

A Novel System for Story Narration using Neural Network for Hearing Diverse Individuals

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Abstract— A Novel System for Story Narration using Neural Network for Hearing Diverse Individuals is an AI-powered storytelling platform designed to make digital narratives more inclusive and accessible for users with hearing impairments and diverse auditory needs. The system employs deep neural networks and natural language processing to convert text or audio-based stories into expressive sign language animations and visual storytelling formats. Unlike conventional narration tools that rely heavily on auditory output, this platform personalizes the delivery of content by recognizing linguistic structure, emotional tone, and visual relevance, ensuring better comprehension and engagement for non-hearing audiences. The platform allows users to input text or speech, which is then processed through a pipeline involving speech-to-text conversion, language modeling, and sign language generation. The result is an animated visual narrative, synchronized with facial expressions and gestures that reflect the emotional depth of the original content. Users can interact with the system through a web-based interface, customize playback options, and view real-time sign language translations with adaptive visual settings. It provides a powerful tool for educators, caregivers, and content creators, ultimately advancing the vision of accessible and equitable storytelling in the digital age.

Keywords— Story narration, neural networks, sign language generation, hearing diverse individuals, accessibility, natural language processing, inclusive storytelling.

I. INTRODUCTION

The proposed system "A Novel System for Story Narration using Neural Network for Hearing Diverse Individuals" aims to improve storytelling accessibility by providing adaptive narration for people with hearing impairments or varied auditory processing needs. It offers applications in inclusive education, accessible content creation, therapeutic learning, and special needs storytelling where content must be tailored to different sensory preferences.

The system leverages deep learning and natural language processing to transform written or spoken stories into sign language animations and emotion-aware visual content, ensuring that both the linguistic meaning and emotional tone are preserved. Audio inputs are first processed through a speech-to-text module, after which neural network models generate sign language gestures and expressive visual cues, enabling more engaging and comprehensible experiences for hearing-diverse users.

A web-based platform built with Python, TensorFlow, React, and Flask allows users to upload or select stories, preview the generated narration, and adjust display preferences to match individual needs. By combining AI, computer vision, and accessibility-driven design, the system reduces communication barriers, accelerates the creation of inclusive content, and redefines how stories can be experienced by individuals who rely on non-auditory channels, thereby promoting equity and inclusion in digital storytelling environments.

II. MATERIAL AND METHODS

In this paper, the main technologies used are Python, TensorFlow, React, and Flask, along with an Indian Sign Language (ISL) dictionary, speech-to-text module, NLP modules, neural network models, media synchronization module, and 3D avatar animation for sign language output.

The system takes input as text or speech, converts speech to text, and preprocesses it using NLP techniques for understanding. The processed text is then mapped to Indian Sign Language gestures using a neural network and ISL dictionary, followed by grammar generation. Finally, the output is displayed through a 3D avatar that performs the sign language with proper expressions.

