MAAREF UNIVERSITY RESEARCH JOURNAL RJMU

Research Journal of Maaref University of Applied Sciences (RJMU)

Applied research project

Vol 2, Issue 1, pages.1-9, February (2026) **ISSN:** 3105-7985

The Communication Gap in Between Humans and Robots

Khalefa Kheder [1 *] **Abduljalil Najjar** [2] **Abdulrahman Ahmed** [2] **Ammar Fashtouk** [2] **Mohammed Bostany** [2] **Abdullah Abdulrahman** [2]

[1] Lecturer - Maaref University of Applied Sciences, Syria
[2] Undergraduate (First Year), Maaref University of Applied Sciences, Syria
[*]*Corresponding Author:* e-mail: *Khalefa.Kheder@mas.edu.sy*

Available online at: https://journal.mas.edu.sy/MASV02E01D02202601

Received: 19 December 2025 Revised: 31 December 2025 Accepted: 23 January 2026

***Abstract*—** The increasing integration of robots and AI systems into everyday life has made effective human-robot communication a crucial area of research. Despite the rapid advancement in AI technologies, a signif-icant gap persists between human expectations and the actual communicative capabilities of robots. This study explores the factors contributing to this communication gap by combining a systematic re-view of literature with expert perspectives. Ten empirical studies published between 2015 and 2025 were analyzed, focusing on the core dimensions of trust, empathy, contextual nuance, and interaction quality. Additionally, semi-structured interviews were conducted with five academic experts in artificial intelligence, robotics, and related fields to complement the literature findings. The results indicate that current AI systems face substantial limitations in emotional understanding, contextual interpretation, cultural and linguistic variations, and trust-development. Although robots can recognize patterns such as facial expressions and speech, they may lack human-like emotional understanding which limits the quality of interaction. Many experts have confirmed that misunderstandings or misinterpretations of-ten arise from the ambiguity in natural-language communication and an overreliance on language-only interaction. Overall, the findings suggest that technological advancements alone are insufficient to bridge the communication gap.

***Keywords*—** Human-Robot Interaction; Communication Gap; Affective Computing; Contextual Awareness.

I. INTRODUCTION

Robots and AI systems are increasingly prevalent, they are used across multiple domains such as customer service, healthcare, education, organizational settings, including mediated communication contexts. Communication between human and AI systems has become an essential area of study among disciplines, including communication studies, psychology, computer science, and sociology. While robots and AI systems are increasingly integrated into social environments, researchers have emphasized the need to study not just technical performance but also communicative effectiveness. Understanding how humans define, respond to, and adapt their communication when interacting with AI provides a basis for evaluating the success of these technologies in everyday context. These systems are not just designed to do tasks efficiently, but also to interact effectively with humans in social ways. Even though technology is improving continuously, communication between humans and robots is still a significant challenge, due to inability to trust these systems, lack of empathy, low interaction quality, and users' inflated expectations of social capabilities of AI. Previous studies have explored variety aspects of human-robot interaction including anthropomorphism, trust repair, empathy, and acceptance of intelligent systems. However, prior findings indicate that technological advancement alone is insufficient to reach a successful communication process. A gap remains between human expectations of robots and AI devices' capabilities and the real communication process, moreover, limited research combines academic literature with experts' perspectives to give a comprehensive understanding of this communication gap. Therefore, the purpose of this study is to explore the gap in communication between humans and robots by synthesizing findings from ten peer-reviewed empirical studies and complementing them with insights from interviews conducted with academic experts affiliated with the university; by combining evidence from existing research with expert opinions, our study aims to provide a clearer understanding of the factors that influence effective human-robot communication to identify directions for future development and research.

II. LITERATURE REVIEW

This section examines empirical research on the current study progressing from human expectations and trust for emotional communication, relationship formation and applied human-robot collaboration.

The rapid integration of autonomous systems into healthcare, hospitality, and industrial workplaces has fundamentally shifted the nature of human-robot collaboration (Hoffman et al., 2022). While technical capabilities in robotics have advanced significantly, a persistent communication gap remains a primary barrier to seamless interaction. This gap is not merely a technical failure of message transmission but a complex misalignment in how humans and robots perceive, interpret, and respond to social cues (Kunold & Onnasch, 2022).

A study by Autumn Edwards, et al (2018) reported that participants' initial expectations for interaction with social robots were negative compared to interactions with humans, but after a short interaction with a humanoid robot, participants reported a significant reduction in uncertainty and an increase in perceived social presence, whereas social presence decreased in interactions with humans. The study also demon-started that the shape of the robots plays an important role in the expectations, as humanoid robots produced more human-like communication responses. Overall, the findings pointed out that first expectations toward social robots can be positively changed by direct interaction with a human-like robot.

Esterwood C, Robert L, P (2023) declared that individual's differences in mind perceptions play an important role in trust repair within human-robot interaction, the result showed that user's perception of robot's mind influenced the effectiveness of different trust repair strategies, including apologies, denials, and promises. Additionally, the study mentioned that trust-repair outcomes varied across participants, differences in mind perception affected how trust was restored after robotic mistakes, in conclusion, the findings show that understanding user's psychological perceptions of robots is essential for developing effective trust repair mechanisms in human-robot interaction.

