

# Project Report: Dual Language Translator

## 1. Title

Dual Language Translator using LSTM-based Encoder-Decoder Architecture

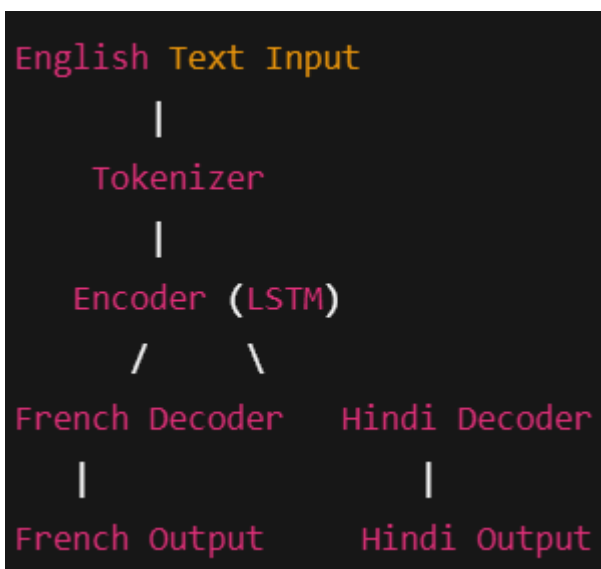
## 2. Abstract

The Dual Language Translator is a deep learning-based project that simultaneously translates English sentences into both French and Hindi. It uses an Encoder-Decoder architecture with LSTM networks, trained on a custom parallel corpus. The system includes a GUI (Tkinter) for real-time translation.

## 3. Objectives

- Design a multi-output translation model.
- Use LSTM encoder-decoder architecture.
- Translate into French and Hindi simultaneously.
- Create a user-friendly GUI.

## 4. System Architecture



# Project Report: Dual Language Translator

## 5. Methodology

- Data: 500 parallel sentences across English, French, and Hindi.
- Preprocessing: Lowercasing, punctuation stripping, start/end tokens.
- Tokenization: Per language, saved as .pkl.
- Padding: Based on max sentence length.

## 6. Model Development

- Embedding (256 dims), LSTM (256 units), Dense (softmax)
- Optimizer: Adam
- Loss: Sparse categorical crossentropy
- Epochs: 200
- Batch size: 64

## 7. Model Saving

Saved in 'model/' folder as encoder\_fr.h5, decoder\_fr.h5, etc. Tokenizers saved as eng\_tokenizer.pkl, etc.

## 8. GUI Implementation

- Built using tkinter
- Real-time English -> French & Hindi
- Handles short input with validation.

## 9. Output Example

Input: new jersey is sometimes quiet during autumn and it is snowy in april .

Hindi: न्यू जर्सी कभी -कभी शरद ऋतु के दौरान शांत होती है, और यह अप्रैल में बर्फीली है।

French: Le New Jersey est parfois calme à l'automne, et il est enneigé en avril.

# Project Report: Dual Language Translator

## 10. Results & Evaluation

- Loss reduces over epochs
- Validation improves after 150+ epochs
- Clean input data improves translation quality.

## 11. Challenges Faced

- Punctuation inconsistencies
- Token mismatch in decoding
- Managing encoder-decoder separately

## 12. Future Work

- Add more languages
- Implement attention mechanism
- Deploy as web/mobile app
- Add speech input/output

## 13. Conclusion

This project shows the potential of dual-language machine translation using LSTM. With further improvements, it can serve as a robust multilingual communication tool.