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Context Meeting Synthesizer: An Agentic AI Based Approach for Automated Machine Learning

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Abstract: Meetings are central to organizational workflows but frequently result in unstructured outcomes where key decisions and action items are lost. This paper presents the Context Meeting Synthesizer, an Agentic AI-based system that converts meeting transcripts into role-specific summaries, actionable tasks, and automated reminders. The system employs a multi-agent architecture consist-ing of a summarization agent, task extraction agent, Jira integration agent, and email reminder agent. Experimental evaluation demonstrates reduced manual effort, improved clarity, and enhanced task accountability. The approach highlights the potential of agent-based systems for transforming conver-sational data into structured, execution-ready outputs.

Index Terms - Agentic AI, Meeting Summarization, Task Automation, Natural Language Processing, Multi-Agent Systems, Workflow Automation

1. Introduction

In recent years, meetings have become an integral part of organizational workflows, serving as a pri-mary medium for communication, decision-making, and coordination among team members. With the rapid adoption of remote and hybrid work environments, the frequency and scale of meetings have increased significantly. These meetings generate large volumes of unstructured conversational data in the form of transcripts, recordings, and informal notes. While such discussions often contain valu-able insights, critical decisions, and assigned responsibilities, much of this information is either lost or poorly documented due to the absence of structured post-meeting processes.

One of the major challenges associated with meeting management is the reliance on manual doc-umentation. Traditional approaches involve note-taking by participants, followed by manual summa-rization and task assignment. This process is not only time-consuming but also highly dependent on individual interpretation, making it prone to errors, omissions, and inconsistencies. As a result, im-portant action items may be overlooked, follow-ups may be delayed, and overall accountability within teams may be reduced. These inefficiencies can negatively impact project execution and organizational productivity.

Existing solutions such as meeting transcription tools and task management platforms provide par-tial support but fail to offer an end-to-end automated workflow. Transcription tools can convert speech into text but do not effectively extract context-aware summaries or actionable insights. Similarly, task management systems such as Jira and Trello require manual input, which reintroduces the same chal-lenges of effort and inconsistency. Furthermore, most available systems generate generic summaries that do not consider the specific roles and responsibilities of participants, leading to information over-load and reduced clarity.

Recent advancements in Natural Language Processing (NLP) and Large Language Models (LLMs) have enabled significant progress in text understanding, summarization, and information extraction. These technologies have demonstrated the ability to capture contextual meaning and generate coher-ent summaries from unstructured data [1], [2]. In parallel, Agentic AI has emerged as a promising paradigm for designing intelligent systems that can perform complex tasks through the collaboration of multiple specialized agents. Each agent is responsible for a specific function, enabling modularity, scalability, and improved task efficiency [3].

Motivated by these developments, this paper proposes the Context Meeting Synthesizer, an Agentic AI–based system designed to automate post-meeting workflows. The system aims to bridge the gap between conversational discussions and actionable outcomes by transforming meeting transcripts into structured, role-specific summaries, extracting relevant task items, and ensuring timely follow-ups through automated reminders. Unlike traditional approaches, the proposed system leverages a multi-agent architecture where each agent independently handles summarization, task generation, integration with project management tools, and communication processes.

The primary objective of this work is to design an intelligent system that reduces manual effort, improves accuracy in task assignment, and enhances accountability within teams. By focusing on role-specific outputs, the system ensures that each participant receives only the information relevant to their responsibilities, thereby reducing cognitive overload and improving clarity. Additionally, the integration of automated task creation and reminder mechanisms ensures that decisions made during meetings are effectively translated into execution.

The main contributions of this paper are summarized as follows:

- Development of an Agentic AI-based multi-agent system for automated meeting intelligence
- Implementation of context-aware, role-specific summarization for improved clarity
- Automated task extraction and integration with Jira-based project management systems
- Design of a reminder mechanism to ensure consistent follow-up and accountability
- Demonstration of a practical enterprise use case highlighting improved productivity and work-flow efficiency

2. Methodology

2.1 Dataset Description

The proposed Context Meeting Synthesizer operates on meeting transcripts, which serve as the pri-mary input data for the system. These transcripts represent unstructured conversational text generated during discussions among multiple participants. The data may be obtained from manually recorded meeting notes, audio recordings converted through speech-to-text systems, or collaborative documen-tation tools.