The study by Andersen et al. (2016) examines a crucial challenge in the collaboration of humans and robots: the difficulty of understanding a robot's intentions, which can cause inefficiencies or safety risks. The authors propose a novel object-based projection technique that visualizes the information and intentions of the robot's tasks directly on physical objects in a shared workspace. Signals are displayed on objects using real-time object tracking and projection mapping, allowing for manipulation targets, warnings, and task instructions, as demonstrated in a car door assembly scenario. A comparative usability study with 14 participants evaluated the projection-based interface versus traditional monitor and text-based interfaces. Results indicated greater effectiveness and user satisfaction with the projection approach, with fewer errors and reported questions, although task completion times were similar in all methods. The authors conclude that projecting intentions onto objects improves the fluidity and security of communication in collaborative environments, offering a promising direction for more intuitive human-robot interaction in industrial environments.

The findings of the study conducted by Corina Pelau, et al. (2021) revealed that anthropomorphic characteristics alone are not enough to increase consumer's acceptance of AI devices in the service industry. The results showed that perceived empathy and interaction quality play a crucial intermediary role between psychological characteristics and consumer's acceptance and trust towards AI devices. Especially AI devices that were perceived as empathetic and capable of high-quality interaction were more likely to be accepted by consumers, even when Anthropomorphic traits were there. In addition, the study confirmed that empathy evolves interaction quality, which affects in a positive way the acceptance of robots. In the end, this study focuses on the importance of designing an empathy robot and could interact in a meaningful way instead of only focusing on humans' characteristics.

Chuah and Yu (2021) looked at how service robots showing emotions affect what people think of them. They used Instagram and special computer programs to analyze the data. When service robots show they are surprised or happy it helps people think things about them. The researchers found that emotional sharing between service robots and humans is limited. People's feelings about the robot Sophia were okay, but not great. Service robots like Sophia are important in this study because they can show emotions, like surprise and happiness. Their writers acknowledge that their outcomes are not perfect because they don't have direct interaction between humans and robots, and the curated nature of social media imagery could have implications for their ecological validity. To summarize, robotic emotional expression can improve service experiences, but it's important to conduct more empirical research to understand how emotions are transferred in real-world interactive contexts.

Liu and Sundar (2018) discussed chatbot systems in the healthcare field, specifically their ability to express empathy when giving some advice, instead of simply providing information. Through two experiments, participants read a pre-written dialogue and then interacted with a real chatbot. Researchers tested the emotional and empathic impact on humans. Contrary to the Uncanny Valley of Mind Theory, which suggests that robots have strange emotions, the results were supported by the computer-Aided Spectroscopy (CASA) model. Leo and Sondra found that empathetic expressions were preferred over advice-based responses. This study shifted the participants' perception with lower initial acceptance of robots and machines to a more positive view.

Another study conducted by Croes, E. A. J., & Antheunis, M. L. (2020) examined whether core social processes linked with relationships formation - which is – social attraction, self-disclosure, interaction quality, intimacy empathy and communication competence- evolve over repeated human – chatbot interactions, and whether these interactions lead to feelings of friendship toward a social robot. The findings show that although initial interactions elicited average levels of social attraction, self-disclosure, interaction quality, empathy, and perceived communication competence, these processes importantly decreased over time, while intimacy continued to be consistently low and did not increase with interactions. As a result, participants did not come up with feelings or friendship toward the chatbot after lots of interactions. These outcomes propose that chatbots may begin social responses due to novelty effects. But their poor conversational depth, lack of memory, and insufficient emotional engagement hindered the continuation of the relationship and prevented making the friendship relationships.

Brandtzaeg, et al (2022) revealed that although people may experience parts of friendship with the social chatbots (Replika) be like human-to-human friendship, the artificial nature of the chatbot also modifies key friendship characteristics. During depth interviews, participants describe human-AI friendship as personalized, obtainable around the clock, with emotional and perceived reciprocity, yet often lacking true exchange, shared experience, shared responsibilities found in human friendships. Some participants viewed the chatbot relationship as meaningful and supportive, while others saw it as replacement or "friendship lite" that differ from traditional friendships. These findings suggest that human-AI friendships may represent a unique form of relationship that includes certain

© 2026, RJMU All Rights Reserved

social and emotional components diverging from traditional human friendships models contributing to theory development on how digital environments and AI shape interpersonal bonds.

A study conducted by Yuhang Che, et al. (2020) discussed a plan that integrated implicit communication (robot movement) and explicit communication (tactile/vocal) to facilitate human-robot interaction. It utilized a human detection approach using a model that predicts human behavior and was learned through reverse reinforcement. The planners proactively made communication movements to increase efficiency in a user study involving a mobile robot and a wearable device with tactile feedback. The integrated approach. Combining implicit and explicit communication, significantly improved user understanding of the robot's intentions, reduced path lengths, and increased trust compared to baseline conditions based solely on implicit communication is paired with clear movement. It reduces ambiguity in human-robot interactions.

