



Arabic Learning Management System (LMS) mobile application

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Introduction

Our project presents an AI-based Learning Management System (LMS) mobile application designed to transform Arabic-language education. The system caters to two types of end users: Teachers and Students. The teacher's role includes uploading educational materials in the form of PDFs, and using the system's automated question generation feature to create assignments and exams. Teachers can also view their students' exam grades to assess their performance.

For students, the system provides the ability to take exams with questions intelligently tagged based on the curriculum. After completing exams, students can view their grades for each assessment. Additionally, the system recommends learning resources tailored to their weaknesses, helping them improve their understanding of the subject matter.

By streamlining exam creation, grading, and performance review, this AI-powered LMS enhances the teaching and learning experience for both educators and students in Arabic-based education.

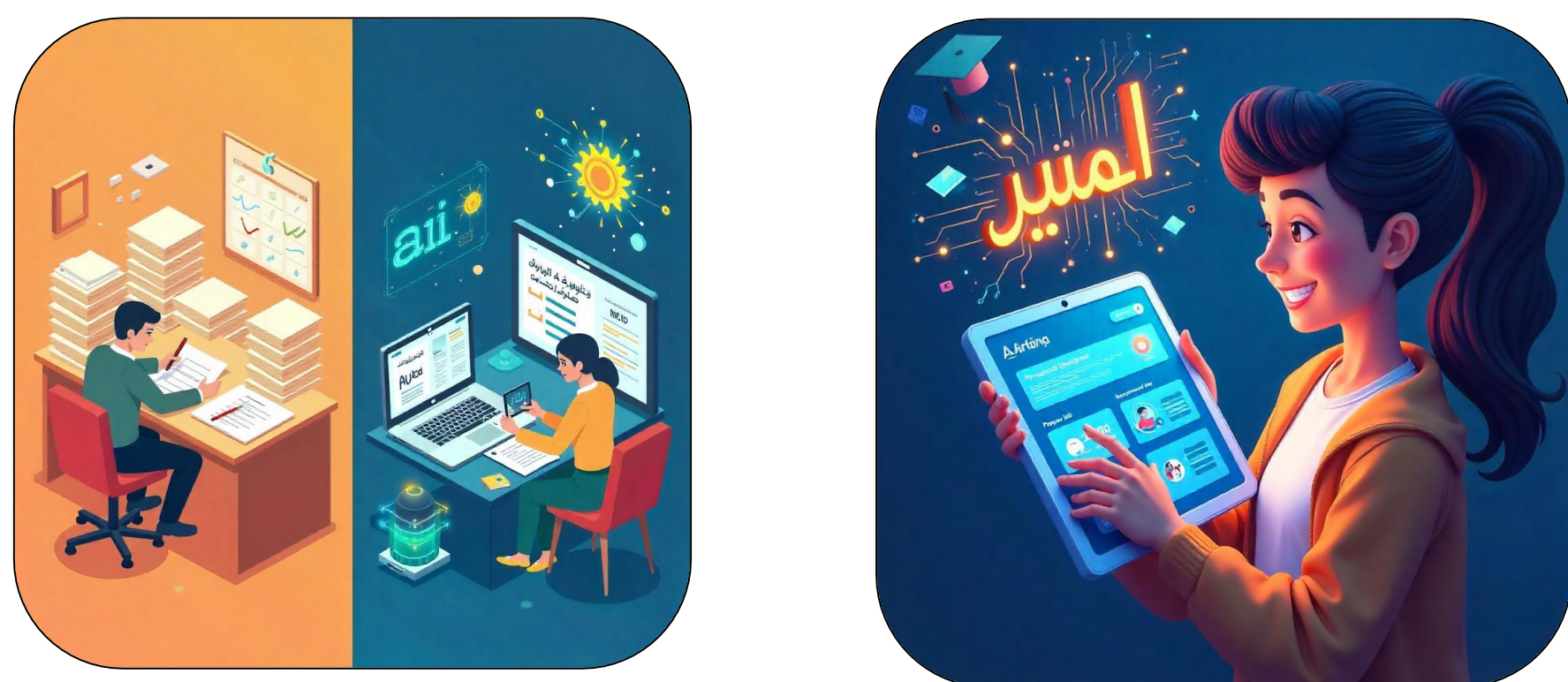


Fig.1. Traditional vs. AI-enhanced Systems

Methods

Our AI-powered Arabic Learning Management System (LMS) is built as a mobile application using Flutter for the frontend and FAST API for the backend, featuring a three-layer architecture (UI, AI logic, and database). The system leverages fine-tuned AraT5 transformer models trained on Arabic-SQuAD and custom EKB datasets to enable advanced natural language processing capabilities. Key features include automatic generation of Arabic multiple-choice questions (MCQs), personalized learning recommendations with 87% accuracy, and comprehensive performance dashboards. The technical stack utilizes PyTorch and Hugging Face for NLP tasks, with Python and MongoDB handling backend operations and data management.

