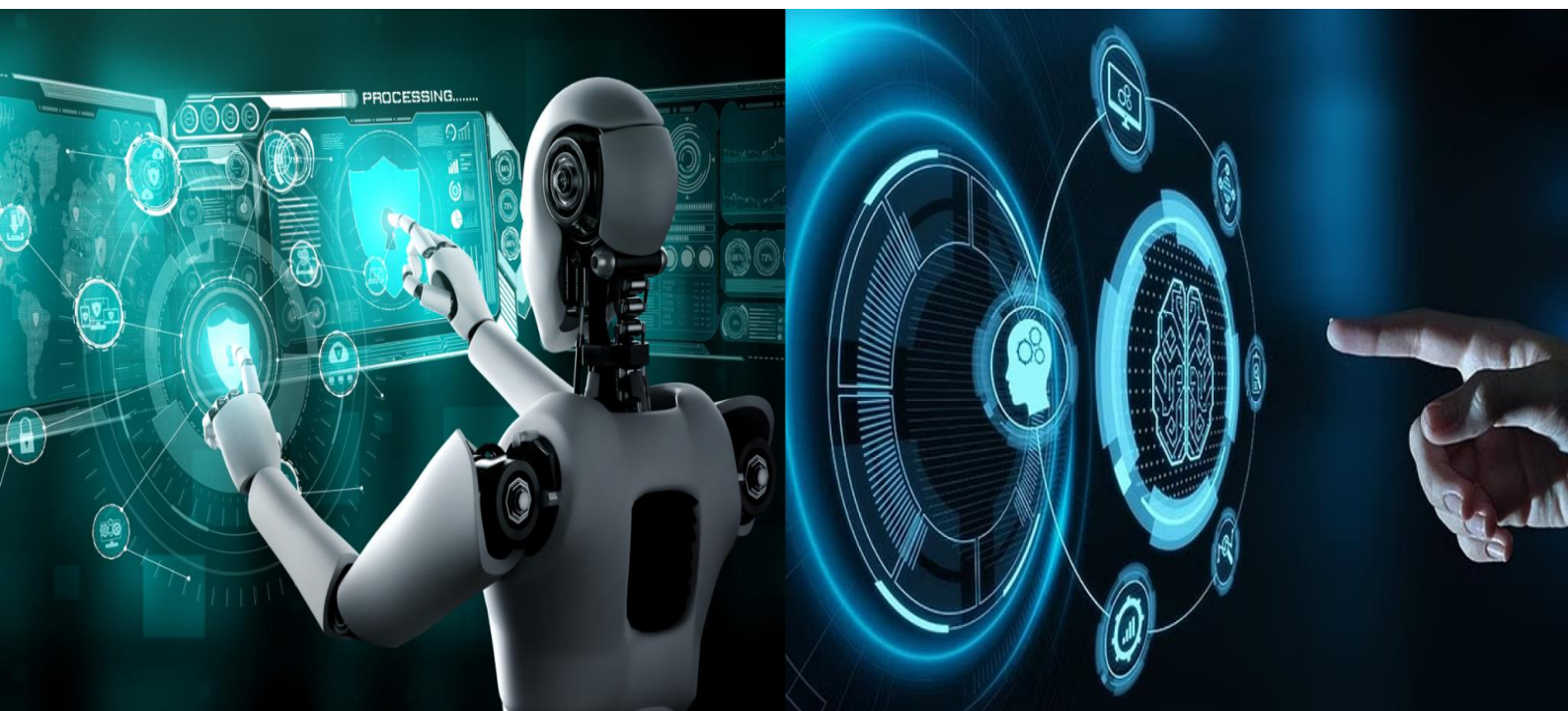


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AI Meeting Summarisation and Action Tacking System

**B.Dhana Lakshmi¹, G. Kavya Sri², A.Chakri³, R. Manoj Kumar⁴, R.Rishi Vardhan⁵,
K.Harsha Vyshnav⁶**

Assistant Professor, Department of CSE (Data Science), NSRIT, Vishakhapatnam, India¹

Student of Department of CSE (Data Science), NSRIT, Vishakhapatnam, India^{2,3,4,5,6}

ABSTRACT: Meeting documentation is important but manual transcription and summarization are time-consuming and error-prone. Traditional methods often miss key points and decisions. This project uses AI technologies like Speech Recognition (Whisper) and NLP-based LLMs (via Ollama) to automatically convert audio into text and generate meaningful summaries. The system handles challenges like noise, accents, and long audio, providing accurate and efficient results in a scalable and near real-time manner.

