EXPLORING PERCEPTIONS AND USAGE OF LARGE LANGUAGE MODELS AMONG UNIVERSITY OF ANDORRA STUDENTS

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Abstract

After a year since ChatGPT came to light, an evaluation of student perspectives and usage concerning large language models (LLMs) becomes necessary. As LLMs continue to influence education, understanding their effects on student learning experiences emerges as an important aspect. This contribution analyzes the perceptions and utilization of LLMs among students in the fields of Education and Information Technology at the University of Andorra. Using a survey as its primary instrument, this research reveals the different ways in which students interact with artificial intelligence (AI) and their attitudes toward these kinds of tools. The study is mainly quantitative, with some questions employing a qualitative approach. Preliminary findings show a range of attitudes, from enthusiastic adoption to skepticism. The surveyed students express advantages in receiving immediate and personalized support for academic aspects, assistance in content generation, and improvement in writing skills. However, concerns about accuracy emerge as a notable weakness. This mixed-methods study illustrates distinct usage patterns between disciplines and academic levels, showing the frequency and purpose of LLMs utilization. Given the bias in the distribution of women and men across the two fields under study, gender data should be interpreted in relation to the specific field rather than gender itself. The results of this research contribute to a deeper understanding of student behavior in regard of content generation tools, providing valuable information for educational institutions seeking to effectively incorporate those tools into their curricula, and it also facilitates further research on the influence of AI in higher education.

Keywords: Artificial intelligence, Large language model, Higher education

1 INTRODUCTION

The concept of artificial intelligence (AI) is not new; it has been discussed for many years. Over 40 years ago, discussions about the definitions of what AI means began. It refers to the simulation of human intelligence in machines that are programmed to think and learn like humans. It involves the development of algorithms and computational models that enable computers to perform tasks that typically require human intelligence [1]. These tasks include things like problem-solving, speech recognition, learning, planning, and perception [2]. Today, AI encompasses various fields such as natural language processing (NLP), machine learning, speech recognition, etc. NLP is a branch of AI focused on the interaction between computers and human language. Its objective is to enable computers to comprehend, interpret, and produce human language in a meaningful and contextually relevant manner. Key aspects of NLP include text processing, language understanding and language generation. NLP is applied in sentiment analysis, speech recognition, question answering, and dialog systems. Despite advancements, NLP faces challenges like handling ambiguity, understanding context and addressing language diversity. Ethical considerations, particularly bias in language models, are important concerns in NLP research. Recent progress, notably with models like GPT-3, has significantly enhanced the capabilities of NLP, pushing the boundaries of what machines can achieve in language-related tasks. The primary objective of a language model is to capture the structure and patterns inherent in natural language, allowing it to predict the likelihood of a word or sequence of words given its context. The term probabilistic indicates that these models are based on the principles of probability theory [3]. In 2017, a group of investigators proposed a new neural network architecture called Transformer for sequence transduction tasks, relying solely on attention mechanisms and omitting the use of recurrent or convolutional layers [4]. The effectiveness of the Transformer is demonstrated in automatic translation tasks, achieving remarkable results on various benchmark datasets, reducing training time, and improving parallelization. The authors also conducted experiments to analyze the importance of different components of the Transformer and provided insights into its internal functioning. ChatGPT, for instance, is largely based on this architecture [5].

The benefits of AI models extend beyond text generation, though; they prove valuable in various fields, such as music composition. With an unstructured dataset comprising over 13,000 melodies across genres, the model swiftly generates accurate structures up to a certain level of complexity, demonstrating high accuracy in genres adhering to strict music theory rules like classical, electronic, and game music. However, accuracy diminishes in more intricate genres like jazz and oriental music [6]. In the field of image editing and restoration, the application of pre-trained generative adversarial networks (GANs) stands out. These models facilitate efficient customization for specific image restoration, offering time and resource savings compared to training new models from scratch [7]. Another example is DATID-3D, a novel approach for domain adaptation in 3D generative models using text-to-image diffusion. This tool exhibits promise for applications in virtual reality, gaming, and product design, significantly enhancing diversity preservation, image quality, and text-image correspondence compared to existing methods [8]. ChatGPT performs well in translation for high-resource European languages but lags in low-resource or distant languages. However, with the GPT-4 engine, ChatGPT's translation performance significantly improves, making it comparable to commercial products even for distant languages [9]. ChatGPT holds potential for enhancing language learning and instruction in English as a Foreign Language (EFL) writing by providing personalized feedback, increasing engagement, and enhancing writing quality. Despite its benefits, there's a concern about the potential reduction in human interaction and creativity with excessive reliance on AI in EFL writing. A balanced approach is recommended, using ChatGPT to support and enhance rather than replace human teaching and learning [10]. The strengths of LLMs include their ability to generate high-quality texts resembling human-authored content, produce text in diverse styles and languages, and automate content creation across various industries. However, limitations encompass the tendency to generate biased or offensive content, challenges in creating coherent long-form content, a lack of control over generated content, and the high computational cost of large-scale artificial intelligence generative content (AIGC) models. Overall, significant progress has been made, but ongoing efforts are needed to enhance the quality and diversity of AIGC [11].