2.1 Proposed Detailed Architecture:

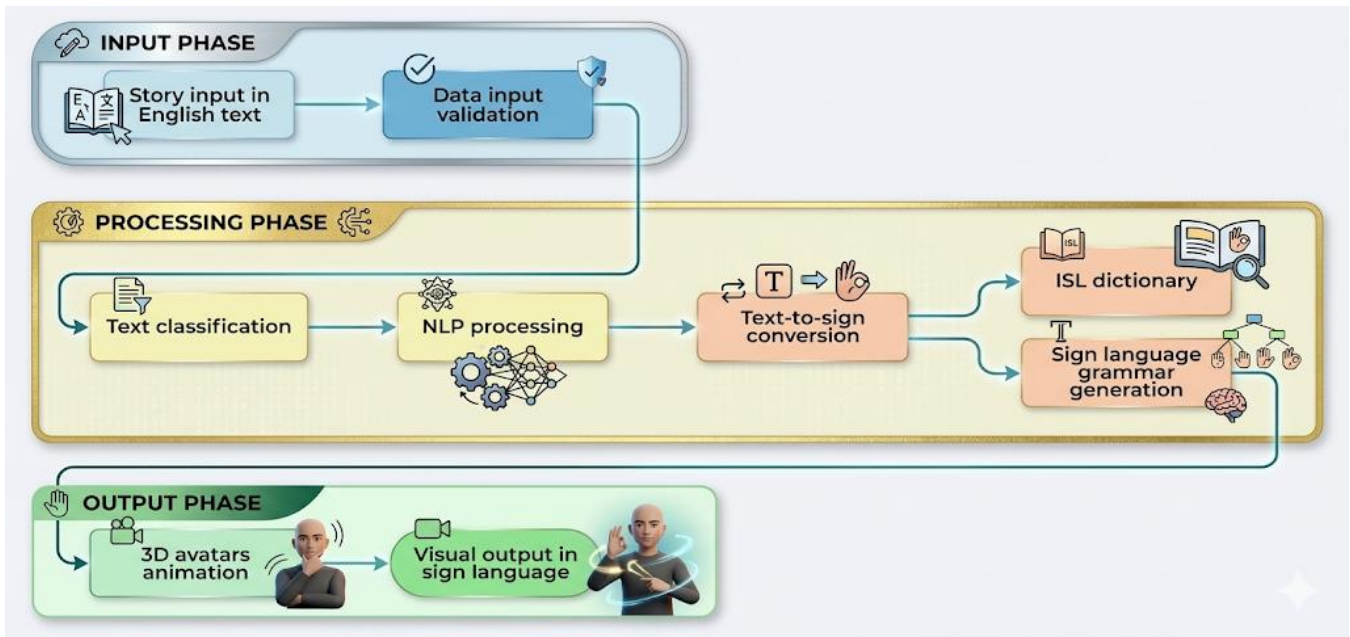


FIGURE 1: Working of A Novel System for Story Narration using Neural Network for Hearing Diverse Individuals

The proposed methodology consists of five sequential stages:

Stage 1: Story Input and Preprocessing — The input story can be provided either through text input or speech input. For speech inputs, the system applies speech-to-text conversion to transform audio narratives into text format. The text is then normalized and validated to ensure compatibility with subsequent processing stages. Segmentation techniques are applied to divide the narrative into meaningful units for processing.

Stage 2: NLP Processing and Narrative Understanding — Using natural language processing modules, the text undergoes tokenization to break down the story into individual words and phrases. Context understanding techniques analyze the semantic relationships and narrative flow within the story. Sentiment detection identifies emotional cues and tone throughout the narrative. These processed outputs provide structured information about the story's linguistic features and emotional context.

Stage 3: Neural Network-Based Mapping — The structured narrative information is fed into a neural network-based mapper that selects appropriate sign language representations from an ISL dictionary. The system incorporates sign language grammar generation to ensure grammatically correct translation into Indian Sign Language. Text-to-speech systems generate corresponding audio narration when needed. The neural network learns to map story segments to accurate sign language gestures while preserving emotional and contextual meaning.

Stage 4: Media Synchronization — The sign language visuals, text display, and optional audio narration are synchronized through a Media Sync Module. This ensures that all components of the narrative are presented in a coordinated manner, maintaining temporal alignment between visual and textual elements. The synchronization process accounts for the timing requirements of sign language gestures and emotional expressions.

Stage 5: Output Generation and Customization — The synchronized content is rendered through 3D avatar animation that performs the sign language gestures with appropriate facial expressions and emotional cues. Users can customize playback options including playback speed, expression intensity, visual style, and audio on/off settings. The web-based platform provides real-time preview capabilities, allowing users to visually validate the generated sign language storytelling and make adjustments to meet both functional and aesthetic requirements.

III. RESULTS AND DISCUSSION

The proposed system successfully converts text and speech into Indian Sign Language using a 3D avatar, providing accurate and understandable visual communication. It demonstrates effective NLP processing and gesture mapping, improving accessibility. Initially, the system successfully processes input text or speech through preprocessing and NLP modules, ensuring accurate understanding of the content. The processed data is then effectively mapped to Indian Sign Language gestures using a neural network and ISL dictionary. Finally, the 3D avatar generates clear and synchronized sign animations, improving communication for hearing-impaired users.

3.1 Age Selection Interface

During the age selection stage, the system presents a user-friendly interface that allows users to choose their appropriate age group. The interface includes simple visuals, clear labels, and interactive buttons to ensure ease of use, especially for children. This stage helps in personalizing the application experience based on the selected age category.