KEYWORDS: Meeting Summarization, Speech Recognition, Natural Language Processing, Whisper Model, Large Language Models, Ollama, Artificial Intelligence.

I. INTRODUCTION

Meeting documentation is essential for recording important discussions, decisions, and action items in organizations, educational institutions, and corporate environments. Accurate documentation ensures better communication, accountability, and future reference. However, traditional methods such as manual note-taking and transcription are time-consuming, inconsistent, and prone to human error. Important points may be missed, and summarizing long meetings requires significant effort. These limitations highlight the need for an automated and efficient solution. This project presents an AI-powered Meeting Summarizer that automates the process of converting meeting audio into structured and meaningful summaries. It leverages advancements in Artificial Intelligence, Speech Recognition, and Natural Language Processing (NLP) to improve the efficiency and accuracy of meeting documentation. The system begins with audio input, which can be a recorded meeting file. The first step is speech-to-text conversion, where the audio is processed using the Whisper model. Whisper is a deep learning-based speech recognition model capable of accurately transcribing spoken language into text. It performs well even in challenging conditions such as background noise, varying accents, and different speaking styles. This ensures that the transcription is reliable and forms a strong foundation for further processing.

Once the audio is converted into text, the next step is text analysis and summarization. This is achieved using a Large Language Model (LLM) through the Ollama platform. The LLM analyzes the transcribed text, understands the context, and extracts key information such as important points, decisions, and action items. It then generates a concise and structured summary that is easy to read and understand.

II. METHODOLOGY

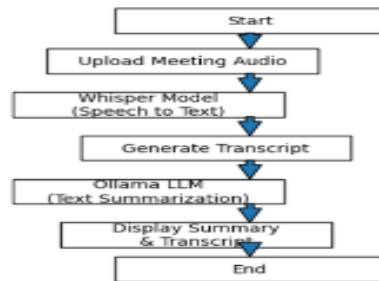
Ethical and Technical Considerations in AI-Based Meeting Summarization The implementation of AI-powered meeting summarization systems involves technical design decisions as well as ethical considerations. Since the system processes spoken conversations that may contain sensitive information, it is essential to ensure accuracy, privacy, transparency, and responsible AI usage.



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Working of AI-Powered Meeting Summarizer Model



III. DATA PRIVACY AND CONFIDENTIALITY

3.1 Informed Usage of Audio Data

Meeting recordings often contain confidential discussions, strategic decisions, and personal information. Therefore, the system must ensure that users are aware of how their audio data is processed. Ethical deployment requires informing users that audio is transcribed and summarized using AI models, maintaining transparency in data handling practices. In addition, **cryptographic techniques** are used to enhance data security by protecting sensitive information during storage and transmission. Encryption methods such as **data encryption and secure access control** ensure that only authorized users can access the recordings and summaries. By combining transparency with strong cryptographic measures, the system maintains user trust, privacy, and data integrity.

3.2 Local Processing and Data Protection

To minimize privacy risks, the proposed system operates locally using Whisper and Ollama models. Since the data is not transmitted to external cloud servers, the risk of unauthorized access or data leakage is reduced. This approach enhances security and protects sensitive organizational information.

3.3 Secure Storage and Temporary Data Handling

Transcripts and intermediate files generated during processing should be handled securely. Temporary files must be deleted after processing, and access controls should be implemented to prevent misuse of stored meeting data.

IV. ACCOUNTABILITY IN AI DECISION-MAKING

4.1 Responsibility in Automated Summarization

AI-generated summaries may occasionally omit key points or misinterpret context. It is important to clarify that the system assists users rather than replaces human judgment. Users remain responsible for verifying the accuracy of generated summaries before official documentation.

4.2 Transparency of Model Behavior

Large Language Models often function as complex systems whose internal decision-making processes are not fully interpretable. This "black box" nature can create challenges in understanding how specific summary outputs are generated. Clear documentation and model selection transparency help address this issue.