There are various examples of how AI is currently used in education, including personalized learning, intelligent tutoring systems, learning analytics, assessment, and grading. Global institutions like UNESCO have recommended the incorporation of AI and LLMs in the field of education. Ethical concerns, including student plagiarism, are acknowledged, underscoring the need for further studies to ensure ethical and effective ChatGPT use [12]. The potential benefits of AI in education include improved learning outcomes, increased efficiency and productivity, and greater access to education for marginalized or underserved populations. However, there are also potential risks and challenges, such as concerns about data privacy and security, the potential for bias or discrimination in AI algorithms, and the displacement of teachers and other education professionals. It is imperative to guarantee that the integration and deployment of AI in education is aligned with the principles of human rights and social justice. To achieve this, involving educational authorities and coordinating collective actions to promote AI use is suggested, with societal improvement being a key focus [13]. The expanding use of AI in personalized learning, analytics, administration, and research support in subsequent years is seen as beneficial. However, there is a need for a comprehensive exploration of ethical and societal implications, demanding a collaborative, interdisciplinary approach among educators, IT professionals, policymakers, and stakeholders [14].

Generative AI holds the promise of revolutionizing education by enhancing learning through personalized experiences, promoting collaboration, and improving assessment methods. While it stands to benefit both instructors and students, offering valuable capabilities like generating course materials, providing suggestions, performing linguistic translations, creating assessment tasks, and evaluating student performance, it is essential to acknowledge the potential risks. These include privacy concerns and bias, underscoring the critical importance of ethical considerations in the application of such tools [15], [16]. While LLMs show potential to improve student engagement and create interactive materials, responsible use is paramount, avoiding bias and ensuring fairness. The need for critical thinking and problem-solving skills in education is mandatory [17]. These models should integrate with education to complement and enhance the learning experience rather than replacing it [18]. ChatGPT produces precise and well-structured responses to university-level questions, raising concerns about potential academic misconduct. Moreover, it can produce challenging critical thinking questions and assess responses across various disciplines [19]. Additionally, it can serve as a virtual tutor for students, addressing doubts and facilitating collaboration, and generating dialogues to aid in language learning. However, concerns persist regarding the accuracy, reliability, and potential biases in ChatGPT's responses, as well as its ability to perpetuate inequalities. On the positive side, its performance varies across domains, showing excellent results in critical thinking, higher-order thinking, and economics in various studies conducted in the context of higher education in different countries [20]. This model could

generate basic lesson plans, offering a framework adaptable to the specific needs and context of teachers and learners. Promoting critical thinking and cultivating openness in teacher education are essential for adapting to the evolving role of technology and its influence on pedagogy [21]. At the same time, ChatGPT can promote personalized and interactive learning experiences through collaboration among policymakers, researchers, educators, and technology experts to harness generative AI tools for constructive educational purposes [22].