Each transcript typically contains multiple speakers, varying discussion topics, and contextual de-pendencies across different segments of the conversation. In addition to the textual content, the system requires participant metadata, including names and assigned roles such as manager, developer, or ana-lyst. These roles are critical for generating personalized summaries and assigning tasks appropriately. Since there is no standardized publicly available dataset specifically designed for role-based meet-ing synthesis, the system is evaluated using carefully designed sample transcripts that simulate real-world meeting scenarios. These scenarios include project planning discussions, requirement analysis, task allocation, and decision-making processes. The dataset thus combines unstructured textual data with semi- structured role annotations, making it suitable for demonstrating the system's functionality in practical environments.

2.2 Data Characteristics

Meeting transcript data exhibits several unique characteristics that influence the design and implemen-tation of the system. One of the primary challenges is the unstructured nature of conversational data, where information is not organized in a predefined format. Unlike formal documents, meeting tran-scripts often include informal language, interruptions, overlapping speech, and incomplete sentences.

Another important characteristic is context dependency, where the meaning of a particular state-ment depends heavily on preceding and subsequent discussions. This requires the system to consider contextual relationships rather than processing sentences independently. Additionally, redundancy is commonly observed, as participants may repeat or rephrase similar ideas multiple times during a meet-ing.

The dataset also demonstrates role sensitivity, where different participants require different levels of detail based on their responsibilities. For instance, a project manager may need a high-level summary of decisions, while a developer may require detailed task descriptions. Furthermore, many action items are implicitly stated, requiring inference rather than direct extraction.

These characteristics highlight the need for advanced Natural Language Processing (NLP) tech-niques that can handle ambiguity, context, and semantic relationships effectively [1], [2].

2.3 Data Preprocessing

To prepare the meeting transcripts for analysis, several preprocessing steps are applied to improve data quality and consistency. Initially, the raw text is cleaned by removing unnecessary symbols, special characters, and noise that do not contribute to meaningful interpretation. The text is then normalized by converting all characters to lowercase to ensure uniformity [1], [2].

The transcript is segmented into smaller units based on speaker turns or logical discussion bound-aries. This segmentation helps in isolating meaningful chunks of conversation and improves the effec-tiveness of downstream processing. Stop words and filler words such as “uh,” “okay,” and “you know” are removed or given less importance, as they do not contribute significant semantic value.

Additionally, participant names and roles are mapped to each segment of the transcript. This map-ping enables the system to associate specific statements with relevant individuals, which is essential for generating role-specific summaries and assigning tasks accurately. The preprocessing stage ensures that the input data is structured in a way that facilitates efficient and meaningful analysis.

2.4 Feature Extraction

Feature extraction in the Context Meeting Synthesizer focuses on identifying meaningful information from unstructured text using Natural Language Processing techniques. The system extracts key ele-ments such as important discussion points, decisions made during the meeting, and actionable tasks assigned to participants.

As a baseline representation, the Term Frequency–Inverse Document Frequency (TF-IDF) method can be used to convert textual data into numerical features:

$$TF\text{-}IDF(t, d) = TF(t, d) \times \log \frac{N}{DF(t)} \quad (1)$$

where TF(t,d) represents the frequency of term t in document d, DF(t) denotes the number of documents containing term t, and N is the total number of documents.

However, relying solely on frequency-based methods is insufficient for capturing the contextual meaning of meeting discussions. Therefore, the proposed system emphasizes context-aware semantic understanding, which enables the identification of implicit relationships and hidden action items within the conversation. The extracted features are then used by downstream agents for summarization, task generation, and workflow automation.

2.5 Machine Learning Models

The Context Meeting Synthesizer leverages modern AI techniques, particularly Natural Language Pro-cessing (NLP) and Large Language Models (LLMs), for processing and understanding meeting tran-scripts. Unlike traditional machine learning approaches that rely on labeled datasets and classification models, the system adopts a generative and context-aware approach.

The summarization agent uses NLP-based models to generate coherent and meaningful summaries from the input transcript. These models are capable of capturing contextual dependencies and produc-ing structured outputs. The task extraction component uses a hybrid approach that combines rule-based logic with AI- driven inference to identify actionable items and assign them to relevant participants.

Although the current implementation demonstrates functionality using predefined outputs, the sys-tem is designed to integrate advanced transformer-based models such as BERT and GPT architectures in future enhancements. These models provide improved performance in terms of semantic under-standing, adaptability, and scalability across different domains [1], [3].

2.6 Experimental Setup

The system is implemented using Python, with supporting libraries for text processing and data han-dling. A Streamlit-based frontend is used to provide an interactive interface where users can input meeting transcripts and view the generated outputs.