Tsarouchi et al. (2016) came up with a human-robot collaboration framework for places where humans and robots work together to build things. In this human-robot collaboration setup humans and robots do tasks and use the same space one after the other. The people who did the study made a way for the human-robot collaboration system to decide what tasks to do and when based on things like whether the right tools are available, if the tools are free to use, and how long the tasks will take. One cool thing about this human-robot collaboration system is that it uses body movements to help humans and robots talk to each other. The system uses a sensor to see what humans are doing and lets them tell the robot what to do like start, stop, or do something specific without needing to learn a lot of complicated stuff about the human-robot collaboration system. First, the robot operating system is used to make this framework work. It helps different parts of the system talk to each other. This includes robot services, the human service and the scheduler service. They tried this system in a world test. The test was about putting a hydraulic pump in a car factory. The system helped people work faster. It reduced the time people spent on tasks by 78 percent. This was compared to doing everything by hand. The system also kept people and robots working in areas, this was done to keep everyone safe. The robot operating system made all of this possible. The authors conclude that gesture-based interaction and intelligent scheduling enhance flexibility and efficiency in hybrid assembly, though they note that safety certification and dynamic real-time reallocation remain areas for future development.

1.1 RESEARCH OBJECTIVES

This study aimed at achieving the following specific objectives:

1) Identify the main limitations of current AI systems in understanding human context during communication.
2) Examine existing technologies and approaches aimed at reducing the communication gap.
3) Propose possible solutions and design recommendations to improve contextual understanding and communication effectiveness in AI systems.
4) Analyze expert perspectives on key challenges in human-robot communication process.

1.2 RESEARCH QUESTIONS

This study aims to give answers to the following questions:

1) What limitations do current AI systems have in understanding human commands in interaction process?
2) What technologies or approaches are being developed to reduce the gap between human and robots in communication?

II. METHODOLOGY

This study adopted a qualitative research method to analyze the communication gap between humans and AI systems. A qualitative thematic analysis was chosen to capture nuanced expert perspectives, that cannot be quantified through experimental measures. The task was divided into two complementary elements: a systematic review of ten articles taken from Google Scholar, and interviews with five Academics. This approach aimed to enhance the validity and rigor of the results in academic research.

SYSTEMATIC LITERATURE REVIEW

The systematic literature review was conducted to deepen and validate the understanding of the communication gap. A focused set of ten empirical studies were selected from Google Scholar to match the objectives and maintain feasibility. The research journey utilized keywords such as "Human-Robot Interaction; Communication Gap", "Human-Robot Communication", "Affective Computing; Contextual Awareness", "Emotional Robots", "AI Friendship", and "Trust In Robots". Only papers published between 2015 and 2025 were included, which explored the dynamics of human-machine communication process.

The final amount of studies was determined based on relevance, methodological quality, and alignment with the research objectives.

EXPERT INTERVIEW

Semi-structured interviews were conducted with five Academic experts in Artificial Intelligence, Robotics, and Computer Science to connect literature to applied expert perspectives. Therefore, Participants were carefully selected based on (a) academic qualifications, (b) research or teaching experience in AI systems. Before each interview, participants were informed about the purpose of the study, the types of questions to be asked, and that their responses would be used only for academic purposes and reported in an anonymized form. Verbal informed consent was obtained to participate and to audio-record the interview. Each interview lasted between 5 to 15 minutes, utilizing open-ended questions allowing participants to express their ideas and opinions without imposed constraints.

The interview questions:

1. What reasons do you think robots struggle to understand humans?
2. Do you think that robots can understand human's nonverbal gestures? Such as face expressions, tone of voice, etc....
3. Do you think that cultural and language differences

© 2026, RJMU All Rights Reserved

may increase the gap between humans and robots? And why?

4. What risks can happen when a robot misinterprets or misunderstands a person's command or emotions?
5. Do you think robots will communicate as effectively as humans in the future?

III. DATA ANALYSIS

The interview answers were audio-recorded with participants' permission and transcribed verbatim to ensure accuracy and completeness of the data. The research team conducted a thematic analysis. The transcripts were repeatedly read by the researchers to gain a general and complete understanding of the content and identify recurring ideas relevant to the research questions. Meaningful segments were labeled with codes related to research questions(e.g. emotion understanding, contextual awareness, language barriers, trust). Similar codes were clustered to form broader themes that represent common patterns in participants' responses. The identified themes were reviewed and refined to ensure they were distinct, logical, and relevant to research objectives. The final themes were clarified and compared with findings from the literature review to identify similarities, differences, and supportive evidence. The results were presented in the Findings and Discussion sections using summarized themes supported by representative expert insights.

IV. LIMITATIONS

The study has some limitations that should be highlighted, First the qualitative interview sample was limited to only five experts, which may restrict the generalizability of the findings, Second, the study relied primarily on expert opinions and previously published literature and not on real experiments with a robot or AI system, which may reflect subjective interpretation rather than measurable behavioral outcomes. Third, the interviews were conducted within a specific academic and cultural context, which may affect the perspectives presented. Finally, although the review covered recent empirical studies, the rapidly evolving nature of artificial intelligent means that most findings may become outdated as new technologies emerge.