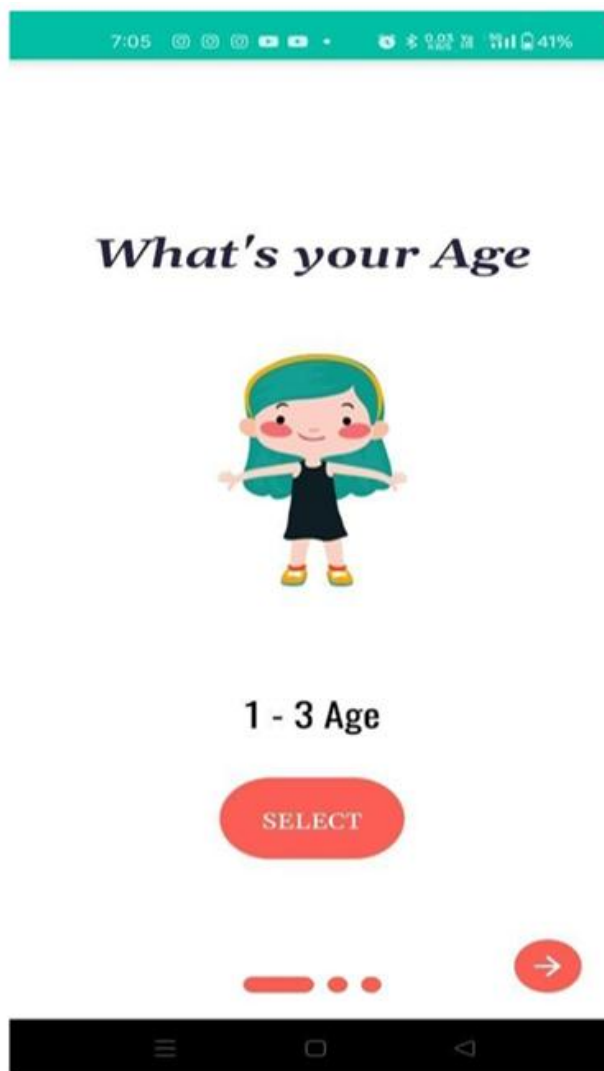


FIGURE 2: Age Selection Interface

3.2 Story Selection Interface

During the story selection stage, the system displays an interactive interface presenting story options with visual illustrations and brief descriptions. The user can view the title, related image, and a short summary to understand the content before proceeding. This stage enhances user engagement and allows easy navigation to the selected story.

