Use of Generative AI - Documentation

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1 Overview

In this application, Generative AI is used as a *decision-support layer* to translate predictive model outputs into human-readable, actionable recommendations. Rather than exposing raw model coefficients or technical explanations, the system employs a structured prompt to guide a language model in generating recommendations that are interpretable, ethical, and aligned with empirical findings.

The Generative AI component does not replace the predictive model. Instead, it operates downstream of the supervised learning pipeline to enhance usability and support academic decision-making.

2 Prompt Design and Iterative Enhancement

2.1 Initial Prompt Design

The initial prompt was designed to accept the predicted exam score and student-related inputs, reference a ranked list of factors influencing exam performance, and generate concise recommendations aimed at improving outcomes. However, early iterations produced repetitive suggestions, frequently emphasizing factors that were already strong, such as recommending increased study time even when study hours were sufficient.

2.2 Importance-Aware Recommendations

To address this limitation, the prompt was enhanced to explicitly reference feature importance rankings rather than numeric model coefficients. Recommendations were prioritized based on relative importance, ensuring that guidance focused on factors most strongly associated with exam performance. This abstraction allowed the system to remain model-agnostic while preserving alignment with analytical results.

2.3 Gap-Aware Logic

A key enhancement involved introducing gap-aware logic into the prompt. The language model was instructed to identify which high-impact factors were currently suboptimal and to avoid recommending changes for factors that already exhibited strong or sufficient values. When top-ranked factors did not require intervention, the prompt allowed recommendations to shift to lower-ranked but still relevant areas. This reduced redundancy and improved recommendation relevance.

2.4 Excellence and Consistency Recognition

To prevent a purely deficit-focused approach, the prompt was further enhanced to recognize excellence. The system detects strong performance in high-impact factors and includes reinforcement-oriented recommendations that encourage consistency and sustainability. When all high-impact factors are strong, the prompt shifts fully to reinforcement guidance rather than suggesting further optimization.

2.5 Ethical and Contextual Safeguards

Explicit safeguards were incorporated into the prompt to ensure responsible use. Recommendations are not generated based on sensitive or non-modifiable attributes such as age, gender, or course enrollment. Contextual factors, including exam difficulty and internet access, are used only to adapt the framing of recommendations and are not treated as primary drivers. Additionally, the prompt avoids causal or guaranteed outcome claims.

3 Role of Generative AI in the Application

Generative AI is used exclusively to interpret structured inputs and ranked factor importance and to generate natural-language recommendations for educators. It is not used to predict exam scores, alter model outputs, or make automated decisions affecting students. All predictive logic remains within the supervised learning model, while Generative AI serves as an explainability and communication layer.

4 Benefits of the GenAI Integration

The integration of Generative AI provides several benefits. It translates complex analytical insights into actionable guidance, adapts recommendations to individual contexts without exposing sensitive data, improves adoption by educators through clarity and relevance, and supports consistency, improvement, and sustainability in academic interventions.

5 Summary

Through iterative enhancements incorporating importance awareness, gap detection, excellence recognition, and ethical constraints, the Generative AI component evolved into a reliable recommendation mechanism. This approach demonstrates how Generative AI can effectively complement traditional machine learning models by ensuring that predictive insights are not only accurate but also interpretable, actionable, and responsibly applied in educational settings.