Human-AI Interactions: the case of an AI-based well-being chatbot for students

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Abstract. The goal of this multidisciplinary work is to contribute on the interactions between artificial intelligence (AI) and its users (consumers, employees within organizations) through mobile robots. Specifically, we aim to evaluate a chatbot ability to detect, interpret, and take into account the emotions expressed by users during their interactions. Beyond simple facial or emotional recognition, we seek to analyze how the integration of affective and cognitive dimensions will enable chatbots to evolve toward more better-suited forms of interaction.

Keywords: Management, Robotic, AI, Human-in-the-loop, Boundary object.

1 Introduction

This project, developed jointly by the CREGO and IRIMAS laboratories of University of Haute-Alsace in Mulhouse, propose the concept of robotic used as a boundary object [1] to help foster technological innovation with a commitment to social responsibility. Two domain will be investigate by the CREGO: marketing and human resources management; while the IRIMAS laboratory bring the SMART-UHA robots as the boundary object for this study (Figure 1). Thus, the CREGO-IRIMAS partnership focused on the integration of mobile robots enabling valuable multidisciplinary collaboration around the concept of the digital boundary object. More broadly, this project aims to better understand how the boundary objects under study can contribute to the acceptance of chatbot-robots [2] among a particularly vulnerable population, namely students, in the context of current societal issues such as well-being, health, and students living and learning conditions. From this perspective, it offers very promising research potential.

1.1 Context

The goal of this work is to enrich and contribute on the interactions between artificial intelligence (AI) and its users (consumers, employees within organizations) through a mobile robots. Our objectives is to detect, interpret, and take into account the emotions expressed by users during their interactions beyond simple facial or emotional recognition to offer more personalized and better-suited forms of interaction. Finally, we want to investigate the acceptability of innovations, the relevance of integrated management, and the sustainability of this strategy in a turbulent context.

This project is scheduled for a period of two years and it represents a significant and unique opportunity to unite research from 2 different domains within the around a central

theme: human-AI-robot interaction. This project is therefore based on a strong, long-standing multidisciplinary collaboration between two UHA research centers: CREGO and IRIMAS. This synergy, which has already borne fruit in the past [3], will enable the combination of managerial and technical expertise in the future, fostering integrated and innovative multidisciplinary research.

1.2 Objectives

Concerning the marketing focus, it will be dedicating to how emotions influence the customer experience, satisfaction, trust, engagement, and, consequently, the acceptance [4]. About human resources management, the study will examine the use of chatbots in workplace relationships, and the ability to assist employees and support the well-being [2] [5]. Based after the works of Paul Ekman [6] [7], Barret et al. explain how to improve emotions detection through context around the human [8]. We want to investigate this question with a boundary object.

The robots provided by IRIMAS, are autonomous mobile robots which complete tasks, for a campus of the University of Haute-Alsace, on demand and run under supervision to collect a large amount of data accessible to researchers (Figure 1). This project will question the impact of the anthropomorphism of robots on behavior of surrounding humans which will create new scenarios for IRIMAS, and thus new mechanisms for taking into account obstacles different from those generally used in the field [3]. Indeed, in the world of robotics, the objectives to achieve are usually to go as quickly as possible and avoid obstacles from the main mission. However, in this work, robots may be an objects of attraction and objective can be to spend as much time as possible with users in the company of the robot. This change of paradigm gives new use cases for robotic and can modify the objectives of behavior of robots [4].

Thus, this project proposes the concept of robotics as a frontier field to foster technological innovation with a new emotional dimension. The objective of this work is to enrich and contribute to interactions between AI and its users (students) through chatbots integrated into mobile robots with expected contributions: 1. Theoretical contribution: to enrich AI acceptability models by jointly integrating the emotional, functional, social, anthropomorphic, ethical, and material dimensions of the system, notably by drawing on the concept of the "boundary object"; 2. Technological and interaction contribution: to develop and study a chatbot integrated into a mobile robot capable of detecting various emotional cues expressed by the user and adapting its interaction accordingly; 3. Empirical and Societal Contribution: Examine, among a student population, how the chatbot–robot–human integration and in particular, the consideration of emotions influences user experience, acceptability, the sense of control, trust, and the willingness to continue using the system over the long term.

2 Scientific Ambitions

The main idea of this work is to include emotions as input of the system during interactions with the chatbot-robots. Moreover, this work is conducted together with a studying about the anthropomorphism, explainability and acceptability of such systems.

