IE643 Course Project
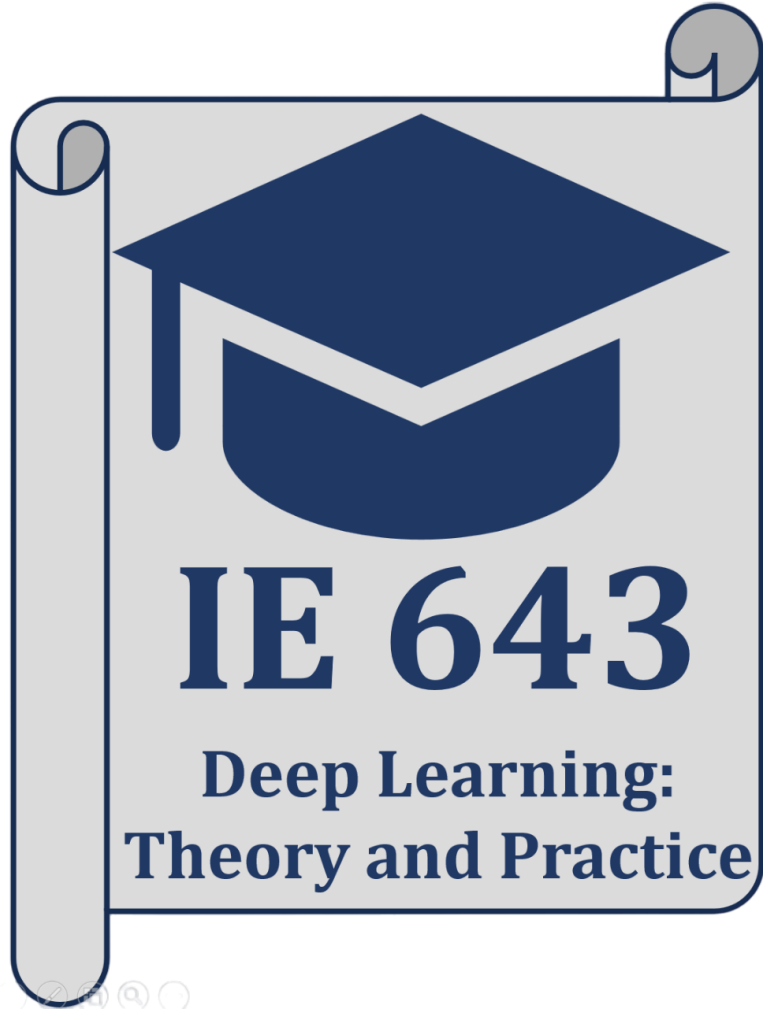
Non-Audio Video Summarization into Audio

Batclan

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IE 643

Deep Learning: Theory and Practice

Abstract

This project presents a non-audio video summarization system that generates audio summaries in Hindi from video content. Video frames are processed using a pretrained VGG16 model for feature extraction, followed by an encoder-decoder architecture to predict captions. The English captions are translated into Hindi using Google Translator and synthesized into speech using a text-to-speech system. Trained on a dataset of 6513 videos with 20 captions each, the system achieved a BLEU score of 0.54.

