Project Report: AI Multi Language Translator using Streamlit and Hugging Face

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Project Title

AI-Powered Multi-Language Translator Web Application

GitHub Link

Developed By

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Objective

The main objective of this project is to build an interactive, easy-to-use web-based translator that can convert text from one language to another using Artificial Intelligence, leveraging pretrained translation models from Hugging Face's MarianMT.

Technologies Used

Tool/Library -> Purpose

Python -> Backend logic

Streamlit -> Frontend web app framework

Transformers -> Pretrained translation models (NLP)

Torch -> Tensor operations and model inference

GitHub -> Code version control and hosting

Supported Languages

- English
- Hindi

- French
- German
- Spanish
- Chinese (Simplified)
- Japanese

Working Principle

- The user inputs text and selects source and target languages.
- The app dynamically loads the appropriate MarianMT model from Hugging Face (Helsinki-NLP/opus-mt-src-tgt).
- The text is tokenized, encoded, translated, and decoded.
- The translated output is shown in real-time on the same page.

User Interface (UI)

- Clean and responsive UI using Streamlit
- Language selectors using dropdowns
- Real-time translation with loading spinner
- Result shown in a text area for easy copy

Features

- Dynamic model loading for language pairs
- Efficient translation with caching using @st.cache_resource
- Real-time feedback with error handling
- Can be easily extended to include voice input/output, PDF translation, etc.

Testing

Validated for multiple translations such as:

- English → Hindi
- French → English
- German → Spanish

Handled cases for:

- Empty input
- Same source and target language
- Unsupported language pairs (handled with try-except)

Files Included

File Name	Description
app.py	Main Streamlit application
requirements.txt	Python dependencies
README.md	Project documentation

How to Run

pip install -r requirements.txt streamlit
run app.py

Future Improvements

- Add audio input and text-to-speech output
- Detect language automatically
- Add support for file (PDF/Doc) translation
- Deploy on a mobile-friendly platform
- Use faster models (e.g., M2M100, NLLB)

Conclusion

This project demonstrates how AI and NLP can be integrated into web applications using minimal code but powerful frameworks like Streamlit and Transformers. The translator is extendable, accurate, and user-friendly, showcasing the potential of pretrained multilingual models in real-world applications.