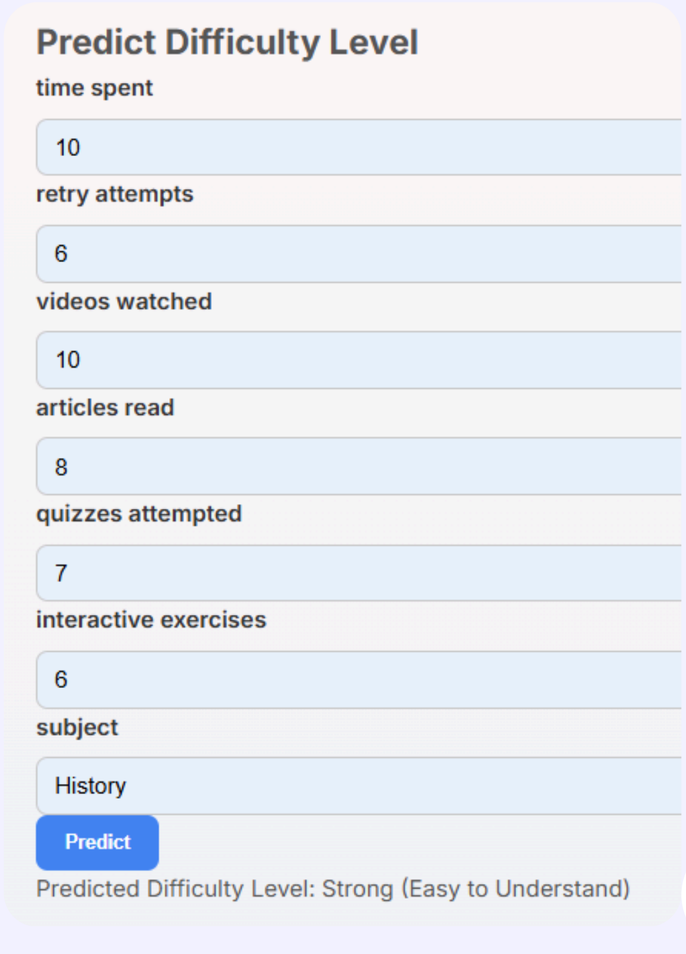




Objective

Predict difficulty level ,detects stress level, and. tutor for answer questions, explain concepts, and generate quizzes.

Difficulty Level Prediction



User Inputs

Features Used:
time_spent, retry_attempts, videos_watched, articles_read, quizzes_attempted, interactive_exercises, subject

ML Models Used

- Random Forest Classifier
- Target: difficulty_level (0 = Strong, 1 = Weak)
- Preprocessing:
  Label Encoding for categorical features
  StandardScaler for numeric features
  Parameters: class_weight='balanced', random_state=42
- Accuracy: 97% Cross Validation: 96.8%

Stress Level Prediction

Predict Stress Level

Time Spent (hours)