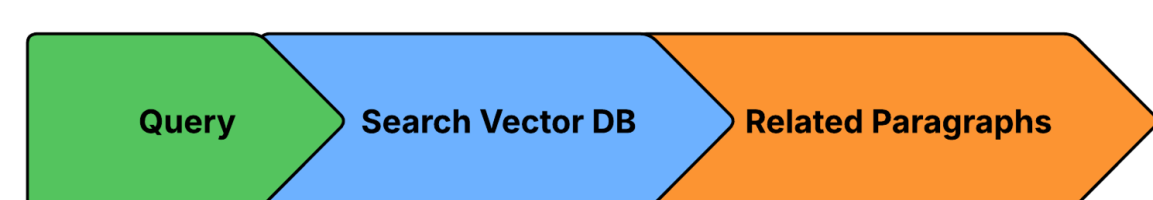


Fig.2. Explore Topics Pipeline

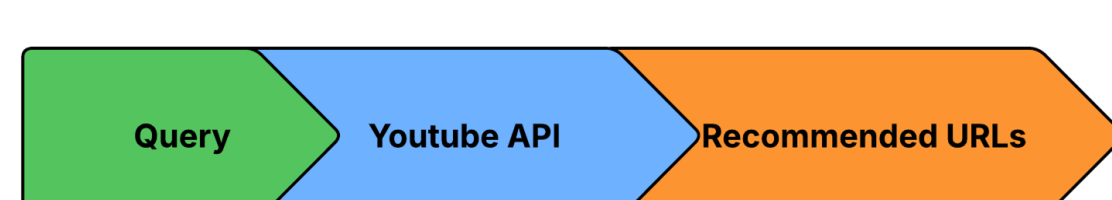


Fig.3. Extra Resources Pipeline

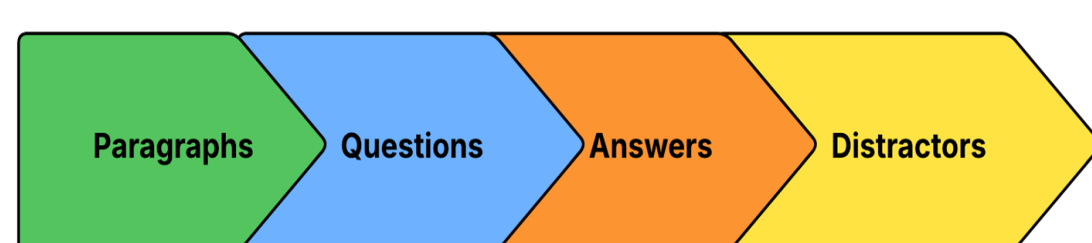


Fig.4. QG/QA Pipeline

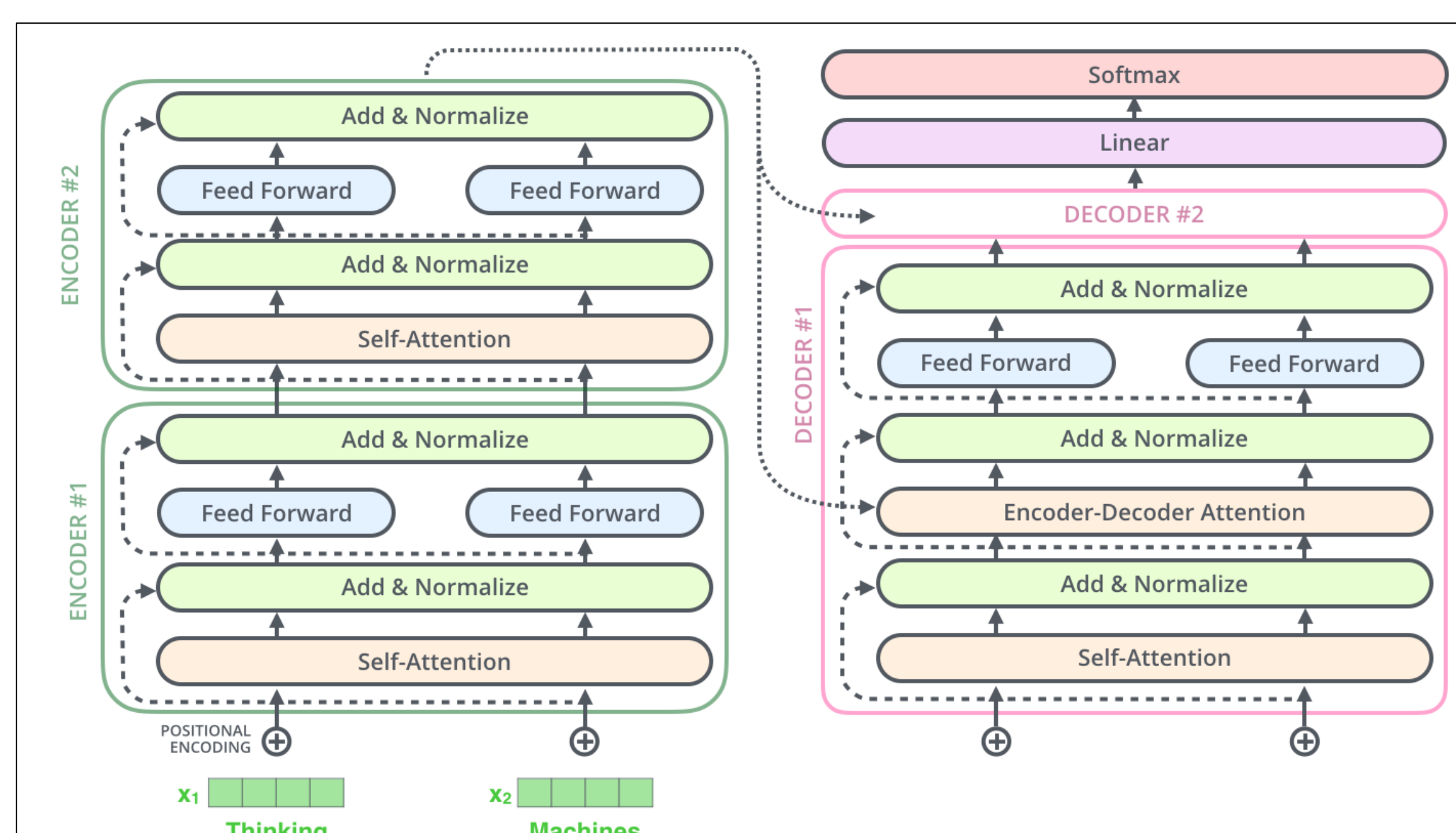


Fig.5. T5 Architecture

Results

Table I: Results of Youtube API:

Model	Accuracy
Multilingual-E5-large-instruct	87.18%
Multilingual-E5-large-paraphrase-multilingual-mpnet-base-v2	83.50%
paraphrase-multilingual-mpnet-base-v2	62.63%
paraphrase-multilingual-MiniLM-L12-v2	55.55%
distiluse-base-multilingual-cased-v2	40.18%

Table II: Results of FAISS Vector Database

Model	Accuracy
Multilingual-E5-large-instruct	87.46%
Multilingual-E5-large	84.59%
paraphrase-multilingual-MiniLM-L12-v2	72.43%
paraphrase-multilingual-mpnet-base-v2	67.34%
distiluse-base-multilingual-cased-v2	42.70%

Table III: Results of Question Generation Model Training:

Model	BERTScore	BLUE-4	METEOR
AraBART	0.85905	0.21653	0.38785
mT5	0.83607	0.17535	0.39472
AraT5	0.87333	0.21653	0.47012

Table IV: Results of Question Answering Model Training:

Model	Precision	Recall	F1-Score
AraBART	0.85905	0.21653	0.38785
mT5	0.6434	0.7402	0.39472
AraT5	0.9037	0.9121	0.8890

- AraT5 demonstrates the best overall performance and is the most suitable for Arabic educational question-related tasks.

Conclusions

The system demonstrates the potential of deep learning models for enhancing Arabic educational content. It supports personalized learning through automated question generation and performance tracking, offering a scalable solution for Arabic-language education.

Bibliography

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