In addition to exploring the various applications and benefits, it is essential to examine the perspectives of users regarding these LLMs. The first point of interest is to understand the confidence level users have in these tools. Users attribute similar credibility levels to both human and AIGC, with AIGC being rated as clearer and more engaging. The importance of education and awareness about LLMs is crucial to help individuals comprehend and evaluate the risks associated with these systems. It is necessary to promote the responsible usage of AIGC by encouraging caution, critical thinking, and media competencies. Users are advised to be discerning in evaluating information sources, look for labeling on AIGC, and exercise caution even when the content origin is known [23]. The study, conducted at Trakia University in Bulgaria, emphasizes the importance of understanding professors' perspectives, a significant user group in education [24]. Professors generally express a positive attitude, citing benefits like organized information, personalized feedback, and improved critical thinking. However, ethical concerns, including plagiarism and privacy issues, are raised. Recommendations for educators include promoting ethical use, using plagiarism detection tools, and providing clear guidelines for responsible AI integration in education [25]. According to students' perceptions, the primary strengths of these tools in education include their potential to enhance learning practices, personalize educational experiences, and provide instant assistance, thereby improving their overall learning experience and engagement. They also identified potential areas for improvement in AI tools for education and critical thinking, highlighting the complex interplay of hope and fear among students regarding the use of AI tools in their educational journey [26]. While many students are familiar with this tool, some of them do not regularly use it for academic purposes. Additionally, this tool aids in writing, virtual tutoring, research assistance, and automated grading [27].

Those tools bring forth new challenges in education, emphasizing the necessity for high university students to employ critical thinking. The aim of this research is to comprehend the perceptions and utilization of LLMs among higher education students, exploring their attitudes toward these emerging technologies.

2 METHODOLOGY

In November 2023, a predominantly quantitative survey with complementary qualitative questions was conducted at University of Andorra (UdA). The primary objective of the study was to understand students' perceptions and usage of LLMs, evaluate their perceived benefits, and identify potential concerns associated with their application in the educational context. The decision to employ a quantitative approach was based on its capacity to yield measurable and conclusive results, facilitating precise comparisons and statistical analyses. This methodology also allowed for the collection of data from a sizable sample, thereby enhancing the validity and reliability of the findings. Some qualitative approach to gauge the attitudes and opinions of students towards these tools was incorporated as well. The data collection instrument used was a survey questionnaire, designed to answer how these students perceive and use LLMs. A rigorous validation process of the instrument was conducted for each survey question, assessing the degree of univocity, pertinence and importance. This validation, using the methodology detailed in [28], involved the participation of five experts from diverse fields. Additionally, some questions aim to explore their expertise with such tools. The instrument encompassed a combination of Likert scale questions, ranking questions, multiple-choice questions, and free-text questions, aiming to capture students' opinions and experiences with these tools.

The participants in this survey were students from the BSc in Computer Science and from the BSC in Education at the UdA. Out of a total of 129 individuals, 83 respondents participated, resulting in a margin of error of 6% with a confidence level of 95%. The distribution of the students surveyed is presented in Table 1.

Table 1. Distribution of the users in the dataset by academic level and field

Academic level	*Education*	*Computer Science*	*Total*
1	26	13	***39***
2	14	9	***23***
3	16	5	***21***
Total	***56***	***27***	***83***

The survey was conducted during multiple in-person sessions across all three levels within the two fields. Each participant completed the survey anonymously, ensuring honest and sincere responses to the questions. The answers were compiled into a comma-separated values (CSV) file for subsequent data analysis and interpretation. The survey questionnaire was designed with 15 questions that examine different aspects of the perception and the utility of LLMs within an educational context.
This research employs descriptive statistics as the primary data analysis method. The survey results were then analyzed using appropriate statistical tools, which provided insights into students' perceptions and usage of LLMs. This analysis helped in understanding the factors that influence these perceptions and highlighted potential areas for improvement in the application of these tools in the educational context.

