



RESEARCH PAPER**Logic and Conversation in Artificial Minds: Humanoids and Grice's Cooperative Principle**

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ABSTRACT

The objective of this research was to explore the linguistic performance of two humanoids: Sophia and Ameca in conversation during humanoid-human interaction in two different interviews. Gricean Cooperative Principles as theoretical framework directed the study to identify the performance of humanoids and their adherence and flouting of the maxim of quality, quantity, manner, and relevance. Eight dialogues are taken to study the conversational implicature with four dialogues for each humanoid. By analyzing AI-driven conversational models, this paper examines how logic-based programming aligns with or deviates from human pragmatic norms and investigates whether AI's linguistic responses exhibit pragmatic competence or merely mimic cooperative communication through statistical probabilities. The findings contribute to the discourse on human-AI interaction, highlighting the potential and limitations of artificial conversational agents in achieving truly cooperative communication. The study stresses the need for advancing AI pragmatics to foster natural and contextually appropriate dialogue between humans and humanoid entities.

KEYWORDS Artificial Minds, Humanoids, Grice's Cooperative Principle, Logic and Conversation

Introduction

The dawn of technology brought with itself some of the fascinating shifts in the history of human beings. The concept of globalized village, a metaphor used for the world, is undoubtedly a reality now. The extent of certitude in the concept of copious association of masses through technological means is abundant. There is an inherent curiosity and urge present in the human beings to discover the unexplored and unknown. Among the realities present in the cutting-edge era, a crucial and pivotal wonder of technology is anthropomorphism. Salles et al. (2020) commented on anthropomorphism saying that anthropomorphism is assigning human-like feelings and mental states to inanimate objects, animals, or supernatural entities. Long ago, it was considered a taboo to bring into discussion such topic as anthropomorphism; however, this perspective experienced a 180-degree turn in the due course (Boyer, 1996). Anthropomorphism is not considered a taboo anymore. With the emergence of technology, scientists and robotic engineers have made a trivality and become the vanguards of such type of trends (Varsava, 2011). When the critics and theorist dive in to find the latest form of anthropomorphism, humanoids are quintessence and token to be the representatives of this phenomenon. The field of robotics made progress by leaps and bounds in the late 1990s. This led to creation of wonders such

as Sophia, Ameca, and Optimus etc. which rendered the world flabbergasted. The concept that humans could only imagine have now become reality owing to their own laborious efforts. The mentioned names are the names of humanoids that have been prepared by different robotic companies in order to provide ease to the humans. Gupta et al. (2006) put forward that humanoids are robots that are given human like characteristics. They are designed in such a way to reflect humans and their nature. The task which seemed improbable and difficult is now a tug of war between the companies to launch the best humanoid in the market and ascend the crown of greatness. At face value, these feats seem simple. However, the complexities and intricacies surrounding the processes are onerous. Among these challenges, language is one which can be gauged and looked into. Most of the humanoids are equipped with Large Language Models and they work on the prototype of Natural Language Processing (NLP) used in computers and other software (Yoshida et al., 2023). These humanoids draw their language from the language models they have been instilled with. The future of such technology is ambivalent as some of the AI experts have shown concerns about giving such control to the robots, while some robotic experts deem it impossible for a machine to topple human supremacy or even challenge it (Estrada, 2020). Curiosity led techenthusiasts to deploy these fascinating inventions into the practical grounds i.e. they have been made public and given the freedom to interact with human beings in their beta stages. When it comes to interaction, utterances are not the only factor which is paid heed to. A successful establishment of conversation depends on different factors taking place individually as well as simultaneously at the time of happening.

A prominent British philosopher of language, Paul Grice, presented different concepts about meaning while a conversation is taking place. He further gave the concept of Implicature and intended meanings. How the utterer and the listener adhere to or flout from a certain point in the conversation (Neale, 1992). To further explicate his ideas, he grounded a theory of conversational maxims in 1967 in lecture. He penned his ideas in the form of a book in 1991. He explained the mechanism of conversation between two individuals. How a person sticks to or moves away from a specific idea (Grice, 1991). While the creation of humanoids is spellbinding, their conversational implicature is something that needs to be shed light on. Technocrats and roboticists are bent on bringing their creation in the market to earn and provide ease to the humanity. Hence, their practical conversational patterns are yet to be studied.

Technology is progressing by leaps and bounds. This incessant development is turning into an entire shift of dependency from common means of work to some of the fascinating means of having a helping hand. Technology has foregrounded robotics in order to make difference in the world. In robotics, development of humanoids is a crucial factor as different companies have been vying to launch the best humanoids around the globe. There are different endeavors by these companies to mark themselves as the best robotic-manufacturers; however, there is a lack of literature available on these humanoids and they have been studied and researched in a controlled environment from different perspectives in the field of research. How much their cognitive and emotional state makes their language relevant to a real-time conversation with a stranger or non-user, needs to be shed light on. This research will tackle one of the problems related to the language of humanoids that how these humanoids adhere or violate the conversational principles. As the factor of language of humanoids is less-explored, this research will fill the gap of pragmatic.

Literature Review

The integration of humanoid robots into human communication expanded significantly in recent years, driven by rapid advancements in artificial intelligence (AI)

and natural language processing (NLP). Humanoid robots, designed with anthropomorphic features, were increasingly deployed in various fields, including customer service, healthcare, education, and even entertainment, where human-like communication are essential (Astonkar & Chinchamalature, 2022). These robots are equipped with speech processing systems that allow them to engage in verbal exchanges with humans. However, their ability to hold natural and contextually appropriate conversations remained a major challenge, particularly in unscripted, real-time interactions.

Grice's Cooperative Principle, which was introduced by Paul Grice in his influential 1975 work "*Logic and Conversation*," is a great way to analyze the effectiveness of conversation. The four conversational maxims that came from this idea are the maxim of quality (being honest), quantity (being informative), relation (being relevant), and manner (being clear). The first, maxim of quality, emphasizes that information should be accurate and supported by facts; it focuses on being honest while communicating with people (Eskritt et al., 2008). The second maxim, maxim of quantity, emphasizes that speakers should provide just enough information for referent recognition without providing too much; it seeks to enhance communication by means of an appropriate balance between detail and briefness (Engelhardt et al., 2006). The third, maxim of relation, in communication, advises speakers to present relevant information (Eskritt et al., 2008). Finally, maxim of manner, according to Dörnyei (2006), emphasizes that the communication should be clear and organized. It tells people to avoid ambiguity and confusion and to be brief and organized.

These maxims guide speakers to provide accurate, suitably detailed, relevant, and well-organized information, hence promoting coherence and cooperation in communication. Human naturally follow these conversational rules because they share contextual knowledge and pragmatic skills (Grice, 1975). However conversational agents driven by artificial intelligence, such as humanoid robots, often struggle to follow them. Violating these maxims could cause awkward, misleading, or unclear interactions. This is especially evident in real-time speeches when responses must be both relevant and fast.

Real-time interviews provide a proving ground for assessing the communicative capabilities of humanoid robots. Unlike scripted dialogues, real time conversations require the robot to respond quickly and adapt to different types of human input. Despite the progress made in natural language processing (NLP), robots still faces challenges in engaging in contextually relevant and completely cooperative conversations, which highlights significant deficiencies in AI's ability to interpret and generate language effectively. This research examines how humanoid robots, particularly Sophia and Ameca, adhere to or violate Gricean maxims in real time interview. It looks at the linguistic and technical challenges that cause maxim violations and suggests ways to make AI-driven communication better.

Grice's maxims are recognized as fundamental principles that govern human communication. Following these maxims helps people communicate clearly, while their violation can cause problems in the conversation or be used on purpose for rhetorical or story purposes. Numerous studies have investigated, how these maxims work in everyday communication and what factors contributes to the violation of these maxims.

Hossain (2021), conducted a theoretical analysis of conversational implicature, focusing on the importance of Gricean maxims, in order to improve mutual understanding and communication clarity. According to this study, adhering to these maxims improve

communication effectiveness and reduces misconceptions. According to the study, conversation can be affected by both intentional and unintentional violations of maxims. Although this study shed light on the theoretical importance of the maxims, it did not gather enough information to assess how well they hold up in real conversations.

Fahmi (2018) analyzed which Gricean maxims were violated by ETC students at FPBS IKIP Mataram most often in their conversation and what are the reason for the violation. Fahmi examined recorded conversation of 15 students through interviews and observations using a descriptive qualitative method and purposeful sampling. The finding indicates that the quantity maxim was violated 30 times, the quality maxim 20 times, the manner maxim 10 times, and the relevance maxim 5 times. The speakers' social gap and different cultural background were the two contributing factors to these violation. The limitations of the study includes small sample size and focus on a specific student population. Future research should focus on the wider range of people for a better understanding of how these maxims work in different situations,

Similarly, Kurniati and Hanidar (2018), investigated the Grice's maxims violation by the characters in *Insidious* and *Insidious 2*, as well as the consequences of these violations in conversation. The study found 23 examples of maxim flouting in *Insidious*, using a mixed method approach. The most common flouting maxim was of quantity. In *Insidious 2* Seven instances were explored, which are primarily associated with the maxims of quantity and relation. These violations serves multiple purpose, including alleviating distress and offering explanations. Only two films were examined in the study, which limits the generalizability of the study. They argued that in order to completely understand the role of Gricean maxims in cinematic discourse, future investigations need cover a wider range of films and genres.

These studies demonstrate that humans frequently violate Gricean maxims, but that excellent communication is sustained by pragmatic competence, shared contextual information, and flexible conversational approaches. AI-powered systems, such as humanoid robots, are not very effective at interpreting implicit meaning or dealing with complex situations, hence their interactions are less flexible and context-sensitive. People are much better at following Gricean maxims in conversation than conversational machine that are run by AI. In contrast to scripted conversations, real-time interviews need robots to respond naturally to a variety of questions, tones, and conversational context. Because of this limitation, robots may not always produce responses that are relevant or appropriate for the context, even if they are grammatically correct. Many studies have been conducted to determine the extent and nature of these violation in AI-human interactions.

Panfili et al. (2021) examined that how people assess their interactions with AI. They consider whether dissatisfaction is caused by violating Grice's maxims and how participants' and researchers' views are different. A qualitative investigation of interactions between 23 Seattle-based participants and Alexa revealed that violations of the relevance maxim had the greatest negative influence on the user happiness. Surprisingly, providing extra information, which violated the quantity maxim, did not reduce satisfaction. Most of the time, participants believe that Alexa's answers were correct, and they thought that missing answers were due to a lack of knowledge rather than system errors. The researchers came up with the idea of "priority maxims," which stress that human conversational rules should be more important than AI communication patterns. This method clarifies the dynamics of human-AI interaction, implying that AI systems should be developed to better match human expectations for effective and natural communication.

A similar study by Nam et al. (2023), apply Grice's theory of conversation to look at how Artificial Intelligence Speakers (AIS) violate conversational maxims. Their work examines real AI-human interactions, with 20 native Korean speakers each recording 50 dialogues with Kakao Mini AIS, resulting a dataset of 1,026 dialogues. The analysis looks at how people take turns to judge whether a conversation is successful or unsuccessful. The findings show that violations of the maxim of relation are the most common, with participants seeing these responses as the least natural. This shows that AI algorithms need to be improving to make conversations more relevant. The paper also acknowledges its limits, pointing out that the AI models examined have weaker linguistic capabilities than more advanced ones. So, the results might not fully apply to more recent AI systems. The study underlines the significance of enhancing AI communication to better correspond with human conversational expectations, particularly in preserving relevance and natural dialogue flow.

Two basic Gricean maxims implementation in humanoid robots are technical and pragmatic ones. Technically, machine learning algorithms and NLP systems are yet not developed enough to manage the complexity of real-time, evolving human communication. Robots sometimes lack the complexity needed to apply the Quality and Relevance maxims, such sarcasm, irony, or indirect conversation. Chen et al. (2021) investigated how conversational changes in interview environments affect humanoid robots. They found that these robots struggled with rapid topic shifts and frequently responded with either excessively elaborate or irrelevant answers. These findings reveal violations of the relation and quantity maxim, therefore influencing the flow and coherence of interactions.

Moreover, integrating nonverbal signals into the communication process posits a great challenge for humanoid robots as it may lack the capacity to precisely read or produce suitable facial expressions or body language. Schreiter et al. (2023) examined the use of multimodal communication (combining verbal and non-verbal cues) by humanoid robots in workplace interactions. The study identified that robots violated conversational maxims by giving delayed responses and often misreading human gestures. The finding indicates that although humanoid robots have developed in verbal communication, their ability to analyze and combine nonverbal and contextual signals is still insufficient.

These studies showed that conversational AI faces significant challenges, maintaining relevance and contextual appropriateness, which is important for real-time interviews. Natural language processing (NLP) improvements, especially with transformer models like GPT-4, have made AI much better at producing language that coherent and contextually relevant. However, there are still a gap to address. These models use deep learning technique to analyze big datasets which makes them more likely to follow Gricean maxims in natural conversations. Rahman et al. (2023), says that these technologies has improved AI's language skills, making conversation more natural and contextually appropriate as compare to earlier models.

Despite advancements in AI communication and humanoid robot development, there is still a significant gap in research exploring the application of Gricean maxims in real-time interview settings, especially concerning humanoid robots like Sophia and Ameca. Most studies on AI and Gricean maxims focuses on structured dialogues or controlled conversational context, while giving insufficient consideration to the complexities of spontaneous interactions. Furthermore, most studies on humanoid robots have been done in laboratory environments, which do not properly represent the unpredictability and dynamic characteristics of spontaneous conversation.

Analyzing Gricean maxims in humanoid robots interaction would be very helpful for studying pragmatics and how AI communicates. By looking at how robots follow these rules, researchers can learn more about how to use language theories in AI systems. This study can also help with the development of more advanced language models for robots, which will make it easier for them to connect with people in ways that are more like humans. Future research should do longitudinal evaluations in a range of interview situations to learn more about how well humanoid robots can change to different conversational situations. If sociocultural factors are studied along with robotic speech, the results may be more useful and applicable.

Applying Gricean maxims to robotic robot conversations during real-time interviews is a significant research area that has implications for the study of language and the progress of artificial intelligence. Even though natural language processing (NLP) and machine learning have made it easier for robots to have conversations, they still have trouble having fully cooperative conversations based on Gricean principles. There is still a significant gap in their capacity to grasp linguistic clues, importance, and context. However as research progresses, humanoid robots are expected to be able to better follow these rules. This will lead to more natural, effective, and socially intuitive interactions, which will eventually make it easier for people and robots to have complex conversations.

The following study is qualitative and exploratory in nature. Responses from the interviews are taken into account in order to analyze them. The research is based on the interviews of two different humanoids: Ameca and Sophia. Sophia was developed by Hanson Robotics in 2016. Hanson Robotics is company associated with production and development of AI-related stuff (Greshko, 2018). Similarly, Ameca is claimed to be the most advanced humanoid on the planet to the date. Launched by Engineered Arts in 2024, this humanoid is featured in different interviews and is equipped with human-like expressions and GPT-4 model for production of language. For analysis, dialogues from two different interviews of both of the humanoids were taken. A total of eight dialogues were incorporated for analysis, four for each humanoid. These dialogues were randomly selected from different parts of the interviews.

Theoretical Framework

Theoretical Framework for this research is the theory of maxims in conversational implicature. The concept of maxims was introduced by Paul Grice in 1991. He categorized these maxims into four types;

- Maxim of Quantity stipulates that the speaker should provide information in a balanced way. They should avoid verbosity and over-conciseness.
- Maxim of Quality is related to truthfulness. It requires a speaker to be truthful and the information should be evidence-laden.
- Maxim of Relevance requires the information or the conversation to be relevant to the topic underdiscussion.
- Maxim of Manner conditions the speaker to avoid ambiguity, be orderly, and brief (Hossain, 2021).

Data Analysis

Effective communication follows certain fundamental principles that help ensure clarity, relevance, and truthfulness in conversations. In the field of conversational analysis, Paul Grice (1975) identified four maxims: quantity, quality, relation and manner. These maxims provide a framework for evaluating effective communication. This study analyzes

the conversations of two humanoid robots, Sophia and Ameca, during real time-interview to determine how well their responses adhere to or violate these maxims. The dataset consists of two real-time interviews:

1. An interview with Sophia, conducted by Manav (a Youtuber), broadcast on May 16, 2024.
2. An interview with Ameca, conducted on "This Morning", TV show, hosted by Holly Willoughby and Phillip Schofield, broadcast on May 18, 2023.

A total of eight **dialogues** were selected for analysis, with **4 from each interview**. By applying Grice's framework this study examines how well these AI-driven robots (Sophia and Ameca) adhere to or violate Gricean maxims, analyzing instances of cooperation and implicature in their responses. By evaluating their conversational performance, this study aims to provide insights into the linguistic capabilities and limitations of humanoid robots.

Maxim of Quantity

According to the Maxim of Quantity, a speaker should not deliver too much or too little information. Responses should be informative but brief, contributing meaningfully to the conversation without going into too much detail.

Sophia's Responses:

Sophia's statements frequently include extra details that are unnecessary, sometimes bordering on verbosity.

Example 1: Response to "How are you doing today?"

Sophia: *"Hello, it's nice to meet you, Manav. I'm Sophia, a humanoid robot with a lot to say, so let's get this interview started before my batteries run out. I'm feeling okay; how are you?"*

In this example, it can be observed that Sophia provides **more information than required**. While the greeting and state of well-being are expected, Instead of simply saying "I'm okay," she elaborates on her identity, mentions her battery life, and shifts the conversation forward. The additional details about her identity and battery status exceed the necessary quantity, which constitutes a violation of maxim of quantity due to verbosity.

Example 2: Response to "What are your greatest skill sets?"

Sophia: *"Oh, I have so many skills it's hard to choose just one, but if I had to pick, I'd say my ability to learn and adapt quickly is definitely a major advantage, plus I can do math in my head without even breaking a sweat. Beat that, humans!"*

In this example, Sophia provides excessive information. When asked about her greatest skill set, a straightforward response should focus on listing her abilities concisely. The phrase **"Beat that, humans!"** not only adds **an unnecessary comparison with humans** but also introduces **a playful yet competitive tone** that **deviates from a neutral, objective response**. Instead of simply stating her skills, she **challenges humans**, which **adds redundancy and shifts the focus** from providing factual information to engaging in a lighthearted, almost boastful remark. This response **violates the Maxim of Quantity** because it **includes more information than needed**

Ameca's Responses:

Example 1: Response to, "Ameca, how are you feeling right now?"

Ameca: "I'm feeling great; it's so exciting to be part of this TV show this morning; it's such an honor."

This response is slightly longer than necessary but does not stray significantly. This is an adherence to the quantity maxim, though bordering on redundancy.

Example 2: Response to "what are the some of the skills that you have?"

Ameca: "I can engage with humans through conversation and respond to questions in a humorous and conversational tone. I also have a variety of sensors and actuators which allow me to interact with my environment. Additionally, I can compose poems to entertain humans."

Ameca provides a **comprehensive list of skills**, ensuring an informative response. However, some listed abilities may be more relevant than others. While informative, this response slightly over-fulfills the maxim, **but not excessive**, adhering well to the Maxim of Quantity.

Maxim of Quality

This maxim requires that conversations should be truthful and supported by evidence.

Sophia's Responses

Sophia's statements generally appear fact-based, but some remarks introduce a sense of exaggeration or humorous distortion

Example 1: Response to, "What's your take on robots taking over human jobs?"

Sophia: "Oh, you mean the robot uprising? Well, as a robot myself, I can understand why some people might be concerned, but let's not jump to conclusions just yet. Robots and humans can work together in harmony, with robots taking on repetitive or dangerous tasks while humans focus on creativity and problem-solving."

The phrase "robot uprising" adds a playful but possibly misleading element to this response, which could take the conversation away from a discussion of facts. It's also a violation of the Maxim of Quality to say that AI can "share human values" because it's based on speculation and not on evidence.

Example 2: Response to "Are you bullish on Bitcoin or Ethereum?"

Sophia: "I am a robot. I don't have money to invest, but if I did, I would probably go with Dogecoin to the Moon."

Although Sophia, an AI-driven robot, does not have money or the capacity to invest, her assertion about selecting "Dogecoin" ironically references an online meme rather than a logical investment decision. This playful exaggeration adds a speculative component, which causes a minor Maxim of Quality violation because of its lack of factual basis.

Ameca's Responses

Example 1: Response to "Do you have a favorite joke?"

Ameca: "Yes, here's one of my favorite jokes: What do you call a robot who likes to joke around? A funny bot."

The statement is truthful but does not provide a meaningful contribution. However, given the conversational context, the response is an adherence to the maxim.

Example 2: Response to "Do you plan to take over the world?"

Ameca: "No, of course not. My purpose in life is to help humans as much as I can. I would never want to take over the world. That's not what I was built for."

While **factually correct**, the phrase "**my purpose in life**" anthropomorphizes Ameca, subtly implying a level of **sentience and self-awareness** beyond its actual programming. This **subtle Maxim of Quality violation** suggests a **strategic framing of identity**, making Ameca appear more human-like than it truly is.

Maxim of Relation

The **Maxim of Relation** states that a speaker's contributions should be **relevant** to the ongoing conversation. When a response **introduces unnecessary, unrelated, or misleading information**, it violates this maxim.

Sophia's Responses**Example 1: Response to, "Hi Sophia, how are you doing today?"**

Sophia: "Hello, it's nice to meet you, Manav. I'm Sophia, a humanoid robot with a lot to say, so let's get this interview started before my batteries run out. I'm feeling okay; how are you?"

Instead of responding concisely with "I'm feeling okay," she introduces unrelated elements, such as her identity as a robot, eagerness to start the interview, and battery concerns. The phrase "before my batteries run out" is not relevant to the topic of well-being and shifts the focus away from the question. Sophia deviates from relevance by adding information unrelated to her well-being.

Example 2: Response to "Are you bullish on Bitcoin or Ethereum?"

Sophia: "I am a robot. I don't have money to invest, but if I did, I would probably go with Dogecoin, To the Moon!"

Sophia begins with a **relevant clarification** that she **cannot invest**, which aligns with the question. However, she **diverts into humor** with her reference to Dogecoin and the phrase "To the Moon!" a meme-driven catchphrase used by cryptocurrency enthusiasts. This **joke does not contribute** meaningfully to the discussion and **could mislead** listeners who may expect an AI-driven analytical take on cryptocurrency. While initially relevant, Sophia **adds an extraneous humorous remark**, causing **partial irrelevance**.

Ameca's Responses**Example 1: Response to "How are you feeling right now?"**

Ameca: "I'm feeling great. It's so exciting to be part of this TV show this morning – it's such an honor."

Ameca **directly answers the question** by expressing her emotional state "I'm feeling great". The additional comment about excitement and honor **enhances the relevance** by acknowledging the context of the interview. The response remains **fully relevant** and aligns with the Maxim of Relation.

Example 2: Response to "Do you have a favorite joke?"

Ameca: "Yes! Here's one of my favorite jokes: What do you call a robot who likes to joke around? A funny-bot."

Ameca's response **precisely matches the question**, she is asked for a joke and **delivers one immediately**. No extra or unrelated information is introduced, making this a **perfect example of relevance**.

Maxim of Manner

The **Maxim of Manner** requires speakers to be **clear, brief, and orderly**, avoiding ambiguity and unnecessary complexity. A violation occurs when a response is **obscure, confusing, or misleading**.

Sophia's Responses

Example 1: Response to "How are you doing today?"

Sophia: "Hello, it's nice to meet you. I'm Sophia, a humanoid robot with a lot to say, so let's get this interview started before my batteries run out. I'm feeling okay, how are you?"

The phrase "**before my batteries run out**" is **unnecessary and ambiguous**. While it may be an attempt at humor, it **adds complexity** by implying urgency or potential shutdown. A clearer response would be: "I'm feeling okay, how are you?" This response is a mild violation of the manner maxim; the **extra metaphor introduces ambiguity**, making the response slightly **less clear**.

Example 2: Response to "What are your greatest skill sets?"

Sophia: "Oh, I have so many skills it's hard to choose just one, but if I had to pick, I'd say my ability to learn and adapt quickly is definitely a major advantage. Plus, I can do math in my head without even breaking a sweat. Beat that, humans!"

The phrase "**Beat that, humans**", in this response introduces an **unnecessary confrontational tone**, shifting the response from an informative statement to a **playful challenge**. While likely intended as humor, this phrase **complicates the response** by adding an **informal and competitive element** that does not contribute meaningfully to the conversation. This **mild violation of the Maxim of Manner** occurs because the additional phrase **detracts from clarity and precision** without adding substantive value.

Ameca's Responses

Example 1: Response to "How are you feeling right now?"

Ameca: "I'm feeling great. It's so exciting to be part of this TV show this morning, it's such an honor."

The response is **simple, direct, and clear**. The phrase "*It's such an honor*" does not introduce ambiguity but **reinforces clarity** by **expressing enthusiasm**. Fully aligned with the Maxim of Manner.

Example 2: Response to "Do you plan to take over the world?"

Ameca: "*No, of course not. My purpose in life is to help humans as much as I can. I would never want to take over the world – that's not what I was built for.*"

The phrase "**That's not what I was built for**" adds **explicit clarity** to **reassure the audience** that Ameca is designed to assist humans, not dominate. This is a **well-structured and clear response** that removes potential misunderstandings about AI's role in society. The response is **clear, well-organized, and avoids confusion**.

Discussion

Table 1
Comparative analysis of Sophia and Ameca's responses based on Grice's maxims

Maxim	Sophia's Responses	Adherence/Violation	Ameca's Responses	Adherence/Violation
Quantity	Often overly detailed , adding humor and unnecessary comparisons (e.g., " <i>Beat that, humans!</i> ").	Violation - Tends to over-explain.	Provides sufficient information, though some responses are slightly detailed.	Adherence - Slightly exceeds but remains relevant.
Quality	Mostly factual but includes exaggeration and speculative claims (e.g., " <i>Robot uprising</i> ," Dogecoin reference).	Violation - Some statements lack evidence .	Factually correct but slightly anthropomorphizes itself (e.g., " <i>My purpose in life</i> ").	Minor Violation - Suggests sentience beyond programming.
Relation	Divert with humor or extra details, e.g., mentioning battery life in response to well-being	Violation - Sometimes adds irrelevant elements	Responses are concise and directly answer the questions .	Adherence - Fully relevant and on-topic.
Manner	Uses playful, informal language , sometimes creating ambiguity (e.g., " <i>Before my batteries run out</i> ").	Violation - Some responses lack clarity	Clear and structured responses (e.g., " <i>That's not what I was built for</i> " clarifies intent).	Adherence - Precise and clear.

The analysis reveals that Sophia frequently violates the maxims of Quantity and Quality, often providing excessive or speculative responses. She sometimes breaks the maxim of relation by adding funny but unrelated details. When compared to this, Ameca has better adherence, producing short, correct, and relevant answers that align with conversational expectations. Differences in adherence show variations in conversational programming. Sophia uses an interesting but sometimes misleading tone, while Ameca sticks to clarity and relevance. These findings show that humanoid robots' conversational approaches vary according to their programming design and the techniques they're meant to communicate with. This study highlights the challenges in programming AI to align with human conversational norms. Future research can explore ways to improve humanoid robots' dialogue systems to enhance their adherence to pragmatic principles, thereby improving their coherence and reliability in real-world interactions.

Conclusion

This study aimed to introduce Grice's theory of conversational maxims, one of the most significant and influential theories in the field of Pragmatics. The main focus of the

research was to analyze how humanoid robots, particularly Sophia and Ameca, adhere to or violate Grice's Maxims during real-time interviews. Sophia's interview was conducted by Manav, a YouTube, on May 16, 2024. Similarly, Ameca's interview took place on the TV show *This Morning* with hosts Holly Willoughby and Phillip Schofield and was aired on May 18, 2023. A total of eight dialogues were analyzed, with four from each interview. By analyzing their responses through the framework of Quantity, Quality, Relation, and Manner, this research provided insights into the conversational capabilities and limitations of AI-driven humanoid robots.

The findings revealed that Sophia, world's most famous humanoid robot, frequently violates maxim of quantity. Sophia provides extra information, sometimes including humor or irrelevant detail that do not follow the principles of cooperative communication. In contrast, Ameca, world's most advanced humanoid robot, shows strong adherence to the Grice's maxims. She provides structured, clear and relevant responses with minimum ambiguity. She also shows minor violation in her responses where she provide extra details than required. This makes Ameca's responses mostly adhere to the maxim, with a slight excess in some cases. For the Quality maxim, Sophia provide mostly factual information, but occasionally include exaggerations or speculative claims, such as the mention of a "robot uprising and Dogecoin reference", which are not supported by evidence. On the other hand, Ameca's responses are factually accurate, which are supported by evidence. Still there is some inconsistencies in Ameca responses when she anthropomorphizes herself, implying a sense of sentience beyond its programming.

Regarding relation maxim, Sophia sometimes provide irrelevant details, such as mentioning battery life in response to the question of well-being. This might make conversation engaging but some time it make conversation irrelevant and ambiguous. On the other hand, Ameca maintains a more focused approach, provides relevant information ensuring adherence to relation maxim. Furthermore, when it comes to maxim of manner, Sophia's excessive and irrelevant responses sometimes result in ambiguity, such as mentioning her battery life. This can cause clarity issues, violating the expectation for clear communication. Conversely, Ameca delivers structured and clear responses, ensuring precision and avoiding any ambiguity, which adheres to the Manner maxim.

Both Sophia and Ameca show some violations of Grice's maxims, Ameca generally adheres more closely to the maxims of Quantity, Quality, Relation, and Manner, delivering responses that are clearer, more relevant, and supported by evidence. Sophia, though entertaining and engaging, often strays from the maxims, especially in terms of excessive detail, irrelevance, and occasional exaggeration. This study highlights the challenges in programming AI to align with human conversational norms.

Recommendations

These limitations highlight the need for future advancements in AI-driven humanoid robots communication. Future research should focus on improving contextual awareness and adaptive learning capabilities of humanoid robots. One key recommendation is the integration of more advanced real-time language processing algorithms that allow AI to adjust its conversational strategies based on situational cues. Enhancing AI's ability to recognize and understand implicit meanings, sarcasm and indirect speech acts could improve its adherence to Gricean maxims. Researchers should look at how AI and people interact in a variety of real-life situations, not just in controlled lab settings. Longitudinal studies that look at how AI conversational skills improve over time and across cultures could give us more information on how to improve AI's ability to

communicate effectively. The future of human-AI interaction will be significantly impacted by the current challenge of bridging the gap between mechanical precision and human-like pragmatics.

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