Technology Stack (Architecture & Stack)

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Team ID: LTVIP2025TMID24661
Project Name: SmartTeach AI

Technical Architecture:

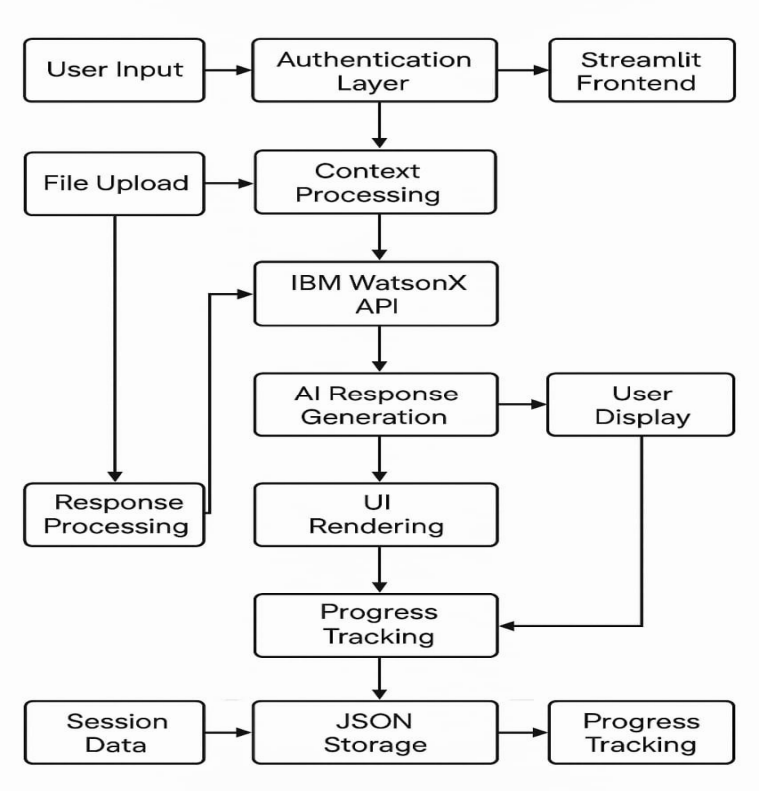

Table-1: Components & Technologies

S.No	Component	Description	Technology
1.	User Interface	Interactive web-based interface for student interaction	Streamlit, HTML, CSS, JavaScript
2.	Application Logic-1	Core business logic and workflow management	Python 3.10+
3.	Application Logic-2	AI-powered chat assistant and NLP processing	IBM WatsonX Granite Foundation Models
4.	Application Logic-3	Quiz generation and assessment system	Python algorithms with dynamic question creation

S.No	Component	Description	Technology
5.	Database	User credentials, quiz history, chat logs storage	JSON-based file storage
6.	Cloud Database	Not implemented (Future scope)	IBM Cloudant (Planned)
7.	File Storage	PDF and image file processing and storage	Local Filesystem with PyMuPDF, PIL
8.	External API-1	Natural language processing and AI responses	IBM WatsonX Foundation Models API
9.	External API-2	OCR processing for image-to-text conversion	Tesseract OCR Engine
10.	Machine Learning Model	Intelligent model selection based on query complexity	IBM Granite Models (Various sizes)
11.	Infrastructure	Application deployment configuration	**Local Server Configuration:** Python 3.10+, Streamlit Server **Cloud Server Configuration:** Streamlit Cloud, Auto-scaling enabled

Table-2: Application Characteristics

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Core development frameworks used	Streamlit, PyMuPDF, Pillow (PIL), pytesseract, BeautifulSoup4
2.	Security Implementations	Authentication, data protection, and session security	hashlib (SHA-256), streamlit-cookies-manager, encrypted session tokens, input validation and sanitization
3.	Scalable Architecture	Modular monolithic architecture with service-oriented components	Python modular design, component-based architecture, API abstraction layers
4.	Availability	High availability through robust error handling and fallbacks	Exception handling, API fallback mechanisms, session persistence, 99.9% uptime target

S.No	Characteristics	Description	Technology
5.	Performance	Optimized response times and resource utilization	Model selection algorithms, response caching, efficient file processing, <3s response time target

References:

- https://c4model.com/
- https://developer.ibm.com/patterns/ai-powered-backend-system-for-order-processing-during-pandemics/
- https://www.ibm.com/cloud/architecture
- https://streamlit.io/
- https://www.ibm.com/watsonx