CS400 MINOR PROJECT SYNOPSIS

A report submitted in partial fulfillment of the requirements for the Award of Degree of

BACHELOR OF TECHNOLOGY
IN
COMPUTER SCIENCE AND ENGINEERING
by
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❖ TITLE:

"Sign2Text: Accessible Communication Platform" - AI Model for Especially-abled people.

❖ GROUP DETAILS:

Developed by: **# Group 9**

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❖ PROBLEM STATEMENT:

This project aims to bridge the communication gap for individuals with hearing or speech impairments by developing a web application that translates sign language to text and vice versa. The app will use AI to enable smoother, more inclusive interactions, addressing a significant barrier faced by those who rely on sign language.

❖ CORE REFRENCES:

i. **American Sign Language (ASL) Dictionary**: A comprehensive source for the visual representation of ASL gestures and their corresponding meanings.

ii. **Machine Learning Techniques for Gesture Recognition:** Research papers and articles focusing on convolutional neural networks (CNNs) and recurrent neural networks (RNNs) for real-time gesture recognition.

iii. Dhruv, A., & Bharti, S. (2021**). Real-Time Sign Language Converter for Mute and   Deaf People**. 2021 International Conference on Artificial Intelligence and Machine Vision (AIMV), 1-6. https://doi.org/10.1109/aimv53313.2021.9670928.

iv. Vu, H., Hoang, T., Tran, C., & Pham, C. (2023). **Sign Language Recognition with Self-Learning Fusion Model.** IEEE Sensors Journal, 23, 27828-27840. https://doi.org/10.1109/JSEN.2023.3314728.

v. K, R., A, P., S, P., Sasikala, S., & Arunkumar, S. (2022). **Two-Way Sign Language Conversion for Assisting Deaf-Mutes Using Neural Network.** 2022 8th International Conference on Advanced Computing and Communication Systems (ICACCS), 1, 642-646. https://doi.org/10.1109/ICACCS54159.2022.9785057.

vi. Dhamane, S., Ainapure, A., & Dhage, S. (2023). Breaking Silence, Embracing Inclusivity: The Power of AI in Communication. 2023 IEEE 5th International Conference on Cybernetics, Cognition and Machine Learning Applications (ICCCMLA), 231-236. https://doi.org/10.1109/ICCCMLA58983.2023.10346765.

❖ INITIAL SOLUTION OUTLINE:

Phase 1: UI/UX Design & Development
- Design an intuitive, accessible user interface for the web application that caters to users with varying levels of ability.
- Develop the front-end of the website with a focus on ease of use, including features like text input, video recording for sign language, and output display.

Phase 2: AI Model Development for Sign Language Recognition
- Collect and preprocess a comprehensive dataset of sign language gestures, focusing on a specific sign language (e.g., ASL).
- Train an AI model to accurately recognize and translate these gestures into text, using techniques like computer vision and deep learning.

