An Outlook on Natural Language Generation

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Abstract—This article presents an outlook on the present state of Natural Language Generation, discusses its impact and research challenges in light of recent progress in the development of Large Language Models. We foresee adverse results and repercussions arising from the use of models like ChatGPT if they are applied inappropriately in the absence of adequate legal guidelines to regulate their usage. Our aim is to highlight the importance of safeguarding human rights and provide recommendations for addressing the most pressing issues to ensure the long-term viability and security of this technology. In the context of the Multi3Generation COST Action (CA18231), we suggest strategies to address intricate challenges and showcase ongoing projects in strategically important European regions: (1) the long-established Iberian Peninsula, home to two of the world's most widely spoken languages, along with several minority languages, and (2) Ukraine, which is actively pursuing its right to self-determination, autonomy, and the preservation of its cultural and linguistic identity. We aim at developing and strengthening a common strategy for newer models that can work alongside or in conjunction with existing ones. The main difference we wish to make in research is to focus on the science of language, further exploring linguistic resources and using their fine-grain quality to create new systems and enhance existing ones in a trusting atmosphere between developers and users, and a safe and innovation-friendly environment for society at large.

I. INTRODUCTION

AS WORDS have become almost meaningless in mass and social media, texts produced massively have become increasingly trivial. Parallel to this, the quality of data and the fidelity, credibility, truthfulness, and trustworthiness of the information conveyed to the masses, sometimes *ad nausea*, is incrementally questionable in terms of false assertions and veracity of information with relation to facts. This appears to be a critical time for reflection on the future of natural language generation (NLG) technology, its methods, models, and applications. Our debate comes at a time of multiple discussions around the widespread disruption brought by large language models (LLMs), particularly followed by the most recent releases of ChatGPT by OpenAI and models alike. This progress may bring the idea that recent models represent the industry's endgame, which causes fear in some, and awe in others, especially due to their enormous power to be used for good and for evil in many diverse and varied forms. Therefore, the good results of the new models should be viewed with some reservation and a critical eye over its developments. On the one hand, the exponential capabilities of LLMs and their capacity to learn from vast datasets, primarily comprised of collective human knowledge present a tremendous technological opportunity, as they are evolving into a multimodal direction, not limited to processing text alone but also incorporating elements like audio-visual data (including colors, images, videos, speech, etc.), addressing complex and high-dimensional phenomena, and seamless managing multitasking demands. On the other hand, the increasing reliance on powerful machine learning (ML) algorithms in AI has the potential to push human control to its limits, particularly in domains like education, medical science, business operations, and most critically, space and military applications.

Multi3Generation COST Action (CA18231), henceforth simply Multi3Generation[1] [**?**], is a European Excellence Network that focuses on NLG research field from a very broad perspective, ranging from machine learning methods, including LLMs to more linguistic methodologies. Through the network exchange facilitated by Multi3Generation, involving researchers from 33 countries, we seize the opportunity to propose alternative or complementary methods for progressing in the field of NLG by promoting the development of (semi- or partially-)transparent glass box systems, instead of blurry or black box systems, i.e., systems built where the human in the loop is essential in the process of language generation, and most importantly, systems that move towards language understanding because they contain knowledge embedded in them, not systems which use questionable data, from questionable sources and questionable methods of obtaining, processing and disseminating those data. Beyond these considerations, we wish to emphasize that we acknowledge the significance of advancements in models that simulate/mimic language, which are already recognized as a noteworthy achievement with substantial societal impact. However, we mostly want to reinforce the opportunity for humans to unravel and grow their consciousness of what they can do better than machines. We also highlight the need to explore innovative approaches and flexible architectures, as well as the adoption of hybrid strategies, which use parts of different approaches and methodologies to the design of 'safe' systems, especially those that make progress in the understanding of language as a science, an achievement that is far from being accomplished up to now.

[1]https://multi3generation.eu/

Thematic track: Challenges for Natural Language Processing

The remainder of the article is organized as follows. Section II presents state-of-the-art NLG, focusing on current projects being developed in the Iberian Peninsula in line with the Portuguese and Spanish strategies for AI, and also emphasize the efforts undergoing in Ukraine to combat misinformation and Russian propaganda in the media. Section III discusses some AI ethical issues that, in our view, require discussion among researchers before they get out of control in the real world. Section IV focuses on the initiatives taken within Multi3Generation to promote innovation, foster interdisciplinary understanding, and encourage the sustainable development of NLG and responsible AI. Finally, Section V presents the conclusions and future work.

II. STATE OF THE ART

Natural Language Generation (NLG) has a well-established research history with a track record of success dating back to the early days of natural language processing (NLP) systems, particularly machine translation [?], [?], [?], [?]. Some projects have been developed, drawing inspiration from the Logos Model's language generation capabilities. These projects have explored linguistics and applied them to generate paraphrases[2] [?], [?], conducting experiments in various areas, including translation [?], language varieties [?], [?], [?], stylistics [?], emotions [?], question-answering, and summarization tasks [?]. These efforts have led to the identification of a new linguistic corollary concept known as a "paraphrasary" [?], [?], result of the experiments conducted alongside the primary paraphrasing research. The research has been extensively documented and is fully traceable.

Due to a scarcity of comprehensive documentation enabling efficient traceability, the sudden rise of generative LLMs took many individuals by surprise. These models began exhibiting generative capabilities that could be both overwhelming and/or controversial for researchers, developers, and users alike. Humans have long been aware that a small gadget has the information and the ability to grow the amount of information of an encyclopedia, an entire library, an entire university, or the world of universities altogether. Now, humans are becoming aware that machines may produce texts of a better quality than them. More and more, digital devices are indispensable to help us in many tasks, and there is a strong human-machine interaction in our daily lives. The technology is here to stay and help. Many ongoing research projects are using LLMs, either exploring their potential, as well as addressing some of their limitations. Here, we focus on projects under development in the Iberian Peninsula and efforts carried out in Ukraine, which we find relevant for further development of AI with regards to NLG. In these projects, there is an implicit intention to distinguish and complement themselves from already existing surveys of Anglo-Saxon NLG solutions [?] [?], and research and commercial state-of-the-art articles [?] [?]. We believe that, if responsibly implemented, new hybrid models with a social and linguistic motivation behind them can be more

trustful, controllable, and efficient in the long run. The projects described here have in common a sense of social responsibility, inclusiveness, ethical standards and responsible care in their design, even when LLMs play a role in them. Members of the Multi3Generation network participate and/or have been partially funded by Multi3Generation.

In Portugal, INESC-ID[3] is a center of excellence for AI and is currently involved in cutting-edge research in AI bridging the gap between academia and research. The interdisciplinarity exchange among researchers working in AI for people and society, information and decision support systems, and human language technologies have been surrounding R&D fields that converge in the area of NLG. We can point out 3 ongoing NLG-related projects: (i) The Center for Responsible AI (CRAI), (ii) Accelerating digital transformation in Portugal (Accelerat.ai), and (iii) The Multimodal Approach for Identifying Conspiracy Theories in Social Media (MAICT). In the next paragraphs, we will describe in detail each one of them.

Financed by the European Union, the "Center for Responsible AI" (CRAI)[4] operates as a component of the Recovery and Resilience Plan (PRR). Headed by the Portuguese startup Unbabel, and other 9 startups (including two highly valued unicorns), in coordination with INESC-ID and 7 other research institutes, the CRAI Center stands out as one of the most extensive initiatives with a focus on ethics and responsibility in AI. The consortium includes a legal firm. Through collaborative efforts among these partners, the aim is to create 21 groundbreaking AI solutions/products that integrate responsible/ethical AI principles such as equity, explainability, and sustainability. This will not only position Portugal and Europe as global front-runners in these technologies but will also help establish guiding principles and regulations within the realm of AI. The joint collaboration in CRAI will play a pivotal role in shaping European Union legislation concerning AI and in attracting international top-tier AI talent.

INESC-ID is also a partner in Accelerat.ai[5], a new large consortium with the objective of expediting the digital evolution of both public and private sectors in Portugal. This project is also backed by the Portuguese PRR, led by the startup Defined.ai and partnered with several corporations and research institutes. Accelerat.ai's main aim is to enhance and optimize customer support services in the Portuguese and European markets, based on the development of a unique set of technological solutions that combine virtual assistants with European Portuguese contact centers, and introduce Portugal to the first fully native-language virtual assistant. INESC-ID's participation in Accelerat.ai, focuses primarily on investigating and exploring the capability of mutual conversion between speech and text, commonly referred to as Automatic Speech Recognition and Speech Synthesis, essential components of Conversational AI. INESC-ID and IST are taking charge of de-

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[2]https://www.inesc-id.pt/projects/IP02043/

[3]https://www.inesc-id.pt/

[4]https://www.inesc-id.pt/inesc-id-takes-part-in-the-worlds-largest-consortium-on-responsible-ai/

[5]https://www.inesc-id.pt/accelerate-ai-a-new-consortium-to-accelerate-digital-transformation-in-portugal/

veloping and researching modules within the speech-to-speech conversational framework. This emphasis includes areas like automatic speech recognition and text-to-speech synthesis for European languages, especially European Portuguese. The expected impact of this research lies in facilitating the fast deployment of new languages, creating more engaging and successful agents, and enhancing acceptance among specific demographic groups.

The exploratory project "Multimodal Approach for Identifying Conspiracy Theories in Social Media" (MAICT)[6], led by INESC-ID, and funded by the Portuguese government (FCT project EXPL/LLT-LIN/1104/2021) aims at developing an innovative multimodal (text-image) conspiracy grammar for Portuguese, based on a multidisciplinary approach. The project contributes to advancing the state-of-the-art in multimodal misinformation studies and addresses the following research questions: 1) Which are the most predominant morphosyntactic, lexico-syntactic, semantic, and discursive features in conspiracy theory narratives that abound in social media, and how do they relate to each other? (2) Which meanings can be inferred from images that include conspiracy narratives, from a social semiotics point of view? 3) How do text and image articulate in multimodal conspiracy narratives to create either a unified or a dissociated meaning? 4) Which are the most suitable approaches to describe and formalize the multimodal properties from text and image, and respective interaction, in view of their automatic processing? 5) How can Portuguese conspiracy sociolects be characterized from a multimodal point of view? Some of the outcomes of this project can certainly enrich emerging transparent models envisaged in Multi3Generation.

The Spanish government is committed to supporting strategic projects for responsible AI, focusing on thematic areas such as employment of commonsense reasoning, inclusion via the use of accessible and intelligible content, improvement of fake news detection, and empowerment of languages with scarce resources. We mention here 4 projects in which the University of Alicante is enrolled: (i) the NLG-related project CORTEX that aims to enhance the commonsense reasoning competence of NLG systems; (ii) the inclusive CLEAR.TEXT project that explores resilient technologies to assist in creating accessible content, (iii) the NL4DISMIS project that aims to identify false and incorrect information in texts and use NLG and/or automated methods to either counteract or supplement the misleading information; and (iv) the NEL-VIVES collaborative project among various Spanish institutions hailing from distinct regions focusing particularly on analyzing and advancing LLMs for Spanish official languages with limited resources. Next, we will describe in further detail each one of these projects.

The "Conscious Text Generation" (CORTEX)[7] is an R&D project funded by the Spanish government, and by "ERDF A way of making Europe", that deals with the integration of world and external knowledge in NLG architectures in order to improve the commonsense reasoning capabilities