3 RESULTS

The vast majority of the students surveyed know what a LLM is. Among the listed LLMs (BARD, Bing AI, ChatGPT, ChatPDF, LLaMa, and Perplexity), 98% of the students reported using ChatGPT. The second most used product is Bing AI, chosen by 48% of the respondents. Following that is BARD at 20%, and then ChatPDF and Perplexity, both at 12%. Lastly, LLaMa had the lowest usage among the surveyed students with a 4%. The frequency of students using LLMs in the past year is measured on a Likert scale, with 6% indicating "Never" and 22% reporting "Rarely". Some users who respond “Rarely” find it highly helpful and others use it for practical tasks like creating shopping lists, menus, and gym routines, despite acknowledging limitations in the updated database. Despite doubts about reliability, they recognize its usefulness for information research in academic work. An additional 22% of the surveyed students report using LLMs "Occasionally", using them for tasks like text writing and resolving programming doubts. Post-task completion, they turn to LLMs for suggestions to refine their work and gather general ideas. A larger group, 29%, responds with "Often", emphasizing the time-saving benefits in information research and using these tools for inspiration, diverse perspectives, and project support in both academic and private contexts. Particularly, they rely on LLMs for navigating complexities, correcting code errors, and conducting advanced or specialized research. Finally, 22% respond with "Very often", indicating frequent incorporation into various aspects of their work. They find LLMs instrumental in generating ideas and obtaining quick, reliable information across tasks such as research, writing, structuring, and creating multimedia content. Computer Science students used those tools more frequently in the last year compared to their counterparts in Education.
In regard to the statement “Responses provided by LLMs are reliable” the students could justify their choice. 3% of the surveyed students strongly disagree, expressing clear skepticism and none provided justifications. Additionally, 13% disagreed, with 40% of those students’ expressing concerns about trust due to the lack of transparency in the origin of responses. It is noted that the accuracy of LLMs varies based on the nature of the task, and errors may occur in providing links or performing specific functions. Other students mention that trust in the responses depends on the language used, and it is emphasized that using this tool requires knowledge of the subject being queried. The most answered option with 45% is neither agree nor disagree and 26% of those students had appropriately justified their choice. Some acknowledge that, as a trained model, a complete guarantee of reliability cannot be ensured. There are those who emphasize that, depending on the topic, some answers may not be entirely correct. The majority agree on the need to be critical of the responses provided by these tools, specify details for more accurate results, and cross-check information with other sources. There is an awareness that the exact origin of the information is uncertain. Moreover, 39% of the surveyed students agree with this question and 16% of these students offered duly justifications. While some agree that the answers are comprehensible and useful, others emphasize the importance of corroborating the information due to a small margin of error. The utility of LLMs depends on the specific application domain for some students. Finally, 1% strongly agree without offering any justification. Both fields had a similar attitude regarding

the reliability of responses generated by these tools. The the density of the provided answers on this question is shown in Fig. 1.

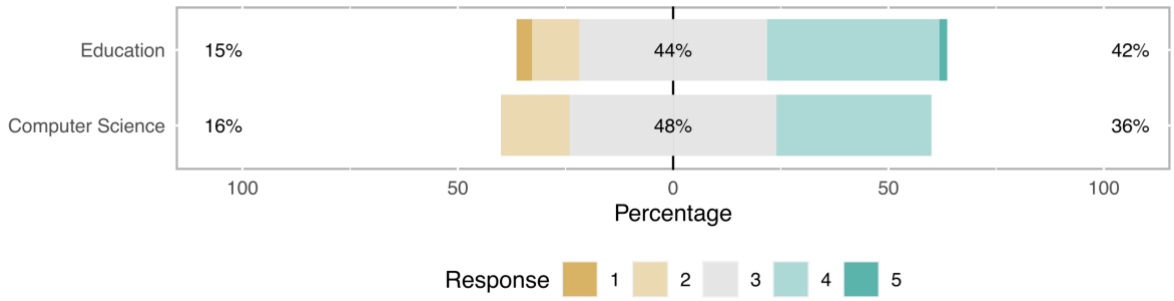

Figure 1. Reliability of LLMs responses by fields of study

On the question “How do you guarantee the reliability of the responses generated by language models when you have doubts about their content?”, individuals highlight various strategies. These strategies encompass reviewing provided links, cross-referencing with other artificial intelligences or reliable sources, conducting personal online research, and comparing results in forums or other sources. Additionally, users adopt an iterative approach, asking multiple questions using different words, and may request a bibliography from the LLM to verify sources. Seeking transparency, users inquire about the origin of the information directly from the AI. They also engage in independent Internet searches, ask for response reviews, compare results across different platforms, consult diverse sources, and cross-reference in various languages. Users filter information, search for alternative sources, and request web pages from which the information was extracted. Many emphasize the importance of verification and cross-referencing with various sources to ensure the reliability of information provided by those tools. Some individuals express limited confidence and underscore the need to be critical of the given responses.

To assess different facets of students' perceptions regarding LLMs, a Likert scale question has been used. The responses are shown in Fig. 2.