4.3 Governance and Usage Guidelines

Organizations implementing the system should define clear policies regarding data handling, storage duration, and authorized access. Establishing governance frameworks ensures responsible usage and minimizes risks associated with automated documentation tools.



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V. ACCURACY AND BIAS IN AI MODELS

5.1 Speech Recognition Limitations

Speech-to-text systems may produce errors due to accents, background noise, or unclear speech. These transcription errors can influence the quality of summaries. Continuous evaluation and model selection improvements are necessary to maintain high accuracy levels.

5.2 Bias in Language Models

Language models are trained on large datasets that may contain inherent biases. These biases can influence the tone or emphasis of generated summaries. Designing prompts carefully and monitoring outputs helps mitigate potential bias in summarization results.

VI. SYSTEM EFFICIENCY AND PERFORMANCE

6.1 Resource Constraints

The system is designed to operate on local machines with limited RAM and CPU resources. Selecting lightweight models such as "tiny" Whisper and "llama3.2:1b" ensures efficient performance without excessive hardware requirements.

6.2 Real-Time or Near Real-Time Processing

To maintain usability, the system must process audio and generate summaries within reasonable time limits. Optimization of model size and processing flow contributes to improved response time and better user experience.

6.3 Security in AI-Based Meeting Summarization

The security of AI-powered meeting summarization systems is critical, as they process sensitive organizational discussions, confidential decisions, and private information. Ensuring strong security mechanisms prevents unauthorized access, data leakage, and misuse of recorded content.

VII. DATA INTEGRITY AND PROTECTION

7.1 Encryption Techniques

Meeting audio files and generated transcripts may contain confidential information. Encrypting data both at rest and during processing helps protect it from unauthorized access. Secure file storage mechanisms and encrypted communication channels enhance overall system security.

7.2 Access Control Mechanisms

Role-Based Access Control (RBAC) ensures that only authorized users can upload, view, or download meeting summaries. Multi-factor authentication (MFA) further strengthens protection by adding additional identity verification layers before granting access.

7.3 Secure File Handling and Data Masking

Sensitive information within transcripts, such as names or financial details, can be masked or anonymized where necessary. Temporary audio files and intermediate data should be deleted after processing to prevent data retention risks.

VIII. AUTOMATED DECISION-MAKING AND TRUST

8.1 Transparency in AI Models

The summarization process relies on complex AI models whose internal workings may not always be interpretable. Providing clear documentation of model usage and functionality improves user trust and ensures responsible AI deployment.



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8.2 Regular Evaluation and Validation

The system should undergo periodic evaluation to ensure transcription accuracy and summary quality. Testing helps identify errors, reduce bias, and maintain reliability over time.

8.3 Human Oversight

Despite automation, human oversight remains essential. Users should review transcripts and summaries before official documentation to prevent misinterpretations or omissions caused by AI-generated outputs.

IX. DATA SHARING AND COMPLIANCE

9.1 Compliance with Data Protection Policies

When meeting data involves sensitive organizational information, compliance with data protection regulations is necessary. Operating the system locally reduces risks associated with external data transmission and supports privacy compliance.

9.2 Standardization of Security Practices

Implementing standardized security protocols, such as secure storage policies and controlled access procedures, ensures consistent protection across departments or organizations using the system.

X. INCIDENT RESPONSE AND RISK MANAGEMENT

10.1 Monitoring and Early Detection

System logs and monitoring mechanisms can detect unusual activity, such as unauthorized access attempts. Early detection enables quick response to potential security threats.

10.2 Communication and Reporting Protocols

In case of a security incident, clear reporting procedures should be established to inform relevant stakeholders. Transparent communication strengthens organizational trust and compliance.

10.3 Post-Incident Analysis

After any security breach or malfunction, a thorough review should be conducted to identify vulnerabilities. Continuous improvement based on incident analysis enhances the long-term resilience of the system.

10.4 Methods and Algorithms for Ethical AI-Based Meeting Summarization

To effectively address ethical, accuracy, and security concerns in AI-based meeting summarization, several advanced methods and algorithms can be employed.