Introduction

- The rapid increase in multimedia content has created a pressing demand for efficient video summarization techniques, especially in non-audio scenarios.
- Pretrained models like VGG16 enable precise feature extraction, while encoder-decoder architectures excel in generating sequence-to-sequence outputs such as captions.
- Combining video summarization with language translation and text-to-speech systems broadens inclusivity and accessibility, making content more universally understandable.
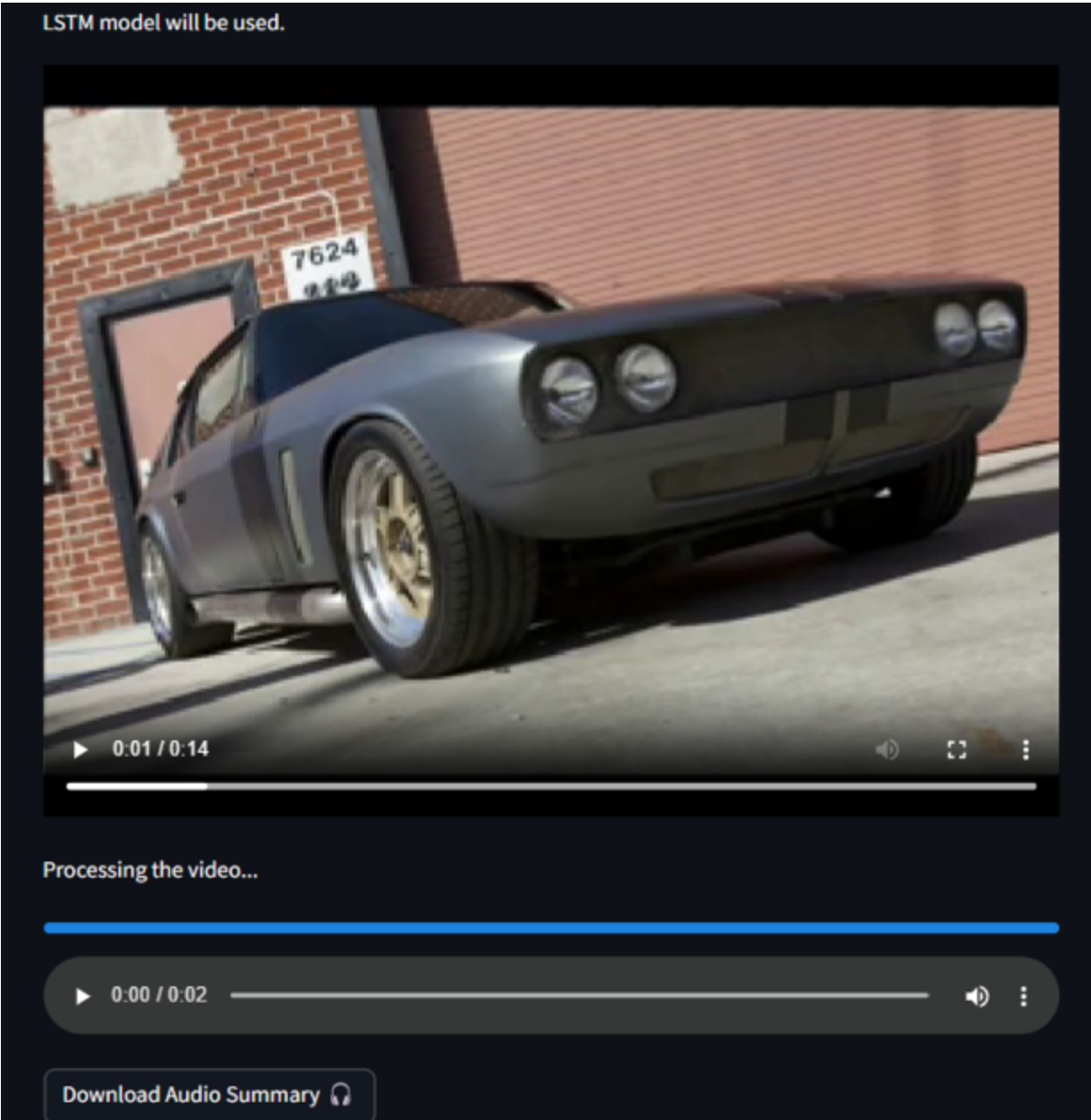

