

# "A Survey on Bridging Digital Communication Gaps in Virtual Meeting Environments"

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**Abstract:** With the adding reliance on video conferencing for communication, vacuity and intelligence- driven advancements have come vital for perfecting user experience. This literature check explores the development and impact of video conferencing operations integrating sign language paraphrase, AI- powered chatbots, and automated meeting recordings. subscribe language paraphrase leverages real- time computer vision and natural language processing( NLP) to make virtual meetings more inclusive for hail- crippled individualities. AI chatbots help in automating responses, scheduling, and enhancing user commerce, reducing the cognitive weight on actors. Meeting recording and recap features ensure indefectible documentation and recovery of pivotal exchanges. also, the check examines the bolstering technologies, including machine knowledge models, speech recognition, and NLP ways, to estimate their effectiveness in perfecting engagement and vacuity. The review also discusses being platforms, challenges, and future trends in intelligent video conferencing results. By addressing vacuity and automation, this study highlights the eventuality of AI-driven advancements in shaping the future of virtual communication

#### I. INTRODUCTION

The rapid-fire- fire elaboration of digital communication has led to the wide handover of video conferencing operations, making them an essential tool for remote collaboration in workplaces, education, and social relations. still, traditional video conferencing platforms constantly warrant vacuity features and intelligent automation, limiting their usability for different user groups, including individualities with hail impairments. To bridge this gap, modern video conferencing operations are integrating AI- powered functionalities analogous as sign language paraphrase, AI chatbots, and automated meeting recordings to enhance inclusivity, engagement, and effectiveness. subscribe leverages cutting-edge technologies in computer vision and natural language processing (NLP). algorithms to interpret sign language gestures and convert them into real- time text or speech, enabling indefectible communication for the hail- crippled community. Intelligent chatbots function as virtual support agents, helping stoners with meeting scheduling, summarization, and instant query resolution, thereby reducing the burden of manual intervention. likewise, meeting productivity and knowledge retention. This literature check explores being disquisition, technologies, and challenges in integrating these AI- driven features into video conferencing platforms. By assaying current advancements, limitations, and future prospects, this study aims to give perceptivity into how AI and vacuity inventions can review virtual communication.

The main pretensions of this disquisition:

- Enhancing Vacuity instrument real- time sign language paraphrase to make virtual meetings inclusive for the hailcrippled community.
- AI- Powered backing Integrate chatbots to automate meeting operation tasks, give instant responses, and help stoners.
- user-Friendly Interface Design an intuitive and easy- to- use UI for all stoners, including those with disabilities.
- Data Security and insulation ensure end- to- end encryption and robust insulation controls to cover user exchanges and sensitive information.
- Scalability and Performance Optimization Develop an architecture suitable of handling a large number of actors while maintaining high- quality audio and video.

#### **II. LITERATURE SURVEY**

#### 1.Being Research on Video Conferencing Applications

#### 1.1 Development and elaboration of video Conferencing

Several studies have explored the elaboration of video conferencing technologies, pressing their impact on remote work, education, and telemedicine. Beforehand platforms analogous as Skype and drone initial work emphasized video quality and scalability, but recent advancements involve the integration of AI technologies features to meliorate engagement and inclusivity (Chen et al., 2021).



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#### 1.2 Subscribe Language Translation in Video Conferencing

The integration of sign language recognition and paraphrase into video conferencing operations has been an area of significant disquisition. Studies by Zhang et al.(2022) demonstrate the use of deep knowledge models and computer vision algorithms to interpret hand movements and render them as text or voice output without delay. pivotal technologies involved include:

- Employing CNNs to identify and interpret gestures.
- Employing Long Short-Term Memory models to interpret continuous gesture patterns.
- Motor-driven frameworks for understanding sign language gestures.
- Gesture datasets, analogous as RWTH PHOENIX- Weather and ASLLEX, used for training and benchmarking.

Even with these developments, obstacles such as regional diversity in sign languages and real-time execution continue to pose difficulties processing conditions, and model delicacy remain.

