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1. ABSTRACT

This project aims to enhance Doğuş Technology's customer service platform, the Lugado Agent Panel, by integrating artificial intelligence to automate and improve multilingual customer interactions. Five AI modules: language detection, automatic translation, sentiment analysis, response suggestion, and emoji recommendation, were developed to reduce human agent workload, accelerate response time, and boost customer satisfaction. Each module is designed to work in real time, enabling seamless, intelligent, and emotionally aware communication.

2. PROBLEM & MOTIVATION

The Lugado Agent Panel previously depended solely on human agents, which led to inefficiencies in managing large volumes of multilingual customer messages. Tasks like manual translation and interpreting customer sentiment were time-consuming and often unreliable. This project was initiated to overcome these limitations by integrating AI-driven modules that deliver faster, more scalable, and emotionally aware support. The goal was to reduce agent workload, enhance communication quality, and bring intelligent automation into the customer service process.

3. IMPLEMENTED AI FEATURES

Five core AI modules were designed, implemented, and evaluated throughout the project, each addressing a specific challenge in customer-agent interactions:

- Language Detection:** Achieved **99.87% accuracy** in distinguishing closely related languages like Turkish and Azerbaijani using a hybrid architecture combining FastText, supervised autoencoders (SAE), and GlotLID for low-confidence cases.
- Automatic Translation:** Leveraged Google Translate API with an **85% qualitative success rate** (158 out of 186 correct translations) in test cases, particularly optimized for **Turkish ↔ Azerbaijani** direction. Intermediate translation via English was also explored to improve accuracy in morphologically similar languages.
- Sentiment Analysis:** BERTurk-based transformer models reached a **macro F1-score of 0.88** on synthetic, balanced datasets. However, performance dropped to **24.5% accuracy** on real-world company data due to anonymization and domain mismatch, highlighting the need for high-quality labeled datasets.
- Response Suggestion:** Using GPT-4o via Azure OpenAI, the module generated **relevant and polite responses in over 80%** of manually evaluated customer-agent dialogue samples. Prompts were optimized for brevity, tone, and contextual relevance.
- Emoji Recommendation:** Lightweight LLM-based suggestions matched user sentiment in most cases, enriching written communication with minimal overhead.

Each module contributes to a scalable, real-time system that enhances multilingual, emotionally aware customer service.