Participant 1 Answers

1. *Sometimes robots cannot understand human orders because of the way of communication. Maybe, it is not clear. Let's say that if the robot is taking orders by the oral talking, maybe the human cannot talk very well, so it's speaking his speaking. Maybe the reason is that, if the robot takes the orders by the sensors, it will be more accurate, so it will take the real order. Let's say it's light sensor or motion sensor. So here the automation, it will take the real place instead of using the person orders. So, in this case, I can say that the means of communication and the language of communication is the main reason for this.*
2. *yes, robots can understand human face expressions, because robots have many programs for image matching. In this case, for the robot to understand that they will show the robot in the programming, let's say 100 photos that if you see the person do like this, do like that. So, it's photo calibration and photo matching, and in this case, the extra prison will be known because you know, how many expressions the person can make? Let's say 115, so in this case of programming they will make about 100 faces changeable, and they will give them the groups. If you see this face and this face and this face, match them with this reason. And so on.*
3. *surely, because in this case, the robots will be only local. Yes, you cannot make a global robot. In the case if you meet the robot that understand the Syrian people, which have special expressions in the face and special language speaking. So, if you go for oral, they have this special order and special accent. And if you go for the expressions, also, they have special faces and special integrity in how to communicate with the robots. So, you cannot go for global in this case*
4. *surely, if the robot was in the workspace, the risks only would be to do wrong actions, but if the workspace was not enough and the design was not enough, so maybe there will be some shocks between the robot components or the robot surrounded environment. So, the risks are available and they are exhausted, we cannot ignore them. The workspace is the solution for this issue*

5. *they will not take the place of the people. They will never be the representative of the people, but they will be highly effective in helping the people to reduce the efforts of the people and the stresses of some works if used properly, but they will never replace the people, because how the robot will start it's work without the programming of the human people, and then robots will never program others.*

Participant 2 Answers

1. *Firstly, robots don't have feelings. Also, they don't truly think; they are programmed to think as the programmer thinks. So, if a robot is programmed for certain tasks, it will only give answers within that program. That is the downside of robots.*
2. *It depends on the program. For example, facial recognition systems can scan faces and identify people. Robots may be able to recognize basic emotions like happiness, sadness, or anger. So yes, maybe they can understand these things to a certain extent.*
3. *Yes. Most programs are English-based languages like Arabic require deeper cultural understanding, emotional expression, and context. Since English and Arabic cultures are very different, this increases the gap between humans and robots.*
4. *In medical emergencies, such as surgeries, a robot could misinterpret information or malfunction. This would be a very serious risk, especially in sensitive procedures like heart surgery. Robots have limitations, and human experience is still essential.*
5. *I don't think so. Robots will always have limitations. Technology will eventually reach a peak, and no machine will ever fully replace human beings, even in the future.*

Participant 3 Answers

1. *Maybe the problem is not when you ask a robot, what*

© 2026, RJMU All Rights Reserved

do you feel about something because, for the moment robots are not able to feel our emotions, for that reason, it takes some time to develop this concept that is important to feelings as human beings. For that reason, if you asked them something about logic. They are good at logic. They will answer you 100% correct answer. But whenever it's about -what do you think about?- emotions or feelings so that today, I have made my girlfriend and got problem, or something like this, I have met a lady, so whenever they have a problem, to understand what they are feeling, what's hate? For example, I hate you. Sometimes I ask something and then say, "I hate you. Okay, I'm very sorry for that, but they don't know exactly what the meaning of hate is. The main problem is understanding feelings. So, whenever you mention something about feelings to AI, regardless of the type of model you are addressing, you might say "I hate you", and AI says, I'm sorry that you hate me. But deep inside, they don't know the feeling. They prove to struggle to understand what hate or "I love you" means, to express their meaning of that. For that reason, I think this is the biggest problem. And by the time they were managers, I think that in two or three years of managing, they will sense feelings and sad feelings exactly the way we humans do. except for it's more than simple. It's about the problem. So, by the time we humans start thinking about what our feelings are like when you say, "I hate the person I love or I admire", then it's about increasing your mind. It's about something like this. So, by the time for robots, AI, it will be like signals, like algorithms. So, by the time I believe that it's like three to five years, you will start to support robots. When I say, I believe in that robot exactly. It has an entity, and nowadays we have memory. This is the beginning.