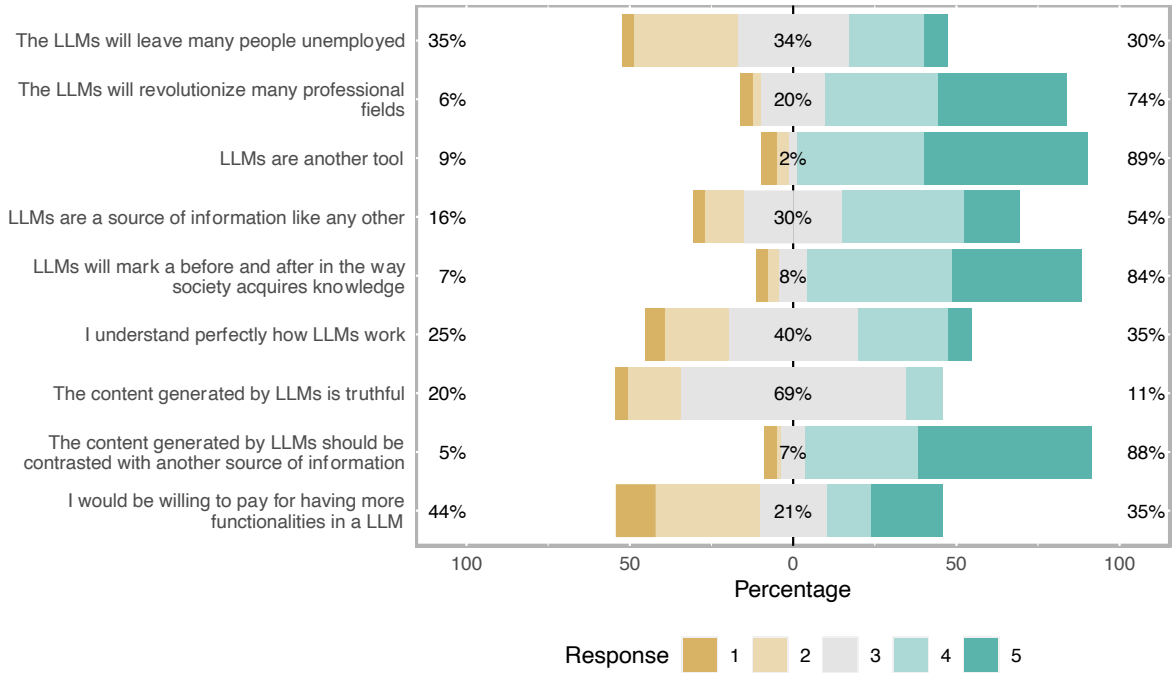

Figure 2. Students’ perceptions regarding LLMs

Students were tasked with selecting the sources of information from the provided list that they would utilize for comparing the results generated by LLMs. It is notable that 82% of the students use search engines, followed by 58% who use their own knowledge. Additionally, 53% of the surveyed students turn to scientific articles, 31% check Wikipedia and 22% refer to books and they ask to experts on the field. Lastly, 17% utilize LLMs to compare the results generated by another LLM. In terms of

understanding how to use them, 70% of the students have engaged with these tools. Among them, 42% have gained insights through online videos, 17% through reading scientific articles, 10% through attending courses, 7% through discussions with experts, 6% through watching TV programs, and none through reading specialized books. The subsequent question aims to identify students' preferred sources of information when faced with unfamiliar topics. Participants were instructed to rank five sources (in-person or virtual courses, LLMs, search engines, bibliography and scientific articles, and online encyclopedias) on a scale from 1 to 5, assigning respective weights of 5, 4, 3, 2, and 1. The results reveal that search engines are the most favored source of information among students, accumulating 295 points. Followed closely, bibliography and scientific articles are in the second position with 274 points. In-person or virtual courses claim the third spot with 251 points. LLMs rank fourth with 229 points, while online encyclopedias are rated the least preferred, with 196 points.
To evaluate the frequency of LLMs usage among surveyed students, a Likert scale ranging from 1 to 5 has been used. Respondents assigned values, where 1 corresponds to "Never", 2 to "Rarely", 3 to "Occasionally", 4 to "Often", and 5 to "Very often". The responses are depicted in Fig. 3.

