

Cognitive Load Estimator for Online Learning

Abstract

Cognitive load is a crucial factor that directly influences the effectiveness of online learning. This project presents the design and development of a Cognitive Load Estimator aimed at monitoring and evaluating learners' mental effort during digital learning activities. The system leverages behavioral data such as task completion time, quiz performance, interaction patterns, and navigation logs, while integrating machine learning models to classify cognitive load into low, optimal, and high levels.

By providing real-time feedback on learner effort, the system enables adaptive interventions such as pacing adjustments, content restructuring, or additional support to reduce overload and improve engagement. This project highlights how cognitive load theory can be practically applied in online education to create intelligent, learner-centered systems. The proposed estimator enhances personalization, optimizes learning experiences, and supports educators in designing more effective digital learning environments.

Objectives of the Project

- To design and develop a framework for estimating cognitive load in online learning environments.
- To collect and analyze behavioral and performance-based data from learners.
- To apply machine learning models for classifying cognitive load levels.
- To implement adaptive strategies that optimize learning experiences.
- To demonstrate the role of cognitive load estimation in enhancing personalized education.

Project Components

Data Sources:

- Task completion time, quiz performance, navigation logs, and interaction patterns.

Machine Learning:

- Classification models to estimate low, optimal, and high cognitive load.

Adaptive System:

- Real-time interventions such as pacing, content restructuring, and support provision.

Software Tools:

- Python (ML models), Learning Management System (LMS) logs, Visualization Dashboard.

Learning Outcomes

By completing this project, students will:

- Understand the concept of cognitive load and its impact on learning.
- Gain hands-on experience in integrating behavioral data with machine learning models.
- Learn to design adaptive systems that personalize learning experiences.
- Develop problem-solving skills in applying AI techniques to education.
- Appreciate the role of data-driven personalization in improving online education systems.

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