10

Retry Attempts

3

Subject

History

Avg Past Quiz Score

20

Predict Stress

Moderate

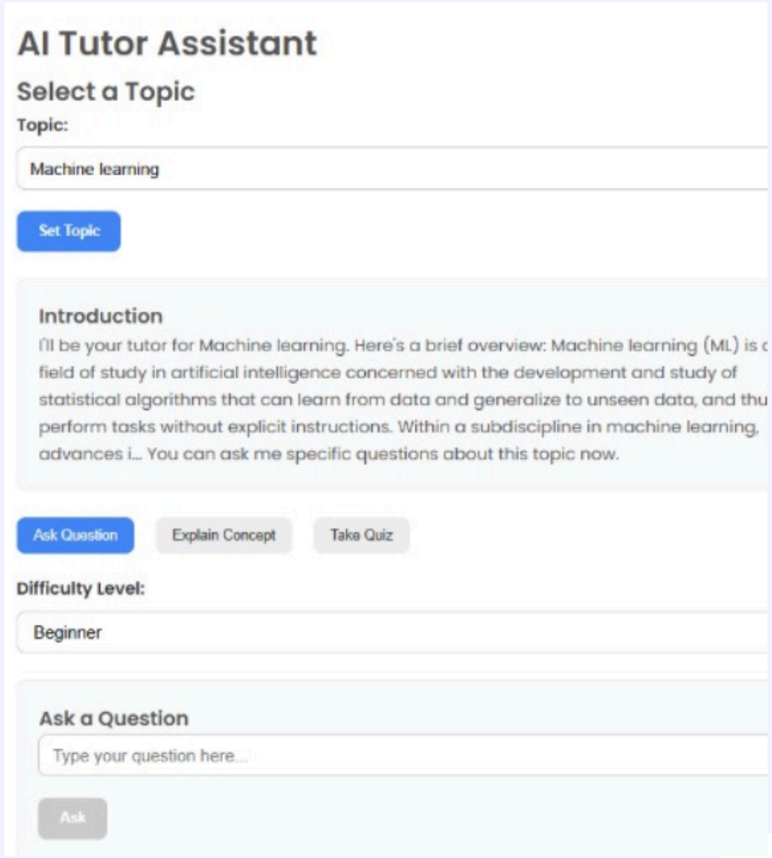
Inputs

time_spent, retry_attempts, past_quiz_score

ML Models Used

- Gradient boosting regressor
- Target: stress_level (0 = Low, 1 = Moderate, 2 = High)
- Preprocessing:
  Rule-based labeling for stress level
  Label Encoding for subject
- Parameters: n_estimators=100, random_state=42
- MAE:0.0041 RMSE: 0.011
- Evaluation: confusion matrix used

Study Tutor



Objective

Use ML models to dynamically explain concepts, answer questions, and generate quizzes based on a user-defined topic

ML MODELS USED

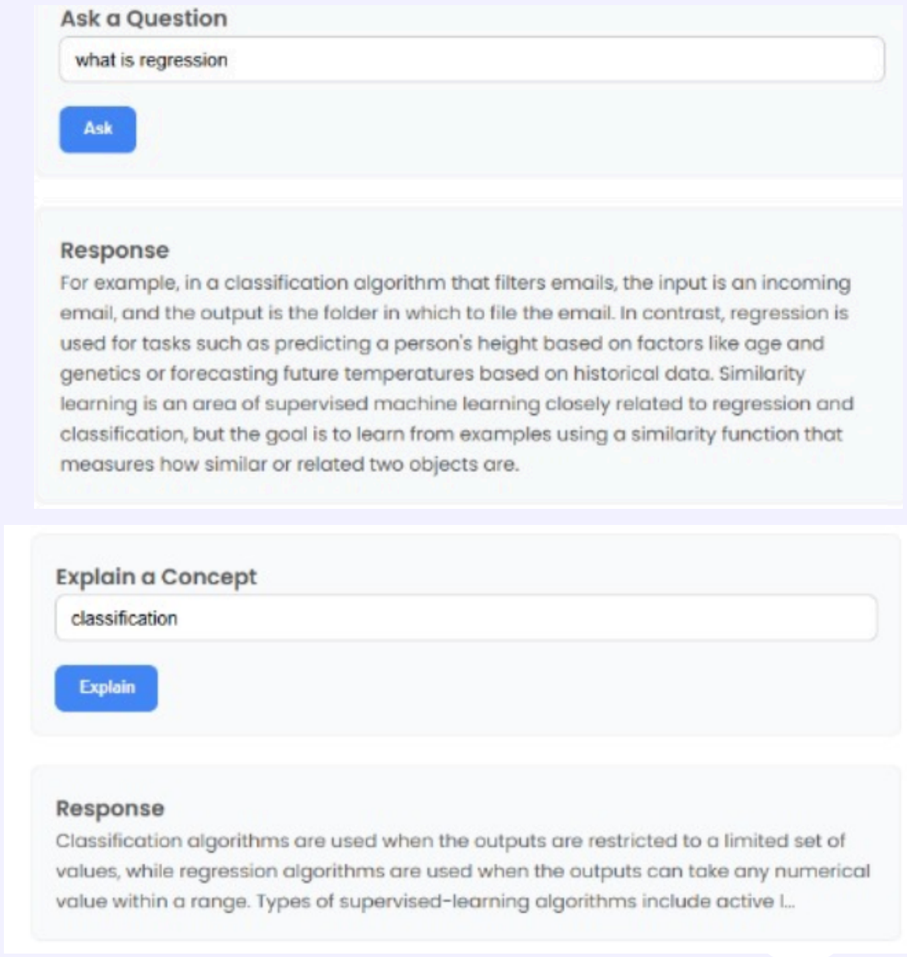
Concept Summarization:

- Model: t5-small
- Task: Summarize topic content retrieved from Wikipedia
- Purpose: Create concise, readable explanations

Question Answering (QA):

- Model: distilbert-base-uncased-distilled-squad
- Task: Extractive QA from summarized concept text
- Purpose: Generate direct answers to user queries

Study Tutor



Model

Semantic Search / Matching:

- Model: sentence-transformers/all-MiniLM-L6-v2
- Task: Embed questions and text for similarity search
- Purpose: Identify relevant content for QA input

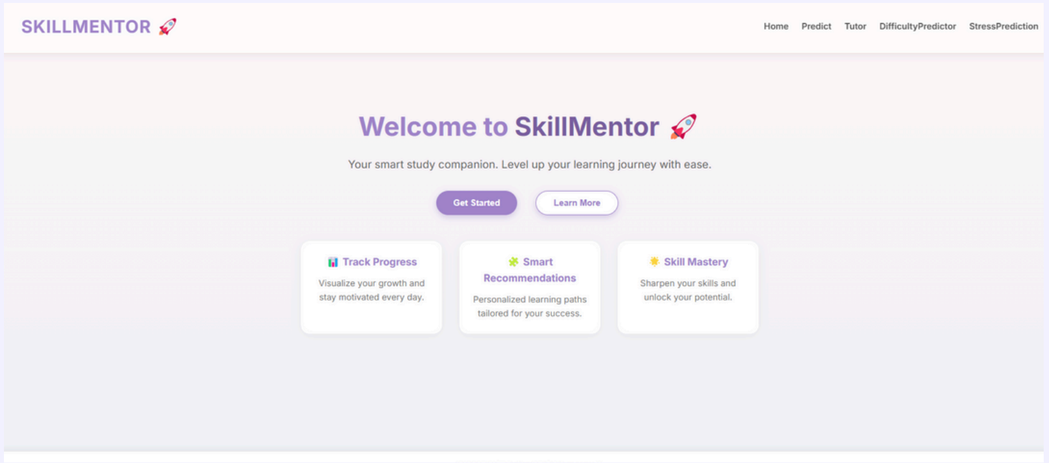
Quiz Generation:

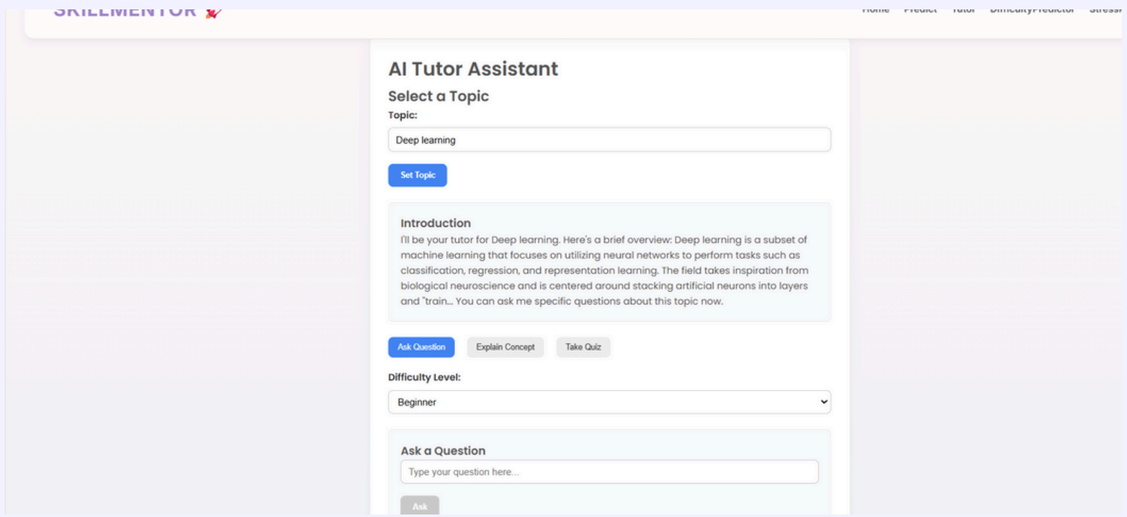
- Logic: Rule-based templates on top of summarized content
- Potential upgrade: Fine-tune generative model in future