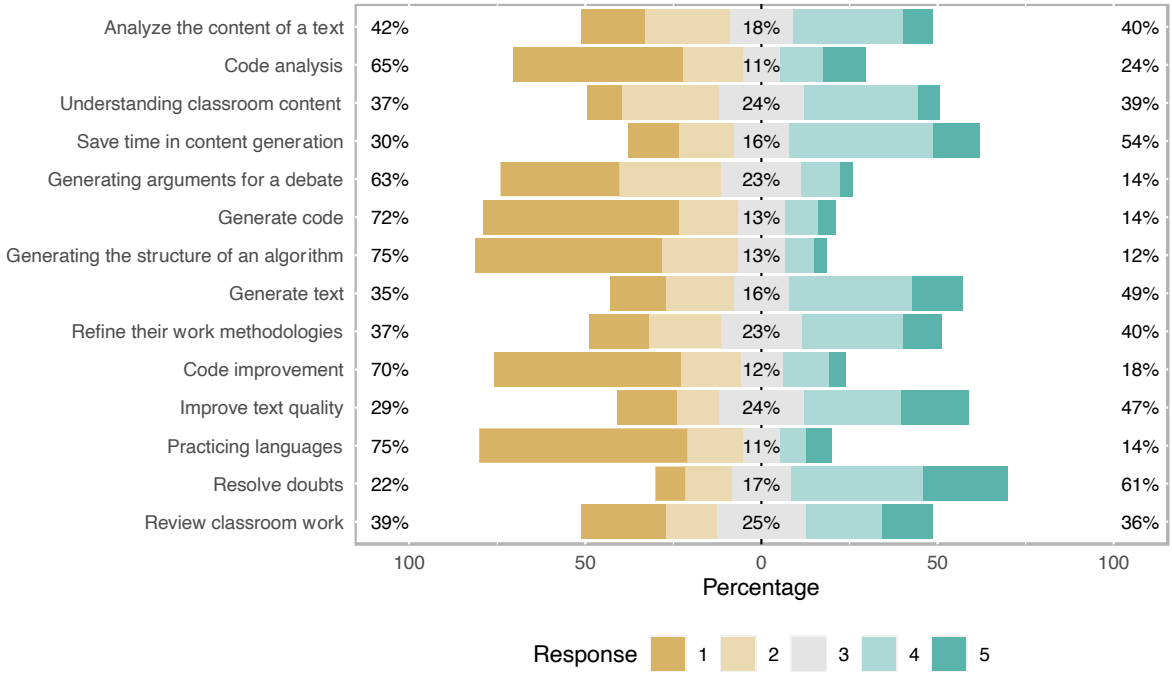

Figure 3. Students' frequency of LLMs usage

The question "Which of the aspects previously mentioned have LLMs helped you the most?" aims to identify the most impactful aspect of LLMs based on the previously evaluated factors. Among respondents, 19% find LLMs most helpful in resolving doubts, closely followed by 18% citing improvements in text quality. Additionally, 12% highlight the benefit of LLMs in saving time in content generation. 6% of the surveyed students find utility in generating text, understanding classroom content, and refining work methodologies. For 5%, the most impactful aspects include reviewing classroom work and none of them. Analyzing the content of a text and generating arguments for a debate are selected by 4% of all the students surveyed. Within the Computer Science students, 19% specifically highlight the assistance of LLMs in code analysis, with 11% emphasizing their role in code generation. Generating the structure of an algorithm is the choice for 7% of the students in this field, while just 4% indicate LLMs' support in code improvement. Notably, no one mentions using LLMs for practicing languages. Among the surveyed students, 59% expressed their intention to use LLMs applications in their professional lives to resolve doubts. Additionally, 48% intend to use LLMs to save time in content generation, 46% to improve text quality, 35% for analyze the content of a text, 31% to refine their work methodologies, and 25% to generate text. On the field of Education, 50% of the surveyed students plan to employ LLMs for generating academic content. Meanwhile, in the Computer Science field, 59% of respondents foresee using LLMs for code analysis, 52% for code improvement, 33% for generating the structure of an algorithm, and 22% to generate code. To assess three distinct aspects of LLM usage among surveyed students a Likert scale is used. Respondents assigned values on a scale from 1 to 5, where 1 corresponds to "Strongly disagree", 2 to "Disagree", 3 to "Neither agree nor disagree", 4 to "Agree", and 5 to "Strongly agree". The responses are shown in Fig. 4.