Figure 1: Interface

1. A white car is drifting.
2. Cars racing on a road surrounded by lots of people.
3. Cars are racing down a narrow road.
4. A race car races along a track.
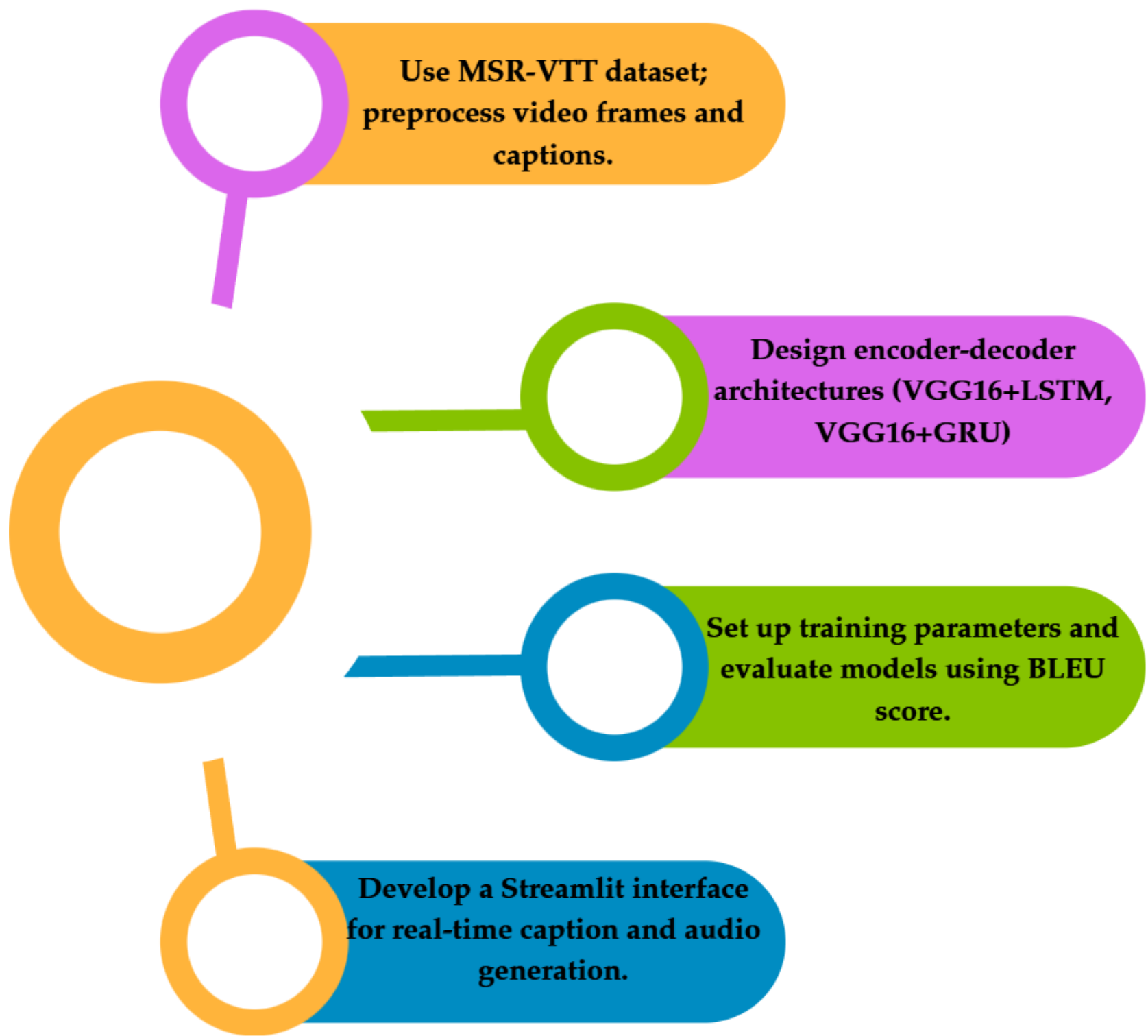5. A car is drifting in a fast speed.

Figure 2: Dataset

Workflow

Use MSR-VTT dataset; preprocess video frames and captions.

Design encoder-decoder architectures (VGG16+LSTM, VGG16+GRU)

Set up training parameters and evaluate models using BLEU score.

Develop a Streamlit interface for real-time caption and audio generation.

