**MetaSigns: AI-Powered Learning with Sign Language for Key School Concepts**

# Project Overview

MetaSigns is an educational game which challenges kids to identify key school concept words inside a short paragraph. It integrates Unity game application with Meta’s LLaMA text generator using Neocortex API. Moreover, MetaSigns uses accessibility and cutting-edge technology to explore kids’ vocabulary on any subject learned in school. It also displays sign language videos for the key concept words.

# System Architecture

The MetaSigns game consists of three main layers:

* Unity Frontend: The UI application which collects input, displays the paragraph/videos, and validates the chosen words.
* Neocortex API: The connection between Unity and LLaMA. It serves as a bridge which transmits the input to LLaMA and returns the generated paragraph.
* LLaMA Backend: Receives the input (school subject, concept words) from Unity and generates a short paragraph including the concept word.

[ Unity Game (UI + Video)]

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[ Neocortex API Layer]

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[ LLaMA Server (NLP)]

# Gameplay Process

1. A school subject is pre-selected (e.g. Biology).
2. The user presses the button “Play”.
3. A paragraph is displayed for the user containing 2-4 concept words related to the school subject (e.g. Membrane, Cell).
4. After the user clicks on any of the key concept words, it highlights the word green, and a video pops up on the side demonstrating the sign language for the correspondent word.

# Setup & Dependencies

MetaSigns needs a set of dependencies and installations to run. They are listed below.

**Installing Unity:**

Download - [Start Your Creative Projects and Download the Unity Hub | Unity](https://unity.com/download)

Documentation - [Unity Documentation](https://docs.unity.com/)

**Installing LLaMA 2:**

Download python - [Download Python | Python.org](https://www.python.org/downloads/)

Download required packages - pip install transformers torch accelerate fastapi uvicorn

Request access to LLaMA 2 models - [Meta Llama 2](https://www.llama.com/llama2/)

**Installing Neocortex:**

pip installation - pip install neocortex

**Installing npoi:**

Step 1 – Click on “Windows”. Select “Package manager”. Click on the “+” symbol.

Step 2 – Paste the URL below and install <https://github.com/GlitchEnzo/NuGetForUnity.git?path=/src/NuGetForUnity>

Step 3 – Reopen Unity. Select “Nuget” from the main menu. Search for “npoi” and install it.

**Storing sign language videos:**

Assets/Resources/aslVideos/

# Algorithm

After pressing the button “Start”. The algorithm begins with an Ollama request since it will have the school subject as input. The request is based on pre-determined words on our spreadsheet which have a respective sign language video for display. It randomizes the selection of words, so we have more versatility. Moreover, the Ollama request follows the system inputs (formattedPrompt) which are used to clean LLaMA’s response to fit our needs.

After our paragraph is generated, we have a function that highlights all words as yellow when hovered on. If the word is clicked on, we have a function which determines if the word clicked on is one of the selected words. If it doesn’t match, it highlights the word as red. If it matches, it will highlight the word green and display the correspondent video.

# Accessibility & Inclusion

MetaSigns is a fun and dynamic game to diversify vocabulary. It aims to include partially or entirely deaf kids in our learning ecosystem. Therefore, it instigates the active participation of the user on absorbing knowledge by identifying a “random” word seamlessly added to a paragraph. The visuals related to sign language add up to our goal of capturing the meaning of a word and storing it using different visual processes (Reading, watching).

# Summary

MetaSigns is an educational game created to help children, including deaf learners, build their vocabulary. Additionally, it utilizes videos to represent this vocabulary using sign language. The game was built using Ollama for generating a paragraph, Unity for displaying the content to the user, and Neocortex API to integrate both ends. In summary, MetaSigns promotes educational inclusivity by merging AI, gameplay, and sign language to facilitate learning needs.