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AutoGradePro: An Automated Grading System for Short-Answer Assessments Using Rule-Based Methods and Large Language Models

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AutoGradePro is an automated grading platform developed to reduce educator's workload in short-answer assessment evaluation in educational institutions. This full-stack web application addresses the limitations in manual grading, particularly excessive time consumption and scalability issues, by leveraging large language models and grading algorithms. The platform is built using Django for the backend, Next.js for the frontend, PostgreSQL database, and Ollama LLM for semantic evaluation. It supports four grading types: exact matching for single-word answers, semantic similarity assessment for short-phrase answers using Ollama's qwen2.5:1.5b model, comparison algorithms for ordered and unordered list-type answers, and predefined range validation for numerical answers. The system processes multiple document formats (TXT, PDF, DOCX, XLSX) through a five-stage pipeline consisting of file upload, format detection, text extraction, answer parsing, and automated grading with report generation. The system can process multiple student answer files simultaneously, which decreases the manual evaluation time and increases efficiency when grading large batches of assessments. Performance evaluation shows high accuracy across objective types: 100% for single-word answers, 92.9% for list-type answers, 84.6% for numerical responses, and 73.3% for short-phrase responses. When grading 20 student files containing 400 questions, average backend processing time was 307.82ms for single-word questions, 601.75ms for list-type questions, and 840.88ms for numerical questions. Compared to manual grading, the system provides a substantial reduction in evaluation time for objective questions and delivers an approximately fourfold increase in processing speed for short-phrase responses. Key features include automated marking scheme parsing, analytics dashboards and spreadsheet results export capabilities. AutoGradePro can reduce repetitive grading tasks while allowing educators to focus on high-value instructional activities.

Keywords: Automated Grading, Full-Stack Web Application, Large Language Models, Semantic Similarity, Short-Answer Assessment