Title : Smart Chatbot for Undergraduate Registry Services, Chiang Mai University

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ABSTRACT

This project aims to develop a Smart Chatbot for Undergraduate Registry Services by applying Artificial Intelligence (AI) and a Large Language Model (LLM) combined with Retrieval-Augmented Generation (RAG) using a Single-Pass Architecture that requires only one LLM call per question. The system employs Hybrid Search (Dense Retrieval via Sentence-Transformers + BM25 with Thai tokenization) with Cross-Encoder Reranking and a 2-Tier Cache (Greeting Cache + RAG FAQ Cache) to provide accurate, reliable answers based on official university documents including academic regulations, student handbooks, and public announcements.

The system follows a Client–Server architecture using Facebook Messenger as the main communication channel and FastAPI as the backend processing framework. The server connects to a Knowledge Base containing public digital documents (e.g., PDFs) with embeddings stored in ChromaDB (Vector Database). The system uses Cloudflare Tunnel for secure internet connectivity without exposing public ports. An Admin Dashboard allows staff to manage the knowledge base, monitor conversations, and view usage statistics.

Evaluation with 113 questions (2 rounds, 16 categories) achieved 93.8% overall accuracy (106/113): 98.3% on standard questions and 88.9% on challenging ones (spoken language, typos, ambiguity, prompt injection). Average response time was 2–4 seconds, and FAQ Cache reduced latency by ~80% for repeated questions.

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