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Automated Group Discussion Feedback and Scoring with AI

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Abstract
The proposed AI-driven group discussion platform addresses several key challenges identified in 15 studies, such as dominance by certain participants, insufficient feedback, lack of structure, and unethical analysis difficulties. It also tackles issues like network variability, ML implementation complexity, security concerns, data biases, low student engagement, and privacy issues. The platform provides solutions by leveraging AI and machine learning for real-time monitoring and personalized feedback, ensuring balanced and productive discussions. Emotion recognition algorithms analyze micro-expressions, while multi-language support and gamification elements enhance accessibility and motivation. Integration with Learning Management Systems (LMS) streamlines resource access and performance tracking, and an advanced analytics dashboard offers insights into group dynamics. Efficient video delivery and scalable multipoint videoconferencing mitigate network issues. Robust security measures protect user data, and continuous assessment features enable personalized feedback. Future enhancements like virtual and augmented reality aim to create immersive discussion experiences and facilitate teamwork, addressing the limitations of existing systems and fostering an inclusive, engaging, and productive environment for all participants.

Keywords: *Emotion recognition performance tracking, gamification, Personalized feedback, unethical analysis.*

1. Introduction
Group discussions play a crucial role in both educational and professional environments by promoting collaborative learning, critical thinking, and effective communication. However, several challenges hinder the effectiveness of these discussions, such as the dominance of certain participants, insufficient feedback mechanisms, lack of structured interactions, and difficulties in conducting nuanced analysis. Additionally, traditional platforms often face issues like network variability, security concerns, data biases, and low engagement due to insufficient technical skills among educators. Research from 15 key studies highlights these problems, underscoring the struggles with maintaining participant engagement, providing the timely feedback, and managing diverse participant groups. To address these issues, an innovative AI-driven group discussion platform has been developed, synthesizing insights from these studies. The platform leverages advanced artificial intelligence and machine learning technologies to offer real-time monitoring, personalized feedback, and emotion recognition through micro-expressions, enhancing the quality of interactions. Features such as multi-language support, gamification elements like badges and leaderboards, and integration with Learning Management Systems improve accessibility, motivation, and resource tracking. The platform's scalable architecture supports efficient video conferencing and adapts to varying network

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conditions, while robust security measures ensure user data protection. Dynamic grouping strategies and continuous assessment features enable personalized feedback. By integrating these AI and ML capabilities, the platform not only solves the problems identified in existing research but also fosters a more focused, inclusive, and productive discussion environment. AI techniques such as supervised learning, reinforcement learning, and emotion analysis play a pivotal role in ensuring discussions remain engaging, ethical, and impactful. Moreover, the broader application of AI in the platform helps automate complex tasks, improve decision-making, and create adaptive systems tailored to the needs of diverse users across various domains. [1-5]

2. Literature Review

2.1 Automated Discussion Analysis - Framework for Knowledge Analysis from Class Discussions

This research paper presents an Automated Discussion Analysis (ADA) framework for managing knowledge from classroom and online discussions. It highlights how these discussions enhance critical thinking and provide insights into learning behaviors. The ADA framework aims to guide the development of AI-driven tools for automated analysis, addressing the current lack of suitable technologies. A case study showcases the application of the framework in analyzing an online discussion forum in a postgraduate course.

2.2 A Machine Learning Solution for Video Delivery to Mitigate Co-Tier Interference in 5G HetNets

This study addresses the challenges of managing interference in Heterogeneous Networks (HetNets) due to increased mobile data traffic, particularly from video services during the COVID-19 pandemic. It introduces the Machine Learning Interference Classification and Offloading Scheme (MLICOS), which consists of two variants: MLICOS1 (traditional classifiers) and MLICOS2 (sophisticated methods). MLICOS aims to mitigate co-tier interference among femtocells for video delivery. Simulation results show that MLICOS outperforms traditional methods in throughput, delay, and packet loss, providing a robust solution for 5G network capacity management.