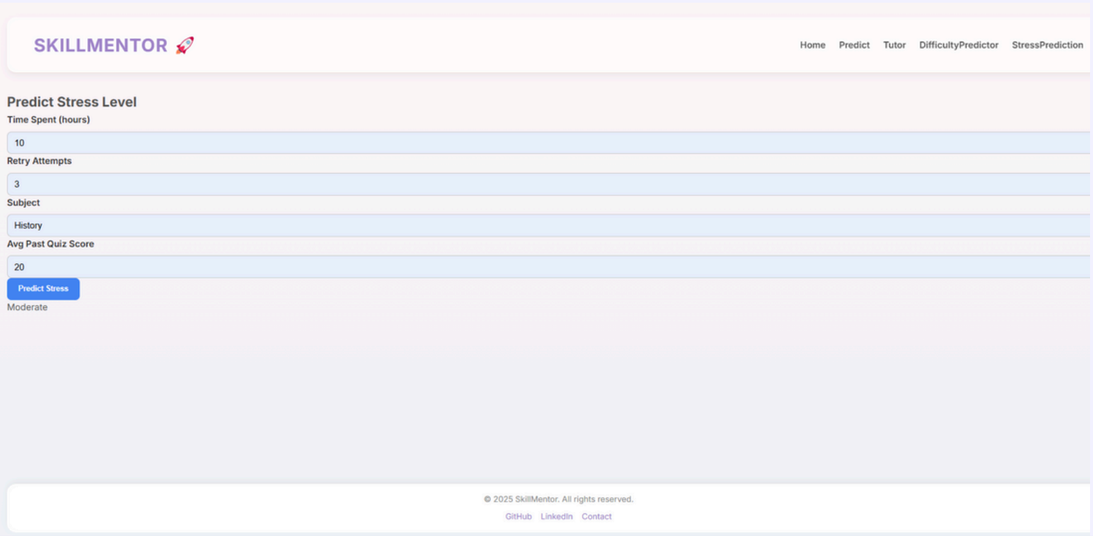
Pipeline Flow:

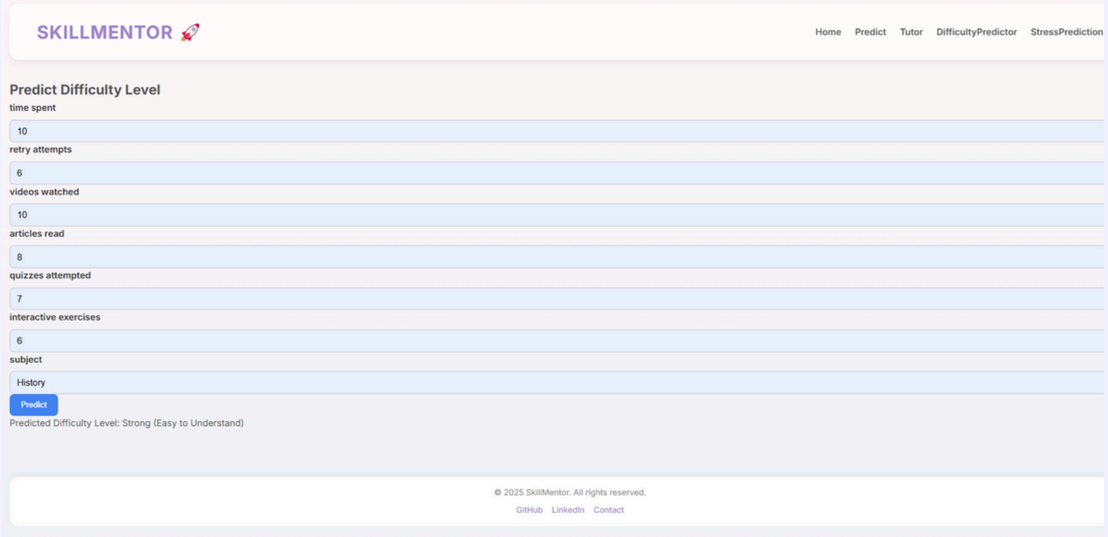
- User Sets Topic →
- Wikipedia Article Retrieved →
- Summarized using T5 →
- QA and Quiz Generated using extractive + semantic ML

Final Outputs









TechStack and Evaluation

Tech Stack:

- Backend: Flask (API)
- Frontend: React + Vite
- ML Frameworks: Scikit-learn, HuggingFace Transformers

DIFFICULTY LEVEL MODEL

```
 Model: Random Forest (Balanced)
Accuracy: 0.97
              precision    recall  f1-score   support

           0       0.98      0.99      0.98       168
           1       0.93      0.88      0.90        32

    accuracy                           0.97       200
   macro avg       0.95      0.93      0.94       200
weighted avg       0.97      0.97      0.97       200

Cross-validation Accuracy: 0.968
```

STRESS LEVEL MODEL

```
Rounded Classification Report:
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       173
           1       1.00      1.00      1.00        21
           2       1.00      1.00      1.00         6

    accuracy                           1.00       200
   macro avg       1.00      1.00      1.00       200
weighted avg       1.00      1.00      1.00       200
```

```
Confusion Matrix (Rounded):
 [[173   0   0]
 [  0  21   0]
 [  0   0   6]]
```