Figure 3: Workflow

Methodology
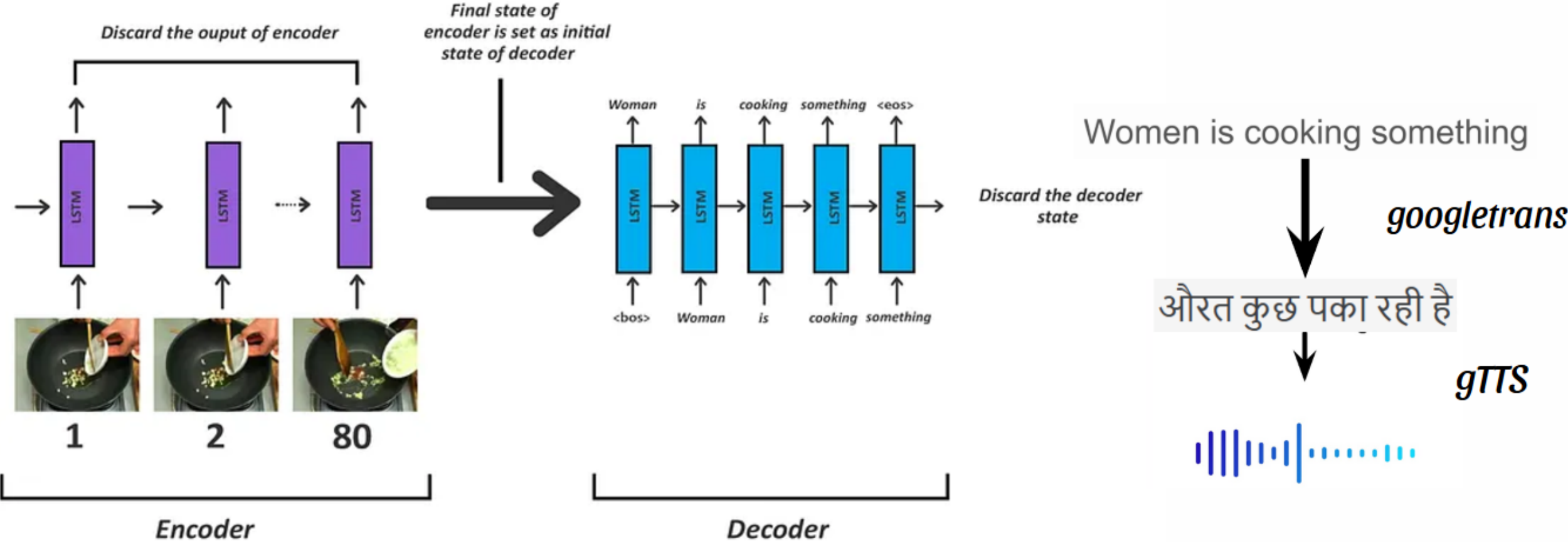
Figure 4 illustrates the architecture,...

Figure 4: Overall Architecture

- **Feature Extraction (Encoder):** Extracts key features from videos using VGG16+LSTM to represent video content effectively.
- **Sequential Prediction (Decoder):** Predicts textual video summaries using LSTM, GRU, or Transformer models.
- **Text-to-Audio Conversion:** Converts the textual summary into Hindi audio using Google Translator and gTTS.

Dataset Details

Category	Details
Video Quantity	7,010 videos
Video Length	10 to 30 seconds per video
Captions per Video	20 captions per video
Vocabulary Size	6,000 unique words
Text Preprocessing	Average of 15 words per sentence
Resolution	320x240 pixels (resized to 224x224 for processing)
Categories	20 categories (e.g., sports, music, etc.)

Figure 5: Dataset Details

Novelty Assessment

- A transformer-based architecture was implemented to improve sequential prediction.
- However, the model yielded good result in training but poor validation results

Result

Model	BLEU Score
Baseline (VGG16+LSTM)	0.56
Our LSTM Model	0.537
Our GRU Model	0.543

Table 1: Comparison of BLEU-1 Scores for Different Models

Conclusion

- Developed non-audio video summarization using VGG-16 for feature extraction and LSTM for sequence prediction
- Created a Streamlit web app for video upload, captioning, and audio playback, achieving competitive BLEU-1 scores.

References

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[4] Priya Singh. *Video Captioning with Keras*. Available: https://medium.com/analytics-vidhya/video-captioning-with-keras-511984a2cfff, Accessed: 2024-11-02.

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Acknowledgments

Github Link and Demo Video Link

Github Repository

Demo Video Link