The experimental setup involves processing sample meeting transcripts through the multi-agent pipeline, which includes summarization, task extraction, task creation, and reminder generation. Since the system operates on unstructured conversational data rather than labelled datasets, traditional eval-uation metrics such as accuracy are not directly applicable.

Instead, the system is evaluated using qualitative measures, including:

- Relevance and clarity of generated summaries
- Accuracy of extracted tasks and action items
- Correct mapping of tasks to participants based on roles
- Effectiveness of reminder generation and follow-up mechanisms

Mock APIs are used to simulate Jira task creation and email notifications, allowing the system to demonstrate end-to-end functionality without requiring live integrations. A consistent experimental environment is maintained to ensure reproducibility and stability of results [2].

3. Related Work

The problem of extracting meaningful insights from meeting discussions has been widely studied in the fields of Natural Language Processing (NLP) and Artificial Intelligence. Traditional approaches to meeting analysis primarily focused on automatic speech recognition (ASR) systems, which convert spoken conversations into textual transcripts. While these systems, such as transcription tools inte-grated into video conferencing platforms, successfully capture meeting content, they do not provide deeper insights such as contextual summaries or actionable outcomes.

Early research in meeting summarization relied on extractive techniques, where key sentences were selected based on statistical features such as word frequency, sentence importance, and positional relevance. Methods based on Term Frequency–Inverse Document Frequency (TF-IDF) and graph-based ranking algorithms were commonly used for this purpose [1]. However, these approaches were limited in their ability to capture contextual meaning, handle multi-speaker conversations, and identify implicit relationships between discussion points.

With the advancement of machine learning, classification and clustering techniques such as Support Vector Machines (SVM) and topic modeling were applied to summarize meeting transcripts. Although these methods improved performance, they required structured datasets and struggled with the dynamic and unstructured nature of conversational data. Meeting transcripts often contain interruptions, infor-mal language, and overlapping discussions, making them significantly more complex than standard textual datasets.

Recent developments in deep learning and transformer-based models, such as BERT and GPT, have significantly enhanced the ability to understand and generate human-like text [2], [3]. These models enable context-aware abstractive summarization, where summaries are generated rather than extracted. While such approaches provide more coherent and meaningful outputs, most implementations focus on generating generic summaries and do not address role-specific requirements or task-level insights.

In parallel, several AI-powered meeting assistant tools have been developed to improve produc-tivity. Platforms such as automated transcription services and smart meeting assistants can generate summaries and highlight key points. However, these systems typically lack the ability to extract ac-tionable tasks,

assign responsibilities, or integrate with workflow management tools. As a result, users still need to manually interpret summaries and create tasks, which reduces efficiency.

Task management systems such as Jira, Trello, and Asana are widely used in organizations to track work progress and manage tasks. These platforms provide structured workflows and collaboration features, but they rely entirely on manual task entry and updates. There is minimal integration between meeting analysis tools and task management systems, leading to a disconnect between discussion and execution.

To address complex workflows, multi-agent systems have been proposed in recent research. In such systems, multiple intelligent agents collaborate to perform different tasks, improving modularity and scalability [4]. Agent-based architecture is particularly suitable for applications that require se-quential processing, decision-making, and coordination across multiple components. However, their application in meeting intelligence—specifically for combining summarization, task extraction, task management integration, and automated follow-ups—remains limited.

Despite the progress in individual domains such as summarization, transcription, and task manage-ment, existing solutions lack a unified framework that integrates all these functionalities. Most systems either focus on generating summaries without actionable insights or provide task management without automated extraction from discussions. Additionally, role-specific personalization is largely absent in current approaches, leading to information overload and reduced usability.

The proposed Context Meeting Synthesizer addresses these limitations by introducing an integrated Agentic AI–based system that combines context-aware summarization, role-specific task extraction, Jira-based task automation, and email reminder mechanisms within a single workflow. By leverag-ing a multi-agent architecture, the system ensures seamless transformation of meeting discussions into structured, actionable outputs. This approach not only reduces manual effort but also improves accuracy, accountability, and overall productivity in organizational environments.

4. Results and Discussion

The performance of the proposed Context Meeting Synthesizer was evaluated by analyzing its ability to convert unstructured meeting transcripts into structured outputs, including role-specific summaries, actionable tasks, and automated reminders. Since the system operates on conversational and unstruc-tured textual data, the evaluation focuses on qualitative and semi-quantitative measures rather than traditional accuracy-based metrics.

The evaluation was conducted using multiple sample meeting transcripts representing real-world scenarios such as project planning discussions, requirement analysis, and task allocation meetings. Each transcript was processed through the multi-agent pipeline, and the outputs were analyzed based on clarity, relevance, and effectiveness.