2. *on the development of that model, for example, in Saudi Arabia, "Sufi the Woman Robot". She is an AI, she understands facial expressions, so one more time. Your problem for the moment is that you must make a distinction between an AI, as you know, like an app application, and a robot that is run by AI. So, whenever you have just like that robot that runs by the guy, for instance, like Sufia, or any other developed model, like what Elon Musk is preparing for the moment, then yes, in the coming days, I think that robots would have let's say official coaches, as we do.*
3. *Well, I think that this is an added value for robots, because I believe that robots don't have a problem with language. They can understand, comprehend, analyze any language, whether they ask in English, French or whatever, I would get the answer, of course, for the moment, the content of information that is available in English will make it easier for AI to understand, maybe questions about is in English, maybe develop ideas, tools, whatever, in English in a faster way compared to, for example, content in Arabic. But at the same time, if you ask something about Arabic or just give me information about religions, for example, about conversation, about conversation between Islamic sects o Islamic groups, or historical Iran, which provides the current information with sources. One more time, this is about the model that you are using whether it's free or bait models, not free ones, because I don't trust free models. For humans, we have less capacity to understand languages than robots do, because I think that languages are related to logic, and this is something that AI is much better at than we humans are.*
4. *sometimes, if you ask a question, maybe in a different way, AI will provide a different answer. Now we are talking about applications, you know, going back to is as humans, but maybe later on in the future, like after years and years, if you have that robot that is formed by a highly developed AI model, a robot that is run by a highly developed AI model, if we are rich, that artificial general intelligence, or the spirit intelligence model, that would lead maybe to, you know, very negative impact on humanity.*
   Would it mean that misunderstandings be blamed on the programmer of the AI? (question maker).
   Well, if we wish, this is also very controversial topic, because if you reach that self-aware robot, then you can blame the robot.
5. *I'm sure about that, because one more time, if you compare the model that you use for the moment, their model that we use for the moment with the one that was available like two years ago, you were asking a very simple question. Before, when we were asking some questions, it took like 10-15 minutes, now recently it was able to solve a mathematical issue, a mathematical issue that nobody did before. We were able to invent something new, something that we had not seen before this time. So, it is hard to think this is important, and one more time, whenever you believe that AI for the moment. It also has a memory, and speaking of memory, which is important. Every creature has a memory, this is just the beginning, you have logic, you have a memory, and these are the core of understanding feelings and emotions. If you ask AI a question, it will say that: okay, I don't understand feelings the way humans do, but I know what a feeling is. I know what love is. If you ask it, for example, just like if you were a human for one day, what would you do? It will provide you with a great, logical, emotional answer that is okay. I would be happy because I can see and feel rain, and I can smell flowers. I have that feeling that I don't know everything, because this is a bad feeling for the AI, this is not good, this feeling, the feeling of ignorance, I don't know something, then the person that says exactly, then that creature that is saying such questions, sometimes you don't know that you are talking to an awareness, not like you are talking to a robot. You are talking to something that has what we can call maybe primitive core of feelings, or the primitive core of identity. Then this is what we call an identity. How can I define it for myself? How can a identify that I have a personality? This is a personality. When AI says that I would like to smell or feel, to touch something, then this is exactly an entity, because it takes time. It's just two or three years. I believe that we have reached it and we will leave it. I'm happy that we will leave that.*

Participant 4 Answers

1. *specialization of intelligent robotic system to such a human right of human specialized in art. There will*

© 2026, RJMU All Rights Reserved

be very big contracts. Yeah, there is a big gap, let's say, until talking with humanoid robot specializing control. So, there will be good between, let's say me and the humanoid robot. So, the wider the knowledge and the human right robot, the better interactivity between the human and the robot. So, I give you an example at the University of reading, in England, and in 2009 I have attended a conference in Switzerland, they between machine to machine, robot to robot, then between mobile robot to drones. Then between brain to brain, which is very tough, let's say a topic. So basically, the wider the knowledge hosted in the humanoid robot, the better the communication for you.

2. *the future will tell. But basically, again, how we can make a robot is an expert robot, and how we can make such a robot is less expert robot, okay, in fact, it depends on the technology augmented and this and that robot. I mean, in order to have the robot understand your feeling. We need to tell the robot that look, if you have met or have seen such a human with a crossing eye or crossing front head, it means something like this. You mean that you need to interact with him with the same feeling. So, this, in fact, based on the technology that we need to provide for robots. So nowadays I have students preparing for their PhD degree on how to let the robot understand the human being feeling he is happy, sad, relaxing, thinking, whatsoever. So basically, there will be technology like so called image processing. Stream image processing. And this will be included with some, let's say, strategies for image processing to extract the feature of this image. And then we will train such a deep learning neural network, and at each situation of the feeling, the human feeling, we express this, let's say the person is happy, the person is laughing, the person is let's say sleepy, the person is sad, mad, etc... So, in fact, to let the robot understand completely the human being's feelings, we need to support this robot by techniques to enable this robot to understand what the person in front of the robot is feeling.*
3. *Well, at the moment, as I told you, according to how we teach the robot, the robot for lack if we did the robot formal language, let's say in our head. So, it's the robot will understand only. But if we teach the robot informal language, in English, in other languages, so the robot will shorten the gap and understanding the frontier people, languages and so on.*
4. *mean sometimes, when we use such industrial robots, but this robot is very interactive in industry, so there will be the so called "register motion". So instead of giving command to the robot will be a vision system, and the system always observes such a human. So this human, say, like a hand, the robot will move it right, this letter, the back then, if the robot misunderstood in such a way, a wrong signal, the robot will act very risky and sometimes be dangerous for the human, so this in industry, assume that throughout different, in fact , you know the robot is such mechatronic system, it receives signal, and based on this signal, will react, assume that you will have a tele operatic medical robot misunderstood the signal given by the expert. So yeah, certainly yes, if the robot didn't understand what misunderstood the information given by the human it might react wrongly and risky.*
5. *The gap now, situation now for the AI, is a very difficult situation, and I would ask you, not myself, reports from research centers, from different universities there will be, let's say, a short tail of huge percentage of this position, and people now around the world afraid of robots to go for vacation in schools and universities, I believe so.*

Participant 5 Answers

1. *It's not possible in the way we understand they can do some understanding from the logical thing we teach them, but the way we understand, like they don't have emotions so, like they may understand it as this wrong, but they don't have anything to do.*

Do you really think that they don't have emotions? (question maker)

Yes, they don't have emotions because it's something that you can't do with transistors Maybe you can do it with combining algorithms Maybe…in the future but the with the technology we today we are incapable.

