Learning Efficiency Score (LES)

Input Features (X):

- **Total Study Time (TST)** = Logout Time - Login Time
- **Material Engagement (ME)** = Time Spent on Material / Total Material Duration
- **Content Completion Rate (CCR)** = Chapters Viewed / Total Chapters
- **Exam Accuracy (EA)** = Correct Answers / Total Questions
- **Time Efficiency (TE)** = Avg. Time on Correct Answers / Avg. Time on Incorrect Answers
- **Score Improvement (SI)** = (Latest Score - First Score) / First Score

Output (Y):

- **Regression:** Continuous LES between 0 and 1. - Phase 2 – Using Linear regression
- **Classification:** Efficiency categories (Low, Medium, High). - Phase 1 – Using logistic regression

Features:

Total Study Time (TST):

Sum of all login durations.

Material Engagement (ME):

Ratio of actual material viewing time to total chapter material length.

$$ME = \frac{Time\ Spent\ on\ Material}{Total\ Material\ Duration}$$

Content Completion Rate (CCR):

Percentage of contents fully viewed

Exam Accuracy (EA):

Ratio of correct answers to total questions.

$$EA = \frac{Correct\ Answers}{Total\ Questions}$$

Time Efficiency (TE):

Comparison of time spent on correct vs. incorrect answers.

$$TE = \frac{Avg.Time\ on\ Correct\ Answers}{Avg.Time\ on\ Incorrect\ Answers}$$

Score Improvement (SI):

Progression in scores over time

$$SI = \frac{Latest\ Score - First\ Score}{First\ Score}$$

Learning Efficiency Score (LES) Calculation

$$LES = w1 \times ME + w2 \times CCR + w3 \times EA + w4 \times TE + w5 \times SI$$

Normalize each feature to a 0-1 scale for consistency

w1 ,w2 ,w3 ,w4 ,w5 are weights based on importance. The weights will finetune automatically after the linear regression.

Steps to do:

- Labeling: Classify the existing learners to three categories: Basic, Intermediate and Expert
- Labeling 2: Convert the learner category to a score (Basic: 0.25. Intermediate: 0.50, Expert: 0.75)
- Preprocessing: Cleaning up data and removing anomalies.
- Feature extraction: Calculate each feature scores
- Machine learning process:
  1. Do logistic regression using the given features as input and label as output and generate the model.
     a. Result: Identify the learning category the learner belongs to (Basic/Intermediate/ Expert)
     b. Gamification: Based on users' category prediction application can provide a badge.

    c. Can provide recommendations for which scores are low, so what to improve.
2. Do linear regression using the given features as input and label 2 as output.
    a. Result: Identify the learning efficiency score.