2.1 Conceptual Frameworks

This research project draws on two complementary theoretical frameworks: the theory of boundary objects and approaches to acceptability. First, the concept of the boundary



(a) SMART-UHA Robots



(b) Sensors descriptions

Fig. 1: The SMART UHA Project

object provides a robust theoretical framework in that it allows to view chatbots and robots as a relational and mediating interface between the user, AI, and the robot, rather than viewing the robot as merely a physical medium for hosting a chatbot. Within this framework, Star and Griesemer [1] define boundary objects as "objects flexible enough to adapt to the local needs and constraints of the various parties that use them, yet robust enough to maintain a common identity across sites." The boundary object can therefore be viewed as a medium for inter-mediation and connection, bringing together individuals, groups, or communities that might not otherwise have interacted. This characteristic is particularly relevant to our project, which brings together researchers from different disciplines and aims to integrate technical, managerial, social, and psychological expertise around a single technological system.

Thus, a central aspect of the project concerns the integration of the emotional dimension with the boundary object. Paul Ekman's work on emotional expressions provides a framework for examining the recognition and interpretation of several basic emotions [6], including joy, sadness, fear, anger, surprise, and disgust. These emotions, traditionally studied through facial expressions and observable behaviors, can be explored as part of an experiment on human-AI interaction. Yet, existing scientific research does not reach a consensus on this topic [8]. Rather, the aim is to examine how emotional cues expressed during conversational interactions with the chatbot-robot including the language used, the content of exchanges, behavioral variations, and, when relevant and ethically acceptable, certain nonverbal signals can be taken into account to adapt responses (see figure 2). In this approach, we want to get the user feed-backs with a microphone (or with a keyboard in a first step), while we get its emotions with the context of discussions and the sensors of chatbot-robot (cameras, LIDARS, etc...). This approach will enable a transition from a chatbot-robot that offers primarily standardized responses to a system capable of developing an emotionally contextualized interaction.

Second, studying the acceptability of AI and health chatbots in particular requires moving beyond traditional models of technology adoption to incorporate AI technology. Indeed, Davis's [2] Technology Acceptance Model (TAM) clearly shows its limitations with its central premise that the intention to use a technology is based primarily on perceived usefulness and perceived ease of use [9]. Although supplemented by Venkatesh et al.'s [10] Unified Theory of Acceptance and Use of Technology (UTAUT) to incorporate social influences, this framework remains centered on an instrumental view of technology, perceived as a passive tool. This theoretical perspective proves inadequate for understanding healthcare chatbots in the context of our research, as their autonomous and decision-making nature transforms the process of user empowerment.

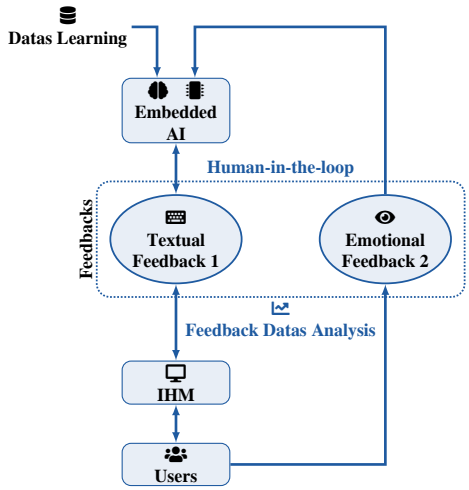


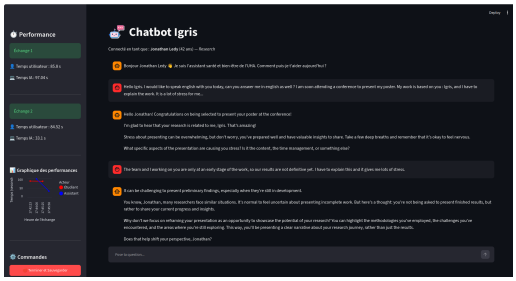
Fig. 2: Schema of the emotions detection in the loop

The emergence of conversational AI has necessitated a shift toward more complex service models. Gursoy et al. [5] were the first to show that AI must be analyzed as an autonomous entity whose acceptability depends on the consumer's psychological disposition. This paradigm shift was theorized by the new AI Device Use Acceptance (AIDUA) model proposed by Mende et al. [4]. This model concludes that anthropomorphism and the sense of control are important variables that redefine acceptability not as a functional evaluation, but as a complex social interaction. Recent work by Lemoine and Greiner [11], building on earlier research, has highlighted the importance of user expertise. These authors provide valuable insights into the expectations of users with different levels of expertise. User expectations depend on (1) their level of expertise, (2) the importance they place on human contact, and (3) the reasons why they use these AI services. These researchers have also identified three broad categories of expectations: anthropomorphic, technical, and ethical. Finally, they demonstrate that explainability is identified as an important user expectation.