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Phase 3: Integration of AI Models with the Web Application
- Integrate the sign language recognition and text-to-sign language AI models into the web application.
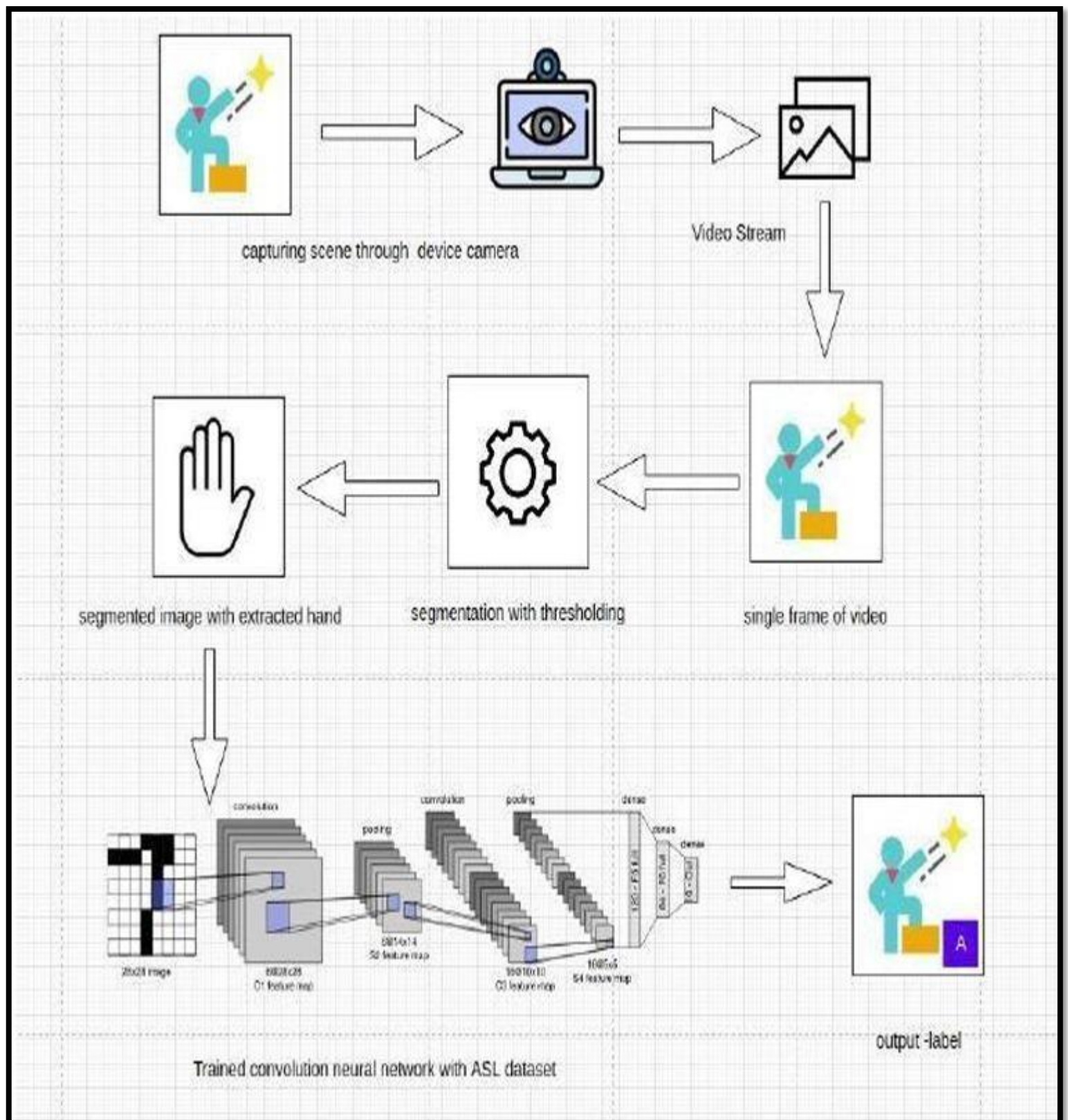- Ensure real-time processing and seamless interaction between the UI and the AI models.