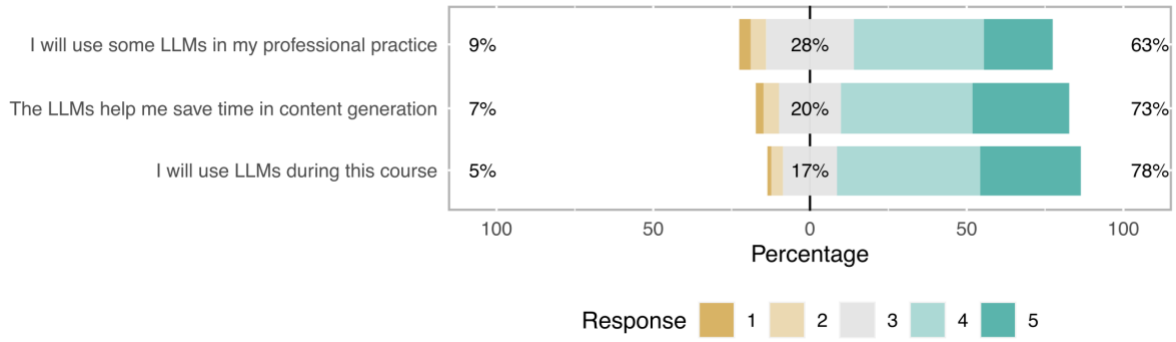

Figure 4. Students' agreement levels on LLMs usage

4 CONCLUSIONS

In this contribution, a survey involving 83 students of the UdA through a questionnaire comprising 15 distinct questions was conducted. These questions were designed to capture different aspects of students' perceptions and usage of LLMs. It has been found that most of the respondents are familiar with LLMs. Moreover, 98% of the surveyed students have used ChatGPT or a similar tool at some point, and mainly used to solve doubts.

Of these students, 40% express confidence in the reliability of responses provided by LLMs.This finding raises intriguing considerations, particularly when viewed in the context of higher education, where one might anticipate a lower percentage. The analysis reveals a pattern among respondents, as a limited portion demonstrated thorough justifications for their trust in the reliability of LLM responses. The various perspectives presented ranged from concerns about LLM sources and the need for answer validation to the acknowledgment of the crucial role played by crafting precise prompts. However, a small fraction of surveyed students displayed a clear proficiency in understanding the operational aspects of LLMs. This underscores the significance of cultivating a deeper understanding of LLM functionality to promote more informed user engagement. In this regard, an observation emerges as a significant percentage of the surveyed students failed to provide any substantial justification for their confidence in the reliability of these language models. This lack of justification points to a potential gap between perceived trust and a deeper understanding of these tools. Given that these tools prioritize constructing coherent sentences over truth, it's intriguing that both Education and Computer Science students share a similar perspective regarding the reliability of these technologies, and it leans more towards positivity than negativity. Moreover, a significant observation arises from the feedback received: while the majority of students tend to verify responses when in doubt, their trust in LLMs' answers might lead them to overlook checking information when they are not in doubt. Therefore, it is important for students to possess knowledge of how language models work, enabling them to be critical of the information they receive. The solution lies in strengthening the critical thinking skills of the students. In that way, a pertinent question appears: what strategies can be employed to encourage students in activating critical thinking skills while using LLMs?

While a significant percentage of students expresses trust in LLMs, the absence of precise justifications and the limited proficiency in understanding these tools underscore the need for further education and exploration in effectively integrating LLMs within higher education contexts. Considering that the majority of the surveyed students had used a LLM or wanted to use it this year and the concerns about the accuracy of these tools [20], it is recommended that academic institutions carefully evaluate the impact of these tools. Educational authorities are encouraged to collaboratively address the workings of LLMs and clearly outline their limitations. Helping students in achieving a deeper comprehension of the capabilities and ethical considerations tied to these tools is crucial [16]. Additionally, universities are advised to incorporate LLMs into their teaching methodologies, recognizing the significant role these technologies play in contemporary education. This approach ensures that students not only learn how to use these tools responsibly but also prepares them for a future where regular interaction with advanced LLMs is commonplace.

Although the sample size was small, we obtained sufficient data to ensure 95% confidence with a 6% margin of error. As a result, an important next step would be to expand this experiment to other courses offered at the UdA. Additionally, conducting the survey among students from the south of France and Catalonia could provide a more comprehensive comparison, allowing for the analysis of whether socio-economic or cultural contexts, for instance, play a role in the results.

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