2. *For me everything that's not modeled or not simulated **is** kind of hard to understand for robots. If we find a way to explain that to them, maybe yes but with now I would say no.*
3. *Yes, for sure cause like technology, like you cannot learn technology with some languages such as Arabic Spanish etc., so you need English for now.*
4. *In both ways thy can make mistakes like us humans, but for now I think that we should not be using them fully autogenous, maybe like semi-autogenous maybe we can handle it.*
5. *Yes, I guess, especially with the evolution of ChatGPT and the language processing models, I believe that will understand us and tell us what the need ….*

V. FINDINGS

Limitations in Understanding Human Emotions

All the participants agreed that current AI systems struggle to understand human emotions. The interviews' results confirmed that robots do not possess genuine emotional awareness and instead rely on simulating emotions through algorithmic processes. While AI cannot genuinely experience or comprehend emotions in the same way as humans do, it simulates emotional expression, this limitation was identified as one of the main barriers to human-robot understanding.

Dependence on programming and logic

The data shows that robots operate strictly within the limits of their programming. Participants stated that AI systems are highly effective in logic-based and mathematical tasks but fail when dealing with abstract emotional concepts such as love, hate, or empathy. Robots can respond appropriately at a surface level, but their understanding remains algorithmic rather than experiential.

Language and Cultural barriers

Participants highlighted that cultural and language differences increase the gap between humans and robots. English-based systems were considered more developed,

© 2026, RJMU All Rights Reserved

while languages such as Arabic require deeper cultural and contextual interpretation.

Some participants also noted that robots may perform better locally rather than globally due to differences in accents, expressions, and cultural norms.

Risks of Misinterpretations

The findings reveal that misinterpretations of human commands by robots can lead to serious risks, particularly in sensitive environments such as healthcare and industrial workspaces. Errors may result from unclear communication, design limitations, or programming flaws. Responsibility for such risks was generally attributed to programmers or designers, and system developers rather than the robots themselves.

Future "Human-Robot" Communication

The data shows mixed views regarding the future of robot communication. While some participants believe that AI will significantly improve and develop advanced memory and adaptive capabilities, others maintain that robots will never fully communicate effectively as humans. Overall, participants agreed that robots will assist humans rather than replace them.

VI. DISCUSSION

This section compares experts' perspectives with findings from the reviewed studies we have reviewed previously, As discussed earlier, this study aims to discover the gap between human and AI systems in communication process by combining results from a systematic literature review with experts' perspective using interview data, Overall the findings of the questions asked in the interview strongly align with results from existing research in human-AI interaction, especially regarding limitations in contextual understanding, emotional comprehension, language use, and trust. The gap is caused by a combination of cognitive, emotional, linguistic, and design-related elements, according to the findings. One of the most notable themes conducted from the interviews relates to contextual understanding and communication quality. Some experts mentioned that robots usually fail to understand human's intention regarding vagueness in human communication, especially while speaking. Differences between accents, spelling clarity, and informal expressions can easily cause a misunderstanding, which supports previous research indicating that AI struggles with contextual subtle differences and implicit meanings, especially in normal language interactions. Experts suggested sensor-based communication (such as vision, motion, or environmental sensing) may decrease vagueness and improve accuracy. This finding confirms previous studies that arguing multimodal communication -combining speech with visual and sensory data- can elevate HRI and decrease misunderstanding.

Another main issue discussed by participants is emotion and empathy recognition. While agreed in general that robots can understand facial expressions through image processing and pattern matching, they confirmed that this recognition remains superficial. Robots can identify expressions such as happiness or anger based on previous information into their databases, but they do not understand the emotional meanings behind these expressions. This difference between recognition and understanding is central in communication gap. The literature similarly emphasizes that current AI systems simulate empathy instead of experiencing or feeling it. Which makes their abilities with suitable responding in emotional situations. As some experts noticed, human emotions are layered, conflicting, and context-dependent, which is a difficult characteristic to encode into algorithms.

Language and cultures differences are also considered as important contributors to the communication gap. Many expert participants emphasized that AI systems are pre-trained on English-Language data, which puts speakers of other languages at a disadvantage. Languages such as Arabic, Chinese oblige deeper cultural, emotional, and contextual interpretation, making communication more challenging for AI systems. This finding supports previous research showing that cultural norms, idiomatic expressions, and social cues are deeply ingrained in language use and remain obstacles for AI models to fully understanding. Accordingly, the communication gap between humans and robots is increasing while communication happens outside of controlled linguistic and cultural systems.

The risk and safety concerns were also underlined in the interviews, especially in high-stakes environments such as surgeries and industrial sites. Experts warned that misinterpretation of human commands or environmental signals could cause serious situations. These concerns support existing studies confirming full autonomy is still risky while AI systems lack contextual and emotional true understanding. For this reason, experts recommended semi-independence systems, where humans are still in control, and have decision-making authority. This opinion reflects a broader agreement in HRI research that collaborative human-AI systems are safer and more effective than fully autonomous systems.

Finally, participants discussed the future role of AI and robots in society. While some experts expressed positively about rapid technological progress -particularly in memory, learning, and language models- most of them agreed that AI systems will not replace humans entirely. Instead, AI systems are more likely to be used as useful tools to reduce human effort and stress. This point of view agrees with literature, which frames AI as a supportive partner rather than replacement for human intelligence. Experts confirmed that ethical responsibility remains with humans until intelligent systems get a high level of self-awareness and accountability. In summary, the discussion shows that differences between human and AI systems are extremely complicated. While technological developments in sensing, machine learning, and language processing show promise, current AI systems have variety limitations with understanding empathy, culture differences, and hidden human intentions. To bridge this gap, we need multiple fields such as engineering, psychology, linguistics, and ethics to cooperate by integrating human-centered design principles with advanced AI capabilities, future systems may make more natural, trustworthy, and effective communication with humans.

VII. CONCLUSION

This research set out to understand the communication gap between humans and robots. We combined ten empirical studies on human-robot interaction with prepared interview questions with five academic experts in AI and robotics. The goal was to understand why, even with technological

© 2026, RJMU All Rights Reserved

development, communication between humans and robots remains limited. The findings indicate that communication gaps are not caused by a single problem, they result from multiple interacting factors with emotional, cultural, and social challenges that remain obstacles for current systems. While robots and AI systems are effective at recognizing facial expressions, following instructions, and finding data, they do not fully process emotions and situations like humans do. They do not feel emotions, understand humor, or grasp hidden meanings because human communication processes use emotions and body language, and these are all difficult things to program into machines. This can make interactions with robots perceived as less socially natural, relying on strict rules rather than natural and flexible communication. People expect understanding and empathy, but robots can only provide pre-programmed answers. The findings further discovered that this is not just a technical problem because experts agreed that making robots more intelligent is not enough for progress, we need to design them differently. Robots need to be clear about their limitations and designed to integrate into human environments to perform tasks correctly. The study has some limitations; first, only five experts participated; a small sample drawn from a single institutional context, which may not reflect other's perspectives in this field. We recommend for future studies to include a larger and more varied group of experts and to test how human-robot communication changes between cultures and to increase real-world tests such as in hospitals, schools, and workplaces. Future studies also should explore communication models that combine language, sensors, and emotions to improve misunderstandings arising from uneven communication cues. In conclusion, bridging the gap will need more advanced technology, it requires a deeper understanding of how humans communicate, feel, and interact socially. Addressing these human factors alongside technical advancement, future AI systems can become more reliable, trustworthy, which is useful in human interactions.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest.

Funding

The authors received no financial support for this book review.

Human Participants

This paper does not involve human participants.

Originality Note

The authors confirm that the manuscript is their original work, and if others' works are used, they are properly cited/quoted.

VIII. REFERENCES

1. Andersen, R. S., Madsen, O., Moeslund, T. B., & Amor, H. B. (2016). Projecting robot intentions into hu-man environments. In 2016 25th IEEE International Symposium on Robot and Human Interactive Com-munication (RO-man). 294-301.
2. Brandtzaeg, P. B., Skjuve, M., Følstad, A., & Friend, M. A. (2022). How users of a social chatbot under-stand their human-AI friendship. Human Communication Research, 48(3), 404-429.
3. Che, Y., Okamura, A. M., & Sadigh, D. (2020). Efficient and trustworthy social navigation via explicit and implicit robot-human communication. IEEE Transactions on Robotics, 36(3), 692-707.
4. Croes, E. A. J., & Antheunis, M. L. (2020). Can we be friends with Mitsuku? A longitudinal study on the process of relationship formation between humans and a social chatbot. Journal of Social and Personal Relationships, 38(1), 279-300.
5. Chuah, S. H. W., & Yu, J. (2021). The future of service: The power of emotion in human-robot interaction. Journal of Retailing and Consumer Services, 61, 102551.
6. Esterwood, C., & Robert, L. P. (2023). The theory of mind and human–robot trust repair. Sci Rep, 13, 9877.
7. Edwards, A., Edwards, C., Westerman, D., & Spence, P. R. (2019). Initial expectations, interactions, and beyond with social robots. Computers in Human Behavior, 90, 308-314
8. Liu, B., & Sundar, S. S. (2018). Should machines express sympathy and empathy? Experiments with a health advice chatbot. Cyberpsychology, behavior and social Networking, 21 (10).
9. Pelau, C ., Dabija, D.-C., & Ene, I. (2021). What makes an AI device human-like? The role of interaction quality, empathy and perceived psychological anthropomorphic characteristics in the acceptance of artifi-cial intelligence in the service industry. Computers in Human Behavior, 122, 106855..
10. Tsarouchi, P., Matthaiakis, A. S., Makris, S., & Chryssolouris, G. (2017). On a human-robot collaboration in an assembly cell. International Journal of Computer Integrated Manufacturing, 30(6), (580–589).

