

Case Study 1: AI Assisted Tool For Child Language Learning

Department of Applied Data Science &
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What Motivated Us?

- Limitations of Traditional Methods
- Need for Personalized Learning
- AI-Driven Engagement
- Enhanced Comprehension with Voice Technology
- Dynamic and Responsive Learning

Objective



- AI-powered voicebot for English learning (Ages 6-12)
- Real-time, personalized speech interactions
- Improves fluency, pronunciation, and vocabulary
- Uses Google Speech-to-Text & Text-to-Speech
- Conversational AI for engaging learning
- Overcomes traditional learning limitations

Model Selection

Dataset & Metrics

Dataset:

- Transcribed children's audio files

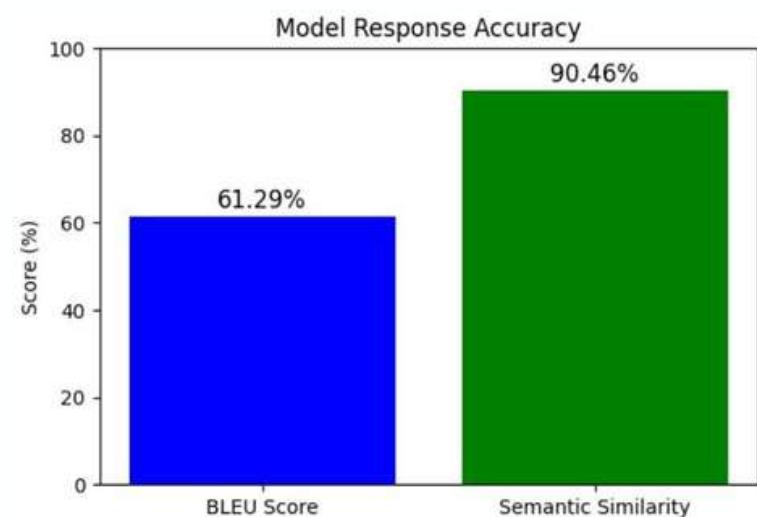
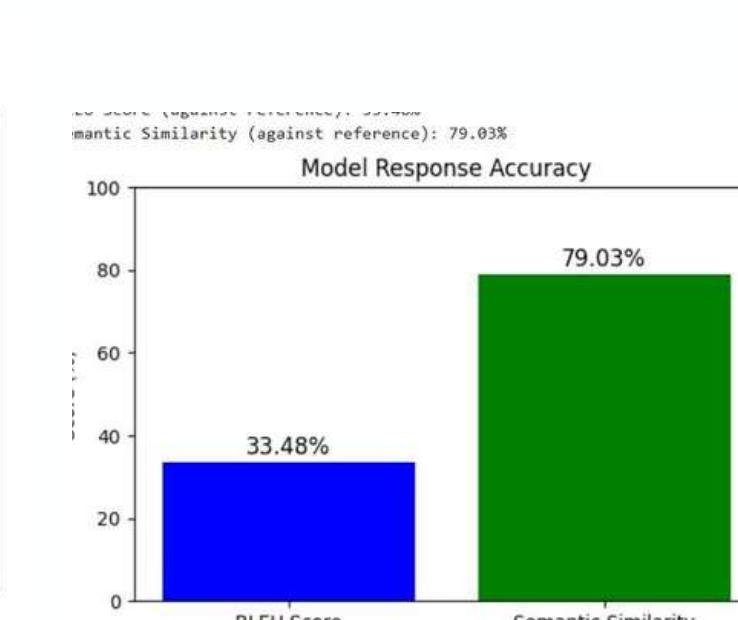
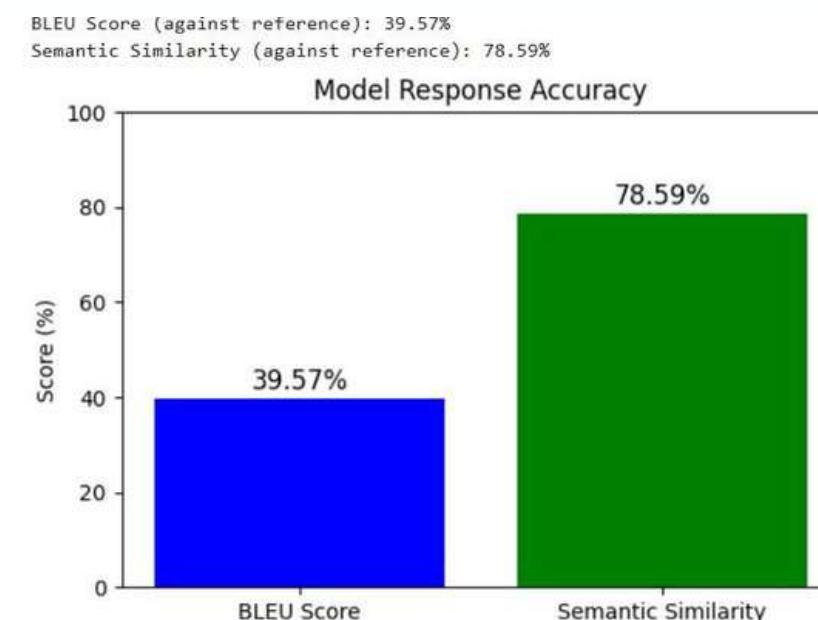
Metrics:

- **BLEU Score – Measures n-gram precision**
- **Semantic Similarity – Evaluates contextual accuracy (cosine similarity)**

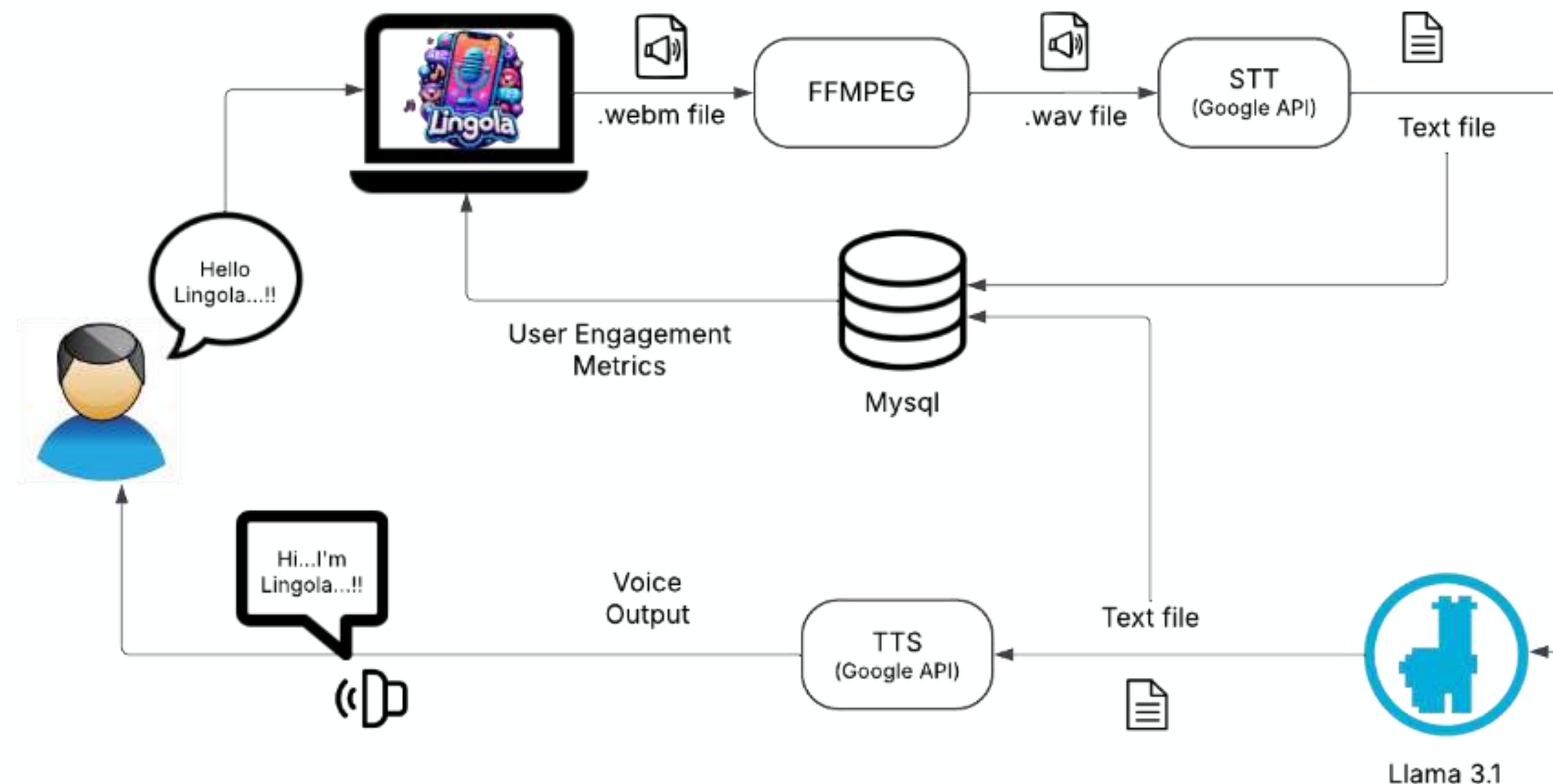
Evaluation Results

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LLaMA2 vs. DeepSeek vs. LLaMA3



Architectural Diagram of "Lingola" Voicebot



Acronyms

.webm file - Web media file
FFMPEG -Fast forward moving picture expert group
.wav file - Waveform audio file format
STT -Speech to text google api
TTS -Text to speech google api

Technology Used

- 📌 Programming Language: Python
- 📌 Platform: Visual Studio Code (VS Code)
- 📌 Backend: Flask
- 📌 Frontend: JavaScript, HTML, CSS
- 📌 Database: MySQL
- 📌 AI Model: Quantized LLaMA 3.1
- 📌 APIs: Google Speech-to-Text, Google Text-to-Speech

Prompts Testing & Evaluation

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- ✓ **Alphabet Instruction** – Engaging activities for letter recognition & recitation.
- ✓ **Numerical Concepts** – Interactive exercises for learning numbers & counting.
- ✓ **Vocabulary Building** – Expanding the child's lexicon with new words.
- ✓ **Animal Identification** – Teaching animal names through contextual conversations.
- ✓ **Topics Covered** – Tracks subjects engaged with for learning insights.
- ✓ **Age-Appropriate Content** – Ensures material is developmentally suitable and excludes inappropriate references.
- ✓ **Error Correction & Feedback** – Provides instant, constructive feedback with positive reinforcement.

Challenges

- 1 Computational Constraints**
- 2 Integration & Speech Processing Challenges**
- 3 Technical Challenges**