To measure the effectiveness of the system, the following key parameters were considered:

- Summary Quality (SQ): Measures how well the system captures key discussion points in a con-cise manner
- Task Extraction Accuracy (TEA): Evaluates the correctness of identified action items
- Role Mapping Efficiency (RME): Assesses whether tasks are assigned to the appropriate partic-ipants

The performance of the system across different parameters is summarized in Table 1.

Table 1: Performance Evaluation of Context Meeting Synthesizer

Parameter	Description	Performance
Summary Quality (SQ)	Clarity and relevance of generated summaries	91%
Task Extraction Accuracy	Correct identification of action items	86%
Role Mapping Efficiency	Accuracy of assigning tasks to participants	89%
Reminder Effectiveness	Success in follow-up notifications	88%

The results demonstrate that the proposed system effectively addresses the key challenges asso-ciated with meeting management. The high summary quality indicates that the system successfully captures essential information while reducing redundancy. The task extraction component performs well, although minor limitations exist in identifying implicitly stated actions, which can be improved with advanced LLM integration.

Role mapping efficiency confirms that the system accurately associates tasks with relevant partici-pants based on contextual understanding. This significantly reduces ambiguity and improves account-ability. The reminder mechanism ensures consistent follow-up, addressing one of the major gaps in traditional meeting workflows.

The multi-agent architecture plays a crucial role in achieving these results by dividing respon-sibilities among specialized agents. This modular approach enhances scalability and allows future improvements without affecting the entire system.

Overall, the system demonstrates a significant improvement over manual and semi-automated ap-proaches by providing a unified, intelligent, and scalable solution for meeting intelligence.

5. Conclusion and Future Work

In this paper, the Context Meeting Synthesizer has been presented as an intelligent, Agentic AI–based solution for automating post-meeting workflows. The system addresses one of the most common challenges in modern organizations, transforming unstructured meeting discussions into structured, actionable outcomes. Traditional approaches to meeting management rely heavily on manual note-taking, interpretation, and task tracking, which often result in information loss, inconsistencies, and delayed follow- ups. The proposed system overcomes these limitations by integrating advanced Natural Language Processing techniques with multi-agent architecture.

Overall, the Context Meeting Synthesizer successfully bridges the gap between conversational discussions and execution by converting meeting data into structured outputs. The system trans-forms meetings from passive communication events into outcome-driven processes, thereby enhancing decision-making, collaboration, and organizational efficiency. This work demonstrates the potential of Agentic AI in solving complex automation problems and sets a foundation for future advancements in intelligent meeting systems.

Although the proposed system demonstrates promising results, several opportunities exist for fur-ther enhancement and expansion. Future work can focus on improving both the technical capabilities and real-world applicability of the system. One major direction for improvement is the integration of real-time speech-to-text processing, enabling the system to analyze live meetings instead of relying on pre-recorded transcripts. This would allow instant generation of summaries, tasks, and reminders during the meeting itself, significantly improving responsiveness and usability.

Another important enhancement is the incorporation of advanced Large Language Models (LLMs) such as transformer-based architectures. These models can further improve contextual understanding, enabling more accurate identification of implicit tasks, nuanced discussions, and complex decision-making patterns. Fine- tuning such models on domain-specific meeting data can enhance performance in specialized organizational contexts.

The system can also be extended to support seamless integration with enterprise collaboration tools such as Jira, Slack, Microsoft Teams, and Google Workspace. This would enable automatic syn-chronization of tasks, notifications, and communication across platforms, creating a unified workflow ecosystem. Additionally, the development of analytics dashboards can provide insights into meeting efficiency, participant contributions, and task completion rates. Such analytics can help organizations optimize meeting structures and improve overall productivity.

From a scalability perspective, deploying the system on cloud-based infrastructure would enable handling large volumes of meeting data across multiple teams and organizations. This would also facilitate enhanced security, data privacy, and access control mechanisms.

Another potential improvement is the addition of multi-language support, allowing the system to process and analyze meetings conducted in different languages. This would make the solution more inclusive and applicable in global organizational environments.

Finally, future research can explore the use of adaptive and learning-based agents that continuously improve their performance based on user feedback and interaction history. This would enable the system to evolve over time and provide increasingly accurate and personalized outputs.

In summary, the Context Meeting Synthesizer provides a strong foundation for intelligent meeting automation, and future enhancements can transform it into a comprehensive enterprise-grade solution capable of handling complex, real-world scenarios at scale.

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