10.5 Speech Recognition Algorithms

The system utilizes advanced deep learning-based speech recognition models such as Whisper to convert audio into text. These models are trained on large multilingual datasets and use transformer architectures to improve transcription accuracy. By analyzing speech patterns, background noise, and contextual cues, the model generates reliable transcripts for further processing.

10.6 Natural Language Processing and Text Summarization

Large Language Models (LLMs) accessed through Ollama are employed for text summarization. These models use transformer-based architectures to understand contextual relationships within transcripts and generate concise summaries. Prompt engineering techniques are applied to guide the model toward structured outputs, such as highlighting key points and action items.

10.7 Privacy-Preserving Processing

Local model execution ensures that meeting audio and transcripts are not transmitted to external cloud servers. This method enhances privacy and reduces exposure to data breaches. Temporary file deletion and controlled access mechanisms further protect sensitive organizational information.



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10.8 Lightweight Model Optimization

To ensure system efficiency on limited hardware, lightweight models such as "tiny" Whisper and "llama3.2:1b" are selected. Model optimization reduces computational overhead while maintaining acceptable levels of accuracy, enabling near real-time performance.

XI. FOSTERING ETHICAL GOVERNANCE IN AI SUMMARIZATION

To promote responsible AI usage in meeting documentation, the following strategies can be implemented:

1. Ongoing AI Literacy and Ethical Training

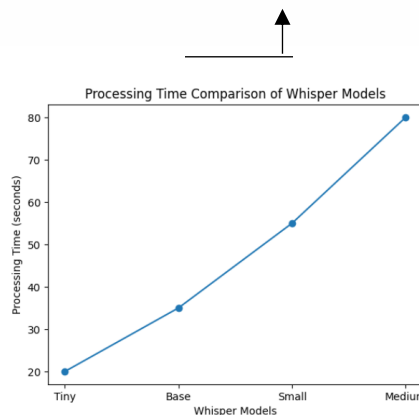
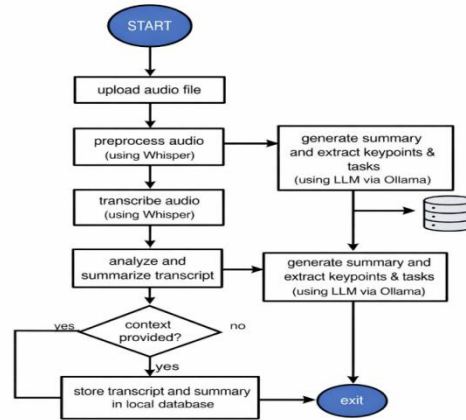
Regular training sessions for developers and users can increase awareness of AI limitations, bias risks, and responsible usage practices. Understanding the capabilities and constraints of AI models ensures better human oversight.

2. Human-in-the-Loop Validation

Incorporating human review of generated summaries ensures accountability and prevents misinterpretation. Human-in-the-loop approaches balance automation with manual verification for improved reliability.

3. Documentation and Transparency

Maintaining clear documentation regarding model selection, data handling procedures, and system limitations enhances transparency. This approach builds trust among users and stakeholders while ensuring compliance with ethical standards.





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XII. CONCLUSION AND FUTURE WORK

Conclusion:

In developing the AI-Powered Meeting Summarizer, we implemented an intelligent system that converts spoken meeting audio into accurate text using the Whisper speech-to-text model and generates concise summaries using large language models through Ollama. The system integrates audio processing, natural language understanding, and user interaction via a Gradio interface to provide a seamless experience. By automating transcription and summarization, the project significantly reduces manual effort, improves productivity, and enhances information accessibility. The modular architecture ensures scalability and flexibility in selecting different transcription and summarization models. Overall, the system demonstrates how AI technologies can effectively streamline meeting documentation and decision-making processes.

Future Work:

Although the current system performs efficiently, several improvements can enhance its capabilities. Future work may include:

1. Integration of real-time live meeting transcription and summarization.
2. Addition of speaker identification (speaker diarization).
3. Support for multilingual transcription and translation.
4. Deployment as a cloud-based web application.
5. Implementation of summary customization options (bullet points, action items, detailed report).
6. Performance optimization using GPU acceleration.
7. Secure storage and encryption for sensitive meeting data.

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