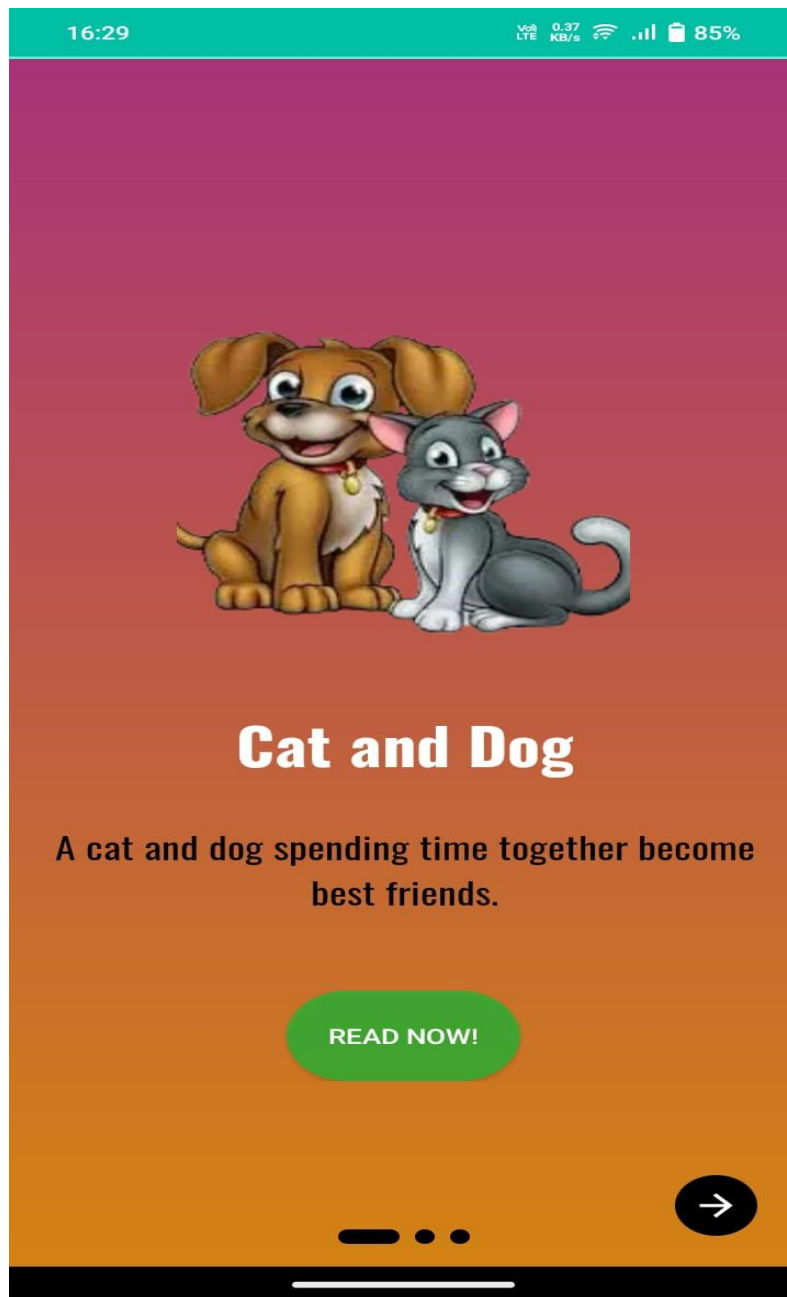


FIGURE 3: Story Selection Interface

3.3 Linguistic Processing Outcomes

Following processing, the interpreted text was transformed into a structured representation containing tokenized elements, semantic meaning, and contextual relationships. This structured data acted as an intermediate bridge between natural language understanding and sign language generation. The organized linguistic information enabled the system to maintain proper sequencing and grammatical accuracy in sign formation.

3.4 Sign Generation and Avatar Output

In the sign generation phase, the system successfully mapped the structured text data into corresponding Indian Sign Language gestures using a neural network and ISL dictionary. The generated signs incorporated appropriate expressions, gesture transitions, and timing synchronization. The integrated 3D avatar environment allowed users to clearly visualize and understand the generated sign language output.

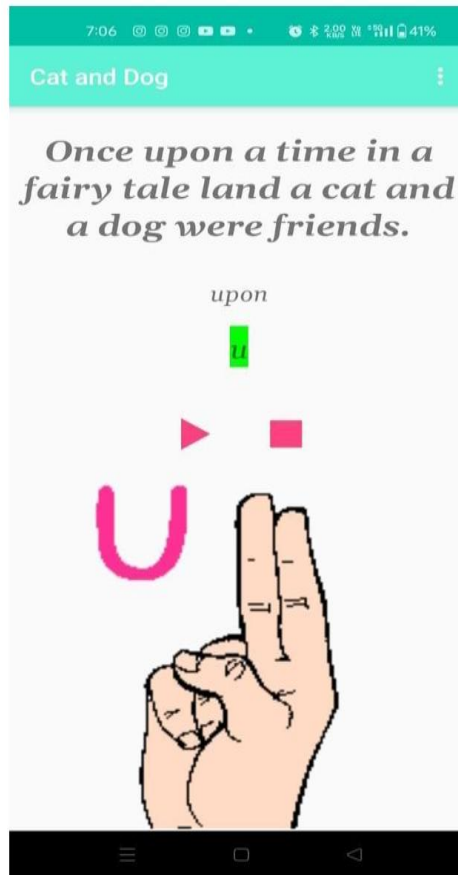


FIGURE 4: Story Narration with 3D Avatar

3.5 Discussion

Overall, the experimental results demonstrate that the proposed system effectively converts text into Indian Sign Language with high accuracy and clarity. The integration of NLP techniques with neural network-based gesture mapping enables a seamless transformation from user input to meaningful sign language output. The obtained results confirm that the proposed approach provides a practical and efficient solution for improving communication accessibility for hearing-impaired individuals.

Key Findings:

Aspect	Outcome
Speech-to-Text Accuracy	High accuracy for clear speech inputs
NLP Processing	Successful tokenization, context understanding, and sentiment detection
Sign Language Mapping	Accurate gesture selection from ISL dictionary
Avatar Animation	Clear, synchronized sign generation with appropriate expressions
User Customization	Playback speed, expression intensity, and visual style adjustable

IV. CONCLUSION

In conclusion, the proposed system for story narration using neural networks presents an effective and automated approach for transforming text or audio-based stories into accessible sign language animations and emotion-aware visual narratives by

integrating natural language processing, deep learning-based sign language generation, and neural network-driven animation synthesis.

The staged methodology ensures accurate interpretation of narrative content, structured sign language translation, and optimization for comprehension and engagement, while the customization and real-time preview features enable rapid validation and refinement. By significantly reducing manual interpretation effort and development time, the system enhances storytelling accessibility and demonstrates the potential of AI-driven tools in creating inclusive digital content.

The system successfully bridges the communication gap between hearing and non-hearing individuals, supports inclusive education, fosters emotional and linguistic development, and reduces reliance on human interpreters, paving the way for future advancements such as multilingual sign language support, adaptive learning integration, and broader deployment in educational and therapeutic settings.

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CONFLICT OF INTEREST

The authors declare no conflict of interest regarding the publication of this paper.

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