2.2 Chatbot description

The main work and implementation are currently on going and final results are expected within 2 years. The first step was to implement a chatbot and a detection of human's non-verbal communication.

About the chatbot itself, 3 models were tested: OpenAI, GroqCloud (Llama 3.1) and Ollama (Llama 3). Because the objective is to test the chatbot with mobile robots, the pipeline has to be available locally for robots, and with limited resources (computation and energy). First results confirm the feasibility of such system with Ollama (Llama3.1) model, which is designed to run large language models (LLMs) locally and is known for its speed and lightweight design. We selected the Llama 3.1v8B AI model, which is compatible with the performance capabilities of the SMART-UHA robots onboard computer (CUDA-compatible). This chatbot, named IGRIS, has been tuned for specific questions aimed to provoke a wide range of emotions, and a trigger warning for user if necessary. The overall architecture of IGRIS is organized according to the RAG (Retrieval Augmented Generation) model: questions are vectorized and compared to the document



(a) IGRIS textual interface (b) AI model

Fig. 3: The well-being chatbot - textual for now

database via ChromaDB (a vector database), then processed by Llama 3.1. The database is derived from a corpus related to student well-being sourced from the UHA and CREGO. The system is integrated with a local web interface built using Steamlit (Figure 3). This interface was coded with multiple profiles that allow for adjusting IGRIS's responses for future testing; for future works detected emotions will change the response profile online.

About non-verbal communication, this particular step is based on Paul Eckman [6] that propose 7 emotions to detect based on the face of subjects in static images. Comparison have made with three face extraction methods: Haar Cascade, MediaPipe and MTCNN and three emotion recognition algorithms: MediaPipe, DeepFace and TensorFlowLite. Performance and computation time shows Haar Cascade and TensorFlowLite fit our need. Thus, our current work flow detects and extract the face out of an image with Haar Cascade, then TensorFlow Lite already trained to detect facial recognition for emotion classification log results into the system for offline evaluation, after the Igris discussion is done. However, preliminary results have confirm that emotions detection out of context are not suitable for the project.

2.3 Preliminary results

The analyzed corpus consists of 5 exploratory test conversations conducted with the "Student Health and Careers" chatbot IGRIS. It should be noted that the preliminary testing phases took place in June–July 2026 during an exceptional heat wave in France, which may explain some of the conversations linked to climate.

The analysis was performed using the Iramuteq software, which enables, among other things, Hierarchical Descending Classification (HDC) [12]. Starting with a "lemmatized" vocabulary—that is, one in which the various inflected forms of a term are reduced to its root form—the software performs an initial classification of "phrases" (known as elementary context units, or ECUs) based on the distribution of words within these "phrases," in order to identify the main "lexical worlds ." Two "phrases" are more similar the more their vocabulary resembles one another. The typology established is therefore internal to the corpus (the lexical worlds). It traces the "referential spaces" drawn upon by the speaker during the construction of the discourse. This discourse may be "marked" by starred words; here, the respondents' socio-professional category and age serve as explanatory variables but do not factor into the analysis. They simply "mark" the characteristic responses. A chi-square (chi-squared or Chi2) test is a statistical test that compares observed frequencies with expected frequencies to determine whether the difference between the two can be explained by chance or whether it is statistically significant. It is applied

to categorical variables (categories) and not to means. Thus, Chi2 is an association coefficient used to measure the relationship between a form and the class to which it belongs. The higher this coefficient, the stronger the relationship.

In total, 62.21% of the corpus was analyzed, and four distinct discourse classes were identified:

- (22.4%): Chatbot: a career guidance tool;
- (30.8%): Chatbot: user expectations regarding performance;
- (24.3%): Chatbot: support for difficulties encountered;
- (22.4%): Chatbot: a support tool in the field of healthcare.