#### 1.3 AI-driven chatbots enhance virtual meetings

by streamlining communication and automating routine tasks, analogous as scheduling, answering queries, and encapsulating meetings. Studies by Patel et al.(2023) bat the performance of conversational AI models, analogous as:

- GPT predicated models for text- predicated discussion.
- BERT and Transformer- predicated chatbots for intelligent query handling.
- Speech- to- Text and Text- to- Speech( STT & TTS) models for voice- predicated commerce.

• Integration with pall services for real- time backing( e.g., Google Dialogflow, Microsoft Bot Framework).

These AI chatbots meliorate productivity and reduce cognitive weight but face limitations in natural language understanding, terrain retention, and user severity.

#### 1.4: Meeting Recording and AI- predicated Recap

Automated meeting recording and recap have come essential features in modern video conferencing platforms. disquisition by Lee et al.(2023) highlights the use of Automatic Speech Recognition ASR) systems powered by AI to transcribe meetings directly. pivotal ways include:

• DeepSpeech and WaveNet for high- delicacy speech recognition.

- Speaker Diarization to identify multiple speakers.
- Text summarization models to induce concise meeting notes.
- pall- predicated recap APIs from providers like Google, AWS, and IBM Watson.

The delicacy of objectifications varies due to background noise, stresses, and multiple speakers, challenging continuous model advancements.

#### 2. Challenges and future Directions

While AI- powered features significantly enhance video conferencing operations, several challenges need to be addressed

• Real time Processing Limitations AI models bear high computational power, leading to quiescence issues.

• Data insulation and Security enterprises AI- driven recap and chatbots involve recovering sensitive interactions that put stringent encryption protocols and compliance standards to the test.

• severity to Different user conditions subscribe language paraphrase must support multiple sign languages and variations.

• delicacy and responsibility AI chatbots and recap services bear continual training to meliorate response delicacy.

• Scalability and Performance Handling a large number of actors while maintaining high- quality streaming and AI processing remains a challenge.

future disquisition should concentrate on multi- modal AI models, confederated knowledge for power-saving AI approaches alongside edge computing aimed at lowering quiescence periods.

# III. DATASETS

#### Media Pipe:

Media Pipe is a customizable machine literacy results frame developed by Google. It's an open source and cross-platform frame, and it's truly feathery. Media Pipe comes with some pre-trained ML results analogous as face discovery, pose estimation, hand recognition, object discovery, etc. Media Pipe is used to recognize the hand and the hand key points. Media Pipe returns a total of 21 pivotal points for each detected hand.

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Fig. 1: Media Pipe hand landmark

#### Tensor flow:

Tensor flow is an open- source library for machine knowledge and deep knowledge developed by the Google brainpower team. It is applicable to various tasks, with a special emphasis on deep neural networks.

# IV. METHODOLOGY

#### 1. System Architecture

The system is designed with a modular architecture to ensure indefectible integration of AI functionalities.

• user Interface Caste : A anterior-end operation enabling video conferencing, chatbot relations, and vacuity features.

• Processing Layer: AI models for sign language recognition, chatbot response generation, and speech- to- text conversion.

• Storage Layer: Secure pall- predicated storage for meeting recordings, repetitions, and chatbot relations.

• Security framework: featuring end-to-end encryption alongside access controls to safeguard data and maintain user confidentiality.

# 2. Data Collection

To train and fine- tune AI models, datasets from various disciplines are employed

• Subscribe Language Datasets: Hand Landmark Dataset and custom datasets for real- time sign recognition.

• Conversational AI Datasets: Pre- trained corpora analogous as OpenAI's GPT datasets and Google Dialogflow.

• Speech Recognition Datasets: Whisper and Mozilla Common Voice for Automatic Speech Recognition ASR).

# 3. Model Selection and Training

Different AI models are trained and optimized for each point.

#### Subscribe Language Recognition :

- Open CV for point birth from video frames.
- LSTM networks for recognizing successive gestures.
- Models relying on motor signals for immediate sign language transcription.

#### • AI Chatbot :

- Pre- trained BERT/ GPT models fine- tuned for meeting backing.
- NLP models trained for contextual and sphere-specific responses.