Measuring Engagement Effectiveness

⌚ Duration (D)

✓ Formula: End Time – Start Time

✓ Example: Session from 11:45:56 to 12:15:56 → Duration = 30 min

⌚ Number of Turns (T)

✓ Count each exchange between the child and voicebot.

✓ Example: Child speaks → Bot

User Stats						
name	age	topics_covered	start_date_time	Duration	Number of Turns	game_result
Ida	6	None	2025-02-23 11:43:43	None	None	None
Ivaan	5	None	2025-02-23 11:54:56	33.115	None	None
Disha	8	None	2025-02-23 11:57:10	34.421	None	None
Alex	8	None	2025-02-23 11:58:36	44.547	None	None
Isha	6	None	2025-02-23 12:00:29	50.057	None	None
Emily	8	None	2025-02-23 12:02:00	94.629	None	None
Johnson	6	None	2025-02-23 12:34:48	115.607	None	None
Ida	6	None	2025-02-23 13:39:56	64.614	None	None

Conclusion

- Lingola is an AI-assisted language learning tool for children aged 6-12.
- Uses speech processing & LLMs for personalized, real-time interactions.
- Integrates Google Speech-to-Text & Text-to-Speech for improved accuracy.
- Enhances fluency, pronunciation, and engagement through conversational AI.
- Addresses limitations of traditional learning methods by making learning interactive & adaptive.

References

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- https://research.google.com/audioset/unbalanced_train/speech.html
- https://huggingface.co/datasets/language-and-voice-lab/samromur_children
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<https://research-publishing.net/publication/chapters/978-2-490057-04-7/733.pdf>
- Generative AI pioneers the future of child language learning
<https://www.sciencedaily.com/releases/2024/07/240726113406.htm>

Thank
you!