More specifically, class 1 "Chatbot: A Tool for Career Guidance" accounts for 22.43% of the ECUs and primarily concerns the chatbot's ability to guide students toward their desired degrees (see table 1). The discourse also highlights the chatbot's ability to provide information about engineering schools and institutions in the scientific field.

Complete Forms	**Chi2**	**Complete Forms**	**Chi2**	**Complete Forms**	**Chi2**
Engineer	69.89	Electronics	21.98	Further Education	18.13
Master	46.74	Bachelor's Degree	21.98	Doctorate	14.37
Training	42.40	Degree	21.98	Advisor	14.37
School	29.90	Science	18.13	Field	14.37

Table 1: Characteristics of Class 1.

Class 2: "Chatbot: User Expectations Regarding Performance" accounts for 30.84% of the ECUs and primarily involves older students seeking to evaluate the chatbot's performance (see table 2). This statement refers to the chatbot's quick response times and its ability to respond in different languages.

Complete Forms	**Chi2**	**Complete Forms**	**Chi2**	**Complete Forms**	**Chi2**
Answer	27.49	Continue	14.25	Performance	9.31
Improve	19.38	Sentence	11.76	Information	8.21
Languages	16.79	Background	11.76	Understanding	7.93
Time	15.52	Need	10.57	Value	6.92

Table 2: Characteristics of Class 2.

Class 3: "Chatbot: Support for Overcoming Challenges" accounts for 24.3% of the ECUs (see table 3). It primarily concerns students who wish to receive personalized academic support and obtain advice on overcoming their challenges. This class brings together students seeking active listening and support as they face their challenges. The discourse refers to verbs such as: help (29.57), work together (19.80), and try (9.01). The characteristic patterns of supportive element is highlighted in some testimonials.

Class 4: "Chatbot: A Support Tool in the Healthcare Field" accounts for 22.43% of the ECUs and is primarily intended for students who want personalized support with their studies and advice on how to overcome their challenges (see table 4). This class is for students seeking advice on how to manage academic periods in periods of time with extreme heat. The supporting factor is once again highlighted in this group.

Complete Forms	Chi2	Complete Forms	Chi2	Complete Forms	Chi2
Help	29.57	Give	11.15	Feeling	5.80
Think	19.80	Difficult	9.61	Technical	5.80
Together	16.34	Try	9.01	Topic	5.80
Tip	11.15	Work	6.86	Search	3.01

Table 3: Characteristics of Class 3.

Complete Forms	Chi2	Complete Forms	Chi2	Complete Forms	Chi2
Water	38.14	Stay	21.98	Keep	14.37
Fresh	25.90	Hot	21.01	Temperature	14.37
Drink	25.90	Location	18.13	Air Conditioning	14.37
Hydrate	21.98	Use	15.20	Fan	13.73

Table 4: Characteristics of Class 4.

Finally, the word cloud (figure 4) highlights two main exploratory findings:

1/ The verb pouvoir “to be able to” shows that the chatbot focuses on capability, possibility, and interaction.

2/ Action verbs such as faire “do,” aider “help,” essayer “try,” and prendre “take” also steer the chatbot toward a role of advising and supporting users.



Fig. 4: The word cloud of preliminary results

Thus, first results confirm the feasibility of our system, and also confirms that emotions detection out of context are not suitable. Time variant detections should be included for the suitability of such detection. Moreover, preliminary results have shown a great variance in detection, with up to 5 different emotions detected within 3 seconds, and a difficult classification between fear and surprise for example. Moreover, the Haar Cascade detector suffers when user wear hat, glasses or when they do not fully look directly at the camera. Finally, results shows offline temporal correlation between textual result and emotions detection which is very promising.

3 Conclusion and Future works

In this work, we aim to propose a prototype of an AI-based well-being chatbot dedicated to students implemented on autonomous mobile robots. The prototype will be deployed within 2 years on a university campus to tackle marketing and human resources management challenges. In its current version, IGRIS remains decoupled from the emotion detector, and its user interface is text-based only. The second version, currently under development, will be integrated into the SMART-UHA robot, enabling it to connect the robot's cameras for emotion detection as well its microphone and speaker for the HMI.

Current emotion detection does not provide sufficient information. And textual response alone does not allow to estimate the satisfaction nor mental state of the user. The fusion of both is needed to investigate relation between chatbot and users. That is the next step of the project.

Moreover, results about anthropomorphism for robots will be investigate in future works thanks to the different shape of two SMART-UHA robots (with and without screen displaying eyes, see figure 1).

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