Phase 4: AI Model Development for Text-to-Sign Language Conversion
        (FUTURE SCOPE)
- Develop a model that converts text into sign language, either through animated avatars or video generation.
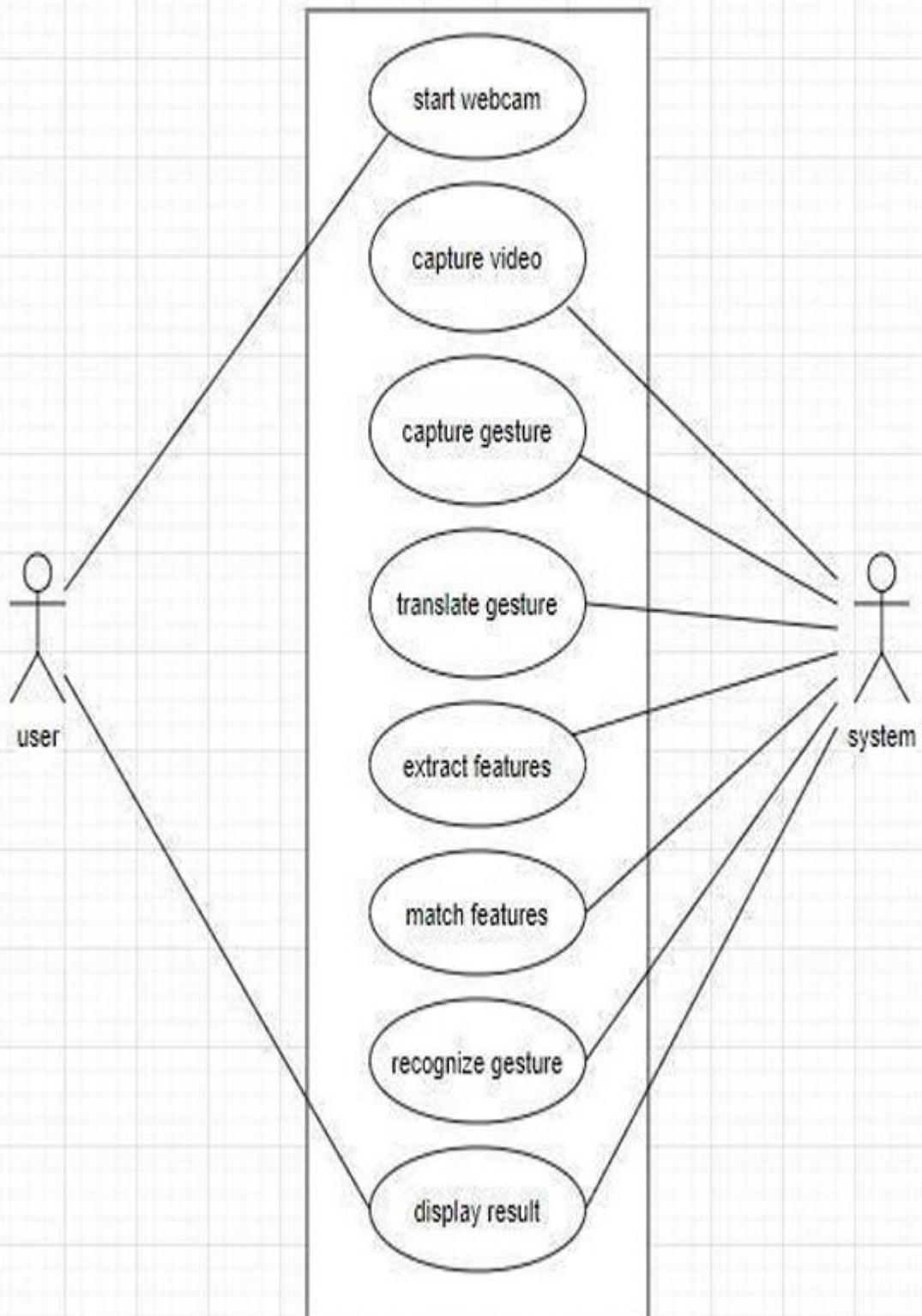- Fine-tune the model to ensure accurate and context-appropriate sign language translations

Phase 5: Testing and Optimization
- Conduct extensive testing with users, including individuals with hearing or speech impairments, to ensure accuracy and usability.
- Optimize the platform based on feedback and performance metrics.

❖ BLOCK DIAGRAM:

capturing scene through device camera

Video Stream

single frame of video

segmentation with thresholding

segmented image with extracted hand

Trained convolution neural network with ASL dataset

output -label

❖ TOOLS AND TECHNOLOGIES:

❖ Front-End Technologies:
- Html5
- Css3
- JavaScript

❖ AI/ML Frameworks:
- TensorFlow
- PyTorch
- OpenCV for gesture recognition
- NLP libraries like Hugging Face Transformers for text processing.

❖ Version Control:
- Git
- GitHub for source code management.

❖ Tools or Platform:
- VS-Code
- Py-charm
- Bootstrap-5