2.3 Adversarial Machine Learning in Text Processing: A Literature Survey

This study explores adversarial machine learning in text processing, focusing on vulnerabilities and potential countermeasures. While advancements in natural language processing (NLP) have driven adoption, they also introduce new risks, especially in applications like sentiment analysis and text classification. The examination covers various attack methods, including character manipulation and word substitution, alongside defense strategies such as adversarial training and input validation. Key findings highlight the exploitation of weaknesses in word embeddings and contextual representations. The paper identifies emerging trends and research directions, stressing the importance of robust evaluation protocols and standardized benchmarks. Overall, it aims to provide insights that enhance the security and reliability of NLP models, serving as a valuable resource for researchers and practitioners in the field. [6-10]

2.4 AI-Based Conversational Agents: A Scoping Review from Technologies to Future Directions

This scoping review explores the evolving field of AI-based conversational agents, analyzing over 150 studies on technologies, applications, and future research directions. It highlights advancements in natural language processing, machine learning, and cognitive architectures, with applications in customer service, healthcare, and education. Key trends, challenges, and future priorities are discussed, focusing on enhancing human-agent collaboration and usability. By linking technological advancements with practical research, the review provides insights for improving human-agent interactions and guiding future innovations in the field.

2.5 A Tale of Three Videoconferencing Applications: Zoom, Webex, and Meet

This paper presents a comprehensive measurement study comparing the user-perceived performance of three major videoconferencing platforms: Zoom,

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Webex, and Google Meet. Analyzing 62 hours of data from over 1,100 sessions conducted with both emulated clients and real mobile devices, the study reveals differences in geographic coverage and resource allocation that affect streaming lag and quality. It also examines how factors like bandwidth, participant numbers, and device status influence user experience. The methodology offers a reproducible framework for benchmarking and analyzing videoconferencing systems, facilitating comparative assessments.

2.6 Review on evaluation techniques for better student learning outcomes using machine learning

This paper investigates student learning outcomes by analyzing various evaluation parameters, including learner characteristics, engagement, strategies, teacher experience, and technology's role in education. Using classification algorithms like Decision Tree, Naïve Bayes, and Support Vector Machine, it categorizes student performance based on examination results. Machine learning techniques help determine if desired learning outcomes are met, emphasizing the importance of regular evaluations to accurately measure educational impact and provide a comprehensive summary of learning effectiveness.

2.7 Research and Thinking on Online Teaching and Learning in Secondary Schools in China Based on the Background of Epidemic Prevention and Control

This study examines the effects of epidemic prevention measures on online teaching and learning in Chinese secondary schools during the COVID-19 pandemic. Using a mixed-methods approach, it analyzes educators' and students' experiences, identifying effective strategies and technological tools that facilitated educational continuity. Key findings emphasize the role of interactive platforms and multimedia content while highlighting challenges like unequal access and motivation. The study proposes a framework for high-quality online education, focusing on teacher training, student support, and parental involvement, with recommendations for improving infrastructure and curriculum. The insights aim to inform educational policymakers and stakeholders to enhance resilience and equity in future online learning experiences.

2.8 Effects of Grouping Strategies on Asynchronous Online Discussion: Evidence from Learning Analytics and Social Network Analysis

This study examines the effects of different grouping strategies on student engagement and knowledge construction in online learning environments using social network analysis and learning analytics. Analyzing discussion forum data, the findings indicate that diverse groups with varying skill levels promote more active participation and richer knowledge sharing. Groups with balanced participation yield more comprehensive discussions. These insights inform instructors and course designers on optimizing online discussions to enhance student collaboration and learning outcomes, contributing to evidence-based practices in online education.

2.9 Correlative Analysis and Impact of Intelligent Virtual Assistants on Machine Learning

This overview highlights the symbiotic relationship between Intelligent Virtual Assistants (IVAs) and Machine Learning (ML), driving innovation across various sectors. IVAs enhance ML models by processing user data, leading to more accurate predictions, while ML advancements improve IVAs' natural language processing and decision-making capabilities. Key applications include personalized healthcare recommendations, tailored financial advice via chatbots, and adaptive learning in education. This integration transforms industries by enhancing customer service and automation, with researchers and developers focused on maximizing its potential. Ultimately, the collaboration between IVAs and ML is poised to redefine human-computer interaction and improve user experience and efficiency across multiple domains.j.

2.10KNADIA: Enterprise Knowledge Assisted Dialogue Systems using Deep Learning

KNADIA transforms enterprise dialogue systems by integrating deep learning and knowledge assistance to enhance customer experience and efficiency. It

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combines neural language models, knowledge graphs, and semantic search to deliver accurate, context-aware responses. Key components include a knowledge graph-based question answering module, a deep learning dialogue state tracker, and a contextual response generator. Evaluations show notable improvements in response accuracy (92%), contextual understanding (85%), and customer satisfaction (90%). KNADIA is scalable across various domains such as finance, healthcare, and e-commerce, facilitating seamless integration with existing systems. This innovative framework bridges knowledge management and conversational AI, empowering enterprises to deliver personalized support, reduce resolution times, and boost customer loyalty, significantly impacting the future of customer service delivery.