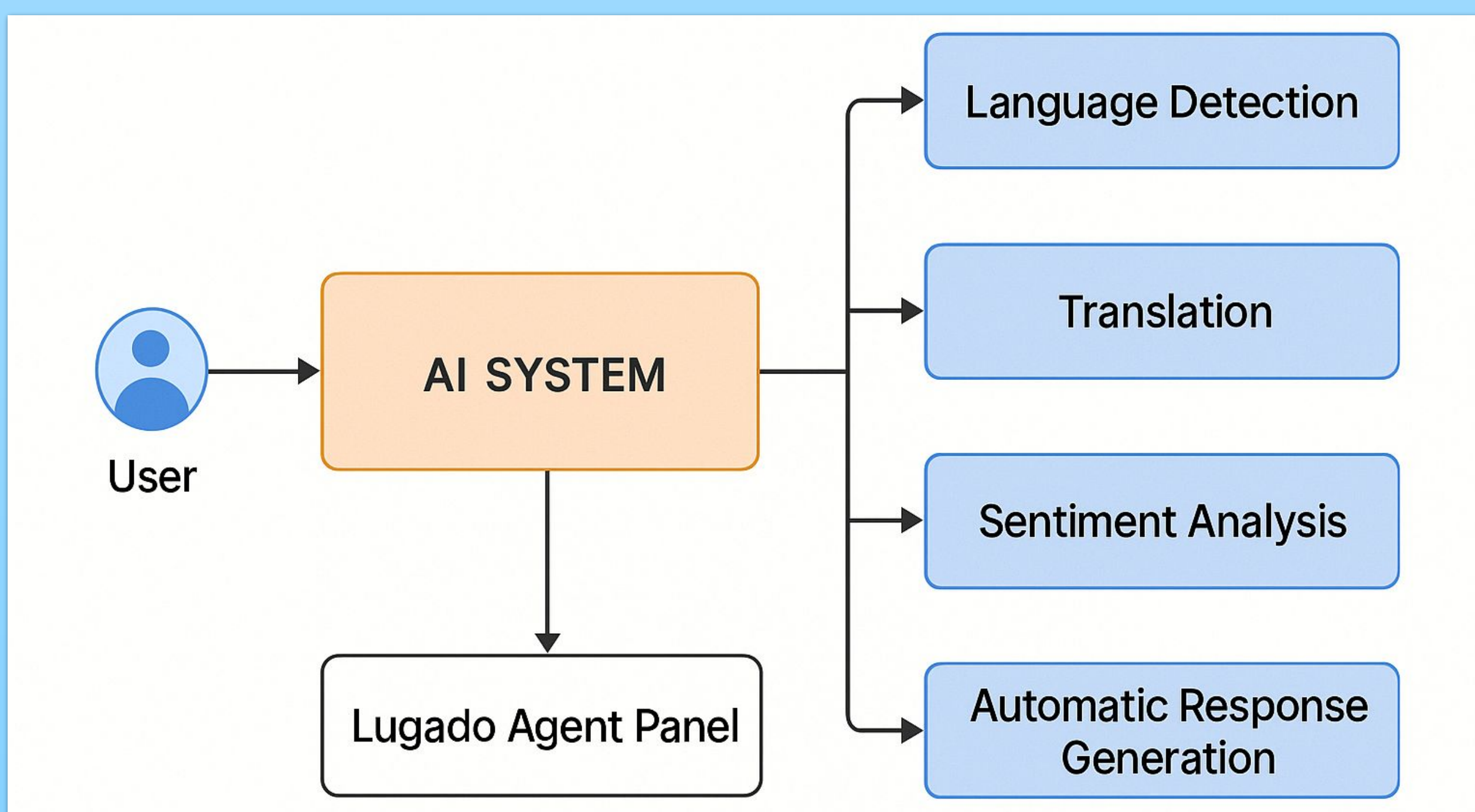


Figure 1. Workflow of Agent Panel with AI Features

4. METHODOLOGIES & TECHNOLOGIES USED

The project leverages a mix of open-source tools and commercial APIs.

- Language Models:** FastText, SAE, GlotLID, BERTurk, GPT-4o
- Translation APIs:** Google Translate (primary), DeepL and Hugging Face (benchmarked)
- Preprocessing Tools:** Zeyrek for lemmatization, Stanza for POS tagging
- Training & Evaluation:** Hugging Face Trainer, SMOTE for balancing, precision-recall and F1-score metrics

A modular, fallback-based architecture ensures robustness across diverse real-world cases.

5. RESULTS & PERFORMANCE

Each AI module was thoroughly tested:

- Language Detection:** 99.87% accuracy for Turkish–Azerbaijani distinction, which is the most interested language pair of the company.
- Translation:** 158 out of 186 translations correct using Google API.
- Sentiment Analysis:** 88% accuracy on synthetic data; dropped to 24.5% on real-world data due to anonymization.
- Response Generation:** 80%+ relevance and politeness in manual reviews.
- Emoji Suggestion:** Mostly aligned with sentiment, added emotional nuance to generated responses.

While synthetic results were strong, real-world performance was limited by data quality.

6. LIMITATIONS

- Low performance on anonymized and imbalanced data:** Missing context and skewed class distribution reduced real-world model accuracy.
- Domain mismatch:** Synthetic training data differed from company dialogues in tone and structure, limiting generalization.
- Privacy constraints:** Restricted access to sensitive data limited fine-tuning and domain-specific optimization.
- Incomplete deployment:** Emoji and response modules not yet integrated with real-time agent feedback and approval loop.

7. IMPACT & ETHICAL CONSIDERATIONS

The project adds both operational and strategic value by reducing response times, improving communication accuracy, and easing the workload of customer service agents. Automating multilingual support tasks, like translation, sentiment analysis, and response generation enables, faster, consistent, and emotionally aware interactions. All development followed ethical standards and Turkey's KVKK law, with strict anonymization of sensitive data. The result is a more efficient, privacy-conscious, and human-centered customer support system powered by intelligent automation.

8. CONCLUSION & FUTURE DIRECTIONS

This project successfully delivered five AI modules that improve the Lugado Agent Panel's capabilities in multilingual and sentiment-aware customer service. Strong results were achieved on synthetic datasets; however, real-world performance highlighted the need for higher-quality, domain-specific annotations. Moving forward, the focus will be on collaborating with Doğuş Technology to build better-labeled data, enhance preprocessing, and fine-tune models like BERTurk or explore multilingual transformers such as XLM-R for broader generalization. Introducing a real-time agent approval step for AI-generated responses will also ensure a more reliable and human-aligned system as it moves toward production.