#### • Speech Recognition and Recap :

- DeepSpeech and WaveNet for speech- to- text conversion.
- Speaker Diarization to separate between multiple speakers.
- Text summarization models for generating concise meeting notes.
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#### 4. System Integration

The AI modules are integrated into the video conferencing platform using.

• Real- Time Processing Channels: Low- quiescence AI conclusion for sign recognition, chatbot queries, and speech recap.

- Multi-Modal AI Integration: coinciding video, audio, and text- predicated relations.
- Deployment on cloud platforms: leveraging scalable services for AI computation and data management.



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#### 5. Testing and Evaluation

The system undergoes rigorous testing to ensure delicacy and performance.

# • delicacy Testing :

- Word Error Rate( WER) for speech recognition.
- BLEU score for sign language paraphrase delicacy.
- User feedback serves as the basis for validating chatbot responses
- Usability Testing: user feedback checks to estimate vacuity and ease of use.

#### Performance Testing:

- Measuring system quiescence for real- time relations.
- Stress testing with high user loads.

#### V. RESULTS

After administering the AI- powered video conferencing operation with features like sign language paraphrase, AI chatbot backing, and meeting recordings, the following results were observed

#### 1. subscribe Language Translation Performance

- Achieved a precision rate between 85 and 90 percent for real-time sign language recognition
- bettered gesture recognition with CNN- LSTM models compared to traditional styles.
- Challenges:

Accuracy slightly reduced due to lighting conditions and hand movement variations.

Limited dataset vacuity for indigenous sign languages.

#### 2. AI Chatbot Efficiency

• AI chatbot successfully handled 85 of user queries related to meeting scheduling, note- taking, and information recovery.

• Response time was under 1.2 seconds, icing real- time backing.

• NLP model fine- tuning bettered chatbot contextual understanding, reducing irrelevant responses.

#### 3. Speech Recognition and Recap

• Speech- to- text delicacy was 92 under normal conditions (clear audio, minimal background noise).

• Speaker diarization correctly linked speakers in 87 of cases.

- Text summarization models reduced meeting length by 60 while retaining pivotal information.
- Challenges.
- Background noise and imbrication speech reduced recap delicacy.
- Accent variations affected AI speech recognition models.

#### 4. System Performance & Real- Time Processing

- Low quiescence(08 seconds) for sign language paraphrase and AI chatbot responses.
- pall- predicated processing bettered scalability, allowing up to 500 actors per meeting.
- Optimized model deployment reduced computational costs by 30 using edge computing.

#### 5. user Satisfaction & Vacuity Advancements

- 90 of stoners set up sign language paraphrase useful for inclusive communication.
- AI chatbot reduced manual tasks, adding user productivity by 40.
- Speech- to- text and meeting summaries helped stoners retain and recoup information efficiently.

# VI. CONCLUSION AND FUTURE WORK

The performance of an AI- powered video conferencing operation integrating sign language paraphrase, AI chatbot backing, and meeting recordings has significantly bettered vacuity, automation, and user engagement. The system successfully bridges the communication gap for individualities with hail impairments by furnishing real- time sign language paraphrase with 85- 90 delicacy, icing inclusivity in virtual meetings. also, the AI chatbot has enhanced productivity by automating tasks analogous as meeting scheduling, real- time query resolution, and summarization, reducing manual trouble and perfecting overall user experience.

The speech recognition and recap module have handed effective meeting documentation, achieving an delicacy of 92 in speech- to- text Page 1 of 2 conversion and effectively distinguishing between multiple speakers.



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These advancements have made the system largely effective for marketable meetings, online education, and collaborative surroundings, allowing stoners to concentrate more on exchanges rather than note- taking. still, challenges analogous as gesture variability in sign language recognition, noise interference in speech recap, and chatbot contextual limitations illuminate areas where further optimization is demanded.

Looking ahead, future work will concentrate on expanding dataset diversity for bettered sign language recognition, enhancing AI chatbot terrain retention, refining multilingual and noise- resistant speech recap, and optimizing system scalability using edge AI and pall computing. also, security advancements like insulation- conserving AI models and stronger encryption mechanisms will be executed to ensure data protection. With these advancements, the system has the implicit to revise virtual communication, making video conferencing more inclusive, intelligent, and indefectible for a global cult.

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