2.11 Questions Classification in Online Discussion Towards Smart Learning Management System

This study proposes a framework for classifying questions in intelligent learning management systems, enhancing online conversation analysis. It automatically categorizes 21 questions by cognitive levels, themes, learning objectives, and types using 27 machine learning and natural language processing algorithms. The framework helps teachers identify knowledge gaps, assess student comprehension, and tailor their teaching methods, resulting in improved accuracy in question classification. Key features include real-time feedback, individualized learning pathways, and enhanced student engagement. This innovative approach leverages AI and natural language processing to advance personalized education and optimize learning outcomes in online environments. [11-15]

2.12 SWITCH-ing from multi-tenant to event-driven videoconferencing services

The SWITCH-ing project explores transitioning videoconferencing services from a multi-tenant to an event-driven architecture to enhance scalability and flexibility. This approach allows platforms to efficiently manage varying participant numbers and usage patterns, ensuring a seamless experience while dynamically allocating resources to reduce costs and environmental impact. The project focuses on designing scalable video routing systems, advanced scheduling algorithms, and user-friendly interfaces. By leveraging advanced technologies, SWITCH-ing aims to create a next-generation videoconferencing platform that meets the needs of diverse users, transforming remote collaboration into a more inclusive, efficient, and sustainable experience.

2.13 Software Defined Network-Enabled Multicast for Multi-Party Video Conferencing Systems

This paper addresses challenges in delivering high-quality multi-party video conferencing, particularly issues related to latency and bandwidth in traditional MCU-based solutions, which can lead to delays and bottlenecks. It introduces a novel architecture that utilizes software-defined networking (SDN) to enhance video conferencing. By separating the data and control planes, the SDN controller helps manage multicast tree construction for video flows, allowing for service-aware QoS guarantees. The proposed architecture employs an innovative method for creating and packing multiple source-based multicast trees to optimize system utility while maintaining end-to-end delay bounds. Simulation results show improved video rates and reduced delays compared to conventional MCU-based approaches, especially in varied network conditions.

2.14 Analyzing Learners Behavior in MOOCs: An Examination of Performance and Motivation Using a Data-Driven Approach

This study analyzes learner behavior in MOOCs using a data-driven approach to explore the connections between engagement, assessment outcomes, and self-reported motivation. By employing learning analytics and data mining techniques, the research identifies key factors that drive success and patterns linked to high achievement and persistence. Findings indicate a strong correlation between learner engagement and motivation with performance, revealing that active participation and consistent logins lead to better outcomes. The insights gained aim to inform the design of effective MOOCs, enabling personalized learning experiences that enhance engagement and

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academic achievement in online courses.

2.15Peer-to-peer Multipoint Video Conferencing Using Layered Video

This research introduces a peer-to-peer multipoint video conferencing system that utilizes layered video coding for efficient video transmission across heterogeneous networks. The system adapts video quality based on varying network conditions and device capabilities, ensuring a high-quality experience for all participants. By using advanced peer-to-peer protocols, it enables scalable and fault-tolerant connections without a centralized server, reducing latency for large-scale applications. Additionally, robust error correction techniques enhance video quality amid network disruptions. This work advances the development of resilient and scalable video conferencing solutions suitable for diverse environments

3. Comparative Study

Table 1 Comparative Study

Ref. No.	Author Name	Publication Year And Publisher	Title of Paper	Methodology	Advantage	Disadvantage
1	Swapna GOTTIPATI, Venky SHANKARAR AMAN, Mallika NITIN Gokarn	May 17,2021 at 03:21:01 UTC from IEEE Xplore.	Automated Discussion Analysis - Framework for Knowledge Analysis from Class Discussions	Utilize the ADA framework to analyze discussions and implement AI for knowledge representation.	Enhances critical thinking. Provides insights into learning behaviors.Automates data capture.	Requires development of automated tools. May struggle with nuanced analysis. Risk of overlooking qualitative aspects.[1].
2	Devanshu Anand, Mohammed Amine Togou, Gabriel-Miro Muntean	IEEE TRANSACTIONS ON MULTIMEDIA, VOL. 25, 2023	A Machine Learning Solution for Video Delivery to Mitigate Co-Tier Interference in 5G HetNets	The study applies Z specification, a formal method, to verify the software of a basic alcohol level detector	Improves throughput and reduces delay and packet loss.Leverages ML for effective interference management.	Complexity in implementing ML algorithms. Performance may vary with different network conditions.[2]
3	Izzat Alsmadi , Nura Aljaafari , Mahmoud Nazzal	Date of publication :2022,IEEE	Adversarial Machine Learning in Text Processing: A Literature Survey	Survey adversarial machine learning in text processing applications, focusing on text generation metrics, defense against attacks, and emerging research trends.	Identifies defense challenges.Highlights importance of adversarial techniques.	Complex problem-solving due to diversity.Ongoing security challenges from evolving attacks[3]
4	Sheetal Kusal , Shruti Patil , Jyoti Choudrie , Ketan Kotecha , Sashikala Mishra, And Ajith Abraham .	IEEE, date of publication 23 August 2022	AI-Based Conversational Agents: A Scoping Review From Technologies to Future Directions	Provide an overview of conversational agents, focusing on techniques (pattern-based, machine learning, deep learning) and tasks involved, utilizing tools like TensorFlow, PyTorch, and NLTK.	Enhances human-computer interaction.Simulates human behavior and emotions.	Complexity in implementing emotional context.Identifies gaps in current research sensitive biometric.[4]

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5	Hyunseok Chang, Matteo Varvello, Fang Hao, and Sarit Mukherjee	IEEE/ACM Transactions On Networking, Vol. 30, No. 5, October 2022	A Tale of Three Videoconferencing Applications: Zoom, Webex, and Meet	Conduct a measurement study comparing Zoom, Webex, and Google Meet based on 62 hours of videoconferencing sessions from emulated clients and real mobile devices.	Systematic performance characterization.Enables reproducible benchmarking.	Limited to three systems.Results may vary with network conditions.[5]
6	Pooja Rana , Dr.Lovi Raj Gupta, Dr. Mithilesh Kumar Dubey, Dr. Gulshan Kumar	2021 2nd International Conference on Intelligent Engineering and Management (ICIEM) .	Review on evaluation techniques for better student learning outcomes using machine learning.	Reviewed evaluation parameters affecting student learning outcomes; applied machine learning classifiers (Decision Tree, Naïve Bayes, Support Vector Machine) for performance tracking.	Enables targeted interventions for improving learning outcomes.Provides data-driven insights into student performance.	Requires extensive data for accurate classification.Potential bias in classification results based on training data.[6]
7	Juan Ang, Caiping Wu	2021 10th International Conference on Educational and Information Technology	Research and Thinking on Online Teaching and Learning in Secondary Schools in China Based on the Background of Epidemic Prevention and Control	Conducted a questionnaire survey using Google Forms, analyzed with Excel to assess online teaching challenges and improve technology integration.	Supports continuous learning.Improves teaching practices.	Teachers lack tech skills.Low student engagement.[7]
8	Heng Luo,Ying Chen, Mingwei Li	November 01,2020 UTC from IEEE Xplore .	Effects of Grouping Strategies on Asynchronous Online Discussion: Evidence From Learning Analytics and Social Network Analysis	Collect data preprocess analyze visualize interpret validate and report systematically thoroughly	Enhances learning outcomes and engagement.	Increases complexity and technical issues.[8]
9	Mohd Aijaj Khan, Anubhav Tripathi, Aaradhya Dixit, Manish Dixit	2019 11th International Conference on Computational Intelligence and Communication Network	Correlative Analysis and Impact of Intelligent Virtual Assistants on Machine Learning	Analyze the capabilities and applications of Intelligent Virtual Personal Assistants (IVPAs) within the broader context of Artificial Intelligence, focusing on their increasing intelligence and user services.	Enhances efficiency and convenience in task management.Expands user access to AI-driven services.	Potential privacy and security concerns with data handling.Dependence on technology may reduce human interaction.[9]

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10	Mahesh P. Singh, Puneet Agarwal, Ashish Chaudhary, Gautam Shroff Prerna Khurana	2018 IEEE 34th International Conference on Data Engineering	KNADIA: Enterprise KNowledge Assisted DIAlogue Systems using Deep Learning	Developed KNADIA using deep learning frameworks (e.g., TensorFlow, PyTorch) for conversational agents and deployed it on cloud infrastructure.	Enhances employee productivity.Supports diverse enterprise needs.	Enhances employee productivity.Supports diverse enterprise needs[10].
11	Bambang Dwi Wijanarko ,Dina Fitria Murad , Yaya Heryadi Lukas , Hapnes Toba,Widodo Budiharto	3-5 September 2018, Bina Nusantara University, Jakarta, Indonesia, 2018 International Conference on Information Management and Technology (ICIMTech)	Questions Classification in Online Discussion Towards Smart Learning Management System	Collect and categorize questions using NLP and machine learning, extract features, train a model, integrate with a smart LMS, and continuously update for personalized learning recommendations	Continuous monitoring.Updating of the modelEnsures accuracy and relevance.	Technical issues.System down time.[11]
12	Vlado StankovskiSandi GecUros Pascinski,Jernej Trnkoczy	2017 IEEE 2nd International Workshops on Foundations and Applications of Self Systems (FASW)	SWITCH-ing from multi-tenant to event-driven videoconferencing services	Assess requirements design architecture implement solution test thoroughly optimize performance	Scalability and cost savings improved.	Higher infrastructure and migration costs involved. [12]
13	Miao Zhao, Bin Jia, Mingquan Wu, Heather Yu	Date of Publication :2018,IEEE	Software Defined Network-Enabled Multicast for Multi-Party Video Conferencing Systems	Propose a novel SDN-enabled architecture for multi-party video conferencing, utilizing multicast trees for video flows and a new multicast construction and packing method.	Reduces latency and improves QoS.Enhances flexibility in network infrastructure.Maximizes system-wide utility for video delivery.	Complexity in implementing SDN architecture.Potential for new bottlenecks in the control plane. Dependence on SDN infrastructure may limit adoption.[13]
14	Abir Jaafar Hussain	Date of publication October 22, 2018	Analyzing Learners Behavior in MOOCs: An	Collect MOOC data, apply data mining, and machine learning techniques sequentially.	Improves student outcomes and retention.	Overreliance on data and technology.[14]

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			Examination of Performance and Motivation Using a Data-Driven Approach			
15	Istemi Ekin AkkuE, M. Reha Civanlar, Oznur Ozkasap	International Journal of Creative Research Thoughts Year: 2006	Peer-to-peer Multipoint Video Conferencing Using Layered Video	Overreliance on data, technology, and potential bias in analysis methods.	Enhances collaboration.Enhances user experience.	Increases network complexity and bandwidth requirements. [15]

4. Discussion

This AI-enhanced group discussion platform tackles persistent challenges found in traditional discussions, including imbalanced participation, limited feedback, and unstructured dialogue. Through advanced machine learning, it creates an environment that encourages equal and effective engagement for all members. Real-time video monitoring assesses participant behavior and engagement, while emotion recognition capabilities analyze subtle expressions to provide insights into individual emotional states, supporting a clearer understanding of group dynamics. This feature allows for personalized feedback, helping participants refine communication skills by identifying both strengths and areas for improvement.The platform's multi-language support, enabled by natural language processing, makes it accessible to diverse groups, allowing inclusive participation across language barriers. Gamification elements, such as badges and leaderboards, further drive engagement, fostering a collaborative and motivating atmosphere. By integrating with popular Learning Management Systems (LMS), the platform enables smooth access to discussion resources and provides educators with a consolidated view of student progress and group interactions. Detailed analytics dashboards help educators monitor group dynamics and engagement, allowing for data-driven instructional decisions.Future improvements may include virtual and augmented reality, offering immersive, interactive experiences that deepen engagement. Additional tools, like collaborative whiteboards and document editing, could support brainstorming and teamwork. Continual assessment is essential to measure the platform's long-term effect on communication skills and ethical behavior, with data informing ongoing refinements. In sum, this platform presents a forward-looking solution to enhance group discussions, leveraging technology to foster inclusivity, engagement, and productivity in educational dialogues.

Conclusion

An important development in improving communication abilities and encouraging moral behavior during conversations is the AI-powered group discussion platform. In addition to addressing the issues with conventional group talks, the platform offers participants a controlled and encouraging atmosphere by using machine learning algorithms to track participant behavior in real-time. The integration of tailored feedback and thorough reporting enables people to identify their areas of strength and progress, promoting ongoing development. Furthermore, the platform's adaptability in accommodating both sporadic phone calls and scheduled class sessions guarantees its relevance in a range of settings, from casual chats to official educational settings. Discussions are further improved by the automatic topic assignment and adherence to preset guidelines, which make them more interesting and targeted. All things considered, this creative method of group talks opens the door to a more dynamic and cooperative educational process,

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which eventually helps students develop critical communication skills that are vital in both academic and professional settings. The platform is positioned for continual improvement as continuing feedback is incorporated into the system, guaranteeing that it stays relevant and successful in meeting users' changing needs.

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