**Math Gesture Recognition and AI Integration System**

Welcome to the Math Gesture Recognition and AI Integration System! This project demonstrates the use of computer vision and artificial intelligence to recognize hand gestures and solve math problems interactively.

**Overview**

This system utilizes real-time hand tracking to detect specific gestures, allowing users to draw math problems on a digital canvas. The drawings are then interpreted by a Generative AI model to provide solutions. The project combines the power of computer vision, gesture recognition, and AI to create an engaging and innovative tool.

**Features**

* **Real-time Hand Tracking**: Detects and tracks hand gestures using a webcam.
* **Gesture-Based Drawing**: Draw on a canvas using recognized hand gestures.
* **AI Integration**: Uses a Generative AI model to interpret and solve drawn math problems.
* **Interactive Interface**: Built with Streamlit for a user-friendly web-based interface.

**Technologies Used**

* **Python**: Core programming language for logic and integration.
* **Streamlit**: Provides the interactive web-based user interface.
* **OpenCV**: Handles video capture and image processing.
* **cvzone**: Library for hand tracking and gesture recognition.
* **Generative AI**: AI model for generating responses based on the drawn content.
* **PIL (Python Imaging Library)**: Manages image conversion for AI processing.

**Installation**

To get started with this project, follow these steps:

1. **Clone the Repository:**

bash

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git clone https://github.com/yourusername/your-repository.git

cd your-repository

1. **Create and Activate a Virtual Environment (Optional but recommended):**

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python -m venv venv

source venv/bin/activate # On Windows, use `venv\Scripts\activate`

1. **Install Dependencies:**

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pip install -r requirements.txt

1. **Configure API Key:**
   * Replace "YOUR\_API\_KEY" with your actual API key for the Generative AI model in the script.

**Usage**

1. **Run the Application:**

bash

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streamlit run app.py

1. **Interact with the App:**
   * Use the checkbox to start or stop gesture recognition.
   * Draw math problems using hand gestures detected by the webcam.
   * View the AI-generated responses in the output area.

**Example**

Here's a brief example of how the system recognizes hand gestures and interacts with the AI:

* **Drawing Gesture**: Use a specific gesture to start drawing on the canvas.
* **Clearing Gesture**: Use another gesture to clear the canvas.
* **AI Response**: The AI interprets the drawn math problem and provides a solution.

**Contributing**

Contributions are welcome! If you have suggestions or improvements, please fork the repository and submit a pull request. For major changes, open an issue to discuss them first.

**Acknowledgments**

* [cvzone](https://github.com/cvzone/cvzone) for hand tracking and gesture recognition.
* [OpenCV](https://opencv.org/) for video processing.
* [Streamlit](https://streamlit.io/) for the interactive interface.
* Generative AI for AI model capabilities.