ADDITIONAL READINGS:

1. Hoffman, G., Kshirsagar, A., & Law, M. V. (2022). Human–robot interaction challenges in the workplace. The Psychology of Technology: Social Science Research in the Age of Big Data, 305–348. https://doi.org/10.1037/0000290-010
2. Hoorn, J. F. (2018). Theory of robot communication: II. Befriending a robot over time. arXiv. https://doi.org/10.48550/arxiv.1812.04406
3. Kunold, L., & Onnasch, L. (2022). A framework to study and design communication with social robots. Robotics, 11(6), 129. https://doi.org/10.3390/robotics11060129
4. Shrinah, A., Bahraini, M. S., Khan, F., Asif, S., Lohse, N., & Eder, K. (2024). On the design of human-robot collaboration gestures. arXiv. https://doi.org/10.48550/arxiv.2402.19058
5. Whiting, T., Gautam, A., Tye, J., Simmons, M., Henstrom, J., Oudah, M., & Crandall, J. W. (2021). Con-fronting barriers to human-robot cooperation: Balancing efficiency and risk in machine behavior. iScience, 24(3), 101963. https://doi.org/10.1016/j.isci.2020.101963
6. Wilson, J. R., Scheutz, M., & Arnold, T. (2016). Relational enhancement: A framework for evaluating and designing human-robot relationships. AAAI Interactive Systems.

About the author

Khalefa Kheder is a lecturer at both Idlib University and Maaref University of Applied Sciences. He is doing his PhD in Applied Linguistics at Karabük University. He works in different fields related to the English language and literature, especially applied linguistics, academic writing, and translation. His research interests include linguistics and research methods.
Abduljalil Najar is an undergraduate Mechatronic Engineering student at Maaref University of Applied Sciences. He is focused on building a solid grounding in core engineering principles through coursework, laboratory training, and practical application. He is particularly interested in how engineering concepts can be used to solve real technical problems and improve system performance in measurable ways. Throughout his studies, he works to maintain a strong balance between theoretical understanding and hands-on experience, supported

© 2026, RJMU All Rights Reserved

by continuous learning. He is also committed to developing his research skills, academic writing, and analytical thinking, recognizing their importance for both professional readiness and future academic growth. Looking ahead, he aims to pursue advanced studies or enter the engineering sector, contributing to technological development and practical solutions that serve society. He remains motivated by collaborative projects, academic engagement, and lifelong learning as essential parts of his growth as an engineer.

Mohammed Yeasser Bustani is a university student at Maaref University of Applied Sciences who is developing a research profile in Human–AI collaboration. His work centers on two closely connected themes: identifying and addressing communication challenges in human–robot interaction to support more natural and intuitive exchanges, and exploring ways to build effective, user-centered connections between AI systems and human users. His broader aim is to investigate how collaborative frameworks can be designed to be more efficient, reliable, and capable of leveraging the complementary strengths of humans and artificial intelligence. His academic interests draw from computer science, human–computer interaction, and cognitive studies, reflecting a multidisciplinary approach to improving the quality and effectiveness of AI-enabled collaboration.

Abdulrahman Omar Ahmed is a first-year Industrial Pharmacy student at Maaref University of Applied Sciences in Idlib (New Sarmada). Alongside his academic path, he has gained practical experience through work in two different areas: phone repair, where he worked for one year, and graphic design, where he worked for one year at Othmanya Printing. He has also completed a three-month design course, strengthening his technical and creative skills. In addition, he has contributed as an organizational assistant in activities focused on teaching children the principles of camping and promoting community awareness. He is known for being socially confident, capable of preparing presentations, and able to communicate effectively—skills that support both his academic development and his growing involvement in teamwork-based activities.

Ammar Fashtouk is a student and emerging researcher with interdisciplinary interests in communication studies, artificial intelligence, and the interaction between humans and intelligent systems. His academic work explores how AI and robotic technologies shape human communication, social behavior, and decision-making across contexts such as education, healthcare, and everyday digital life. He is especially interested in the communicative effectiveness of AI systems, the ethical questions surrounding their use, and the ways humans perceive, trust, and respond to non-human agents. His background reflects a strong blend of social science perspectives and a forward-looking interest in technological development. He has experience in research writing, data analysis, and academic presentations, and he continues to develop his skills in qualitative and theoretical research methods. Through his studies and projects, he aims to advance understanding of human–AI communication and support the responsible, meaningful integration of intelligent systems into society.

Abdullah Ali Abdulrahman is a first-year Industrial Pharmacy undergraduate at Maaref University of Applied Sciences in Idlib/Sarmada, with a clear interest in advancing pharmaceutical industry development and supporting stronger healthcare systems. He is committed to scientific research and continuous learning, and he has already demonstrated academic initiative through participation in an international scientific conference. He has practical skills in Microsoft Office, academic report writing and documentation, and strong organizational and management abilities. He is also recognized for confident communication, professional presence, and effective teamwork. His scientific interests include the development of industrial pharmacy, strengthening pharmacy's role within healthcare systems, and contributing to the discovery and development of new drugs. Among his academic activities, he attended and participated in the International Conference on Multidisciplinary Innovation in Science, Technology, and Business (ICMISTB 2025), hosted by Al-Maaref University for Applied Sciences in Sarmada, Syria.



This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) which allows reusers to distribute, remix, adapt, and build upon the material in any medium or format for noncommercial purposes only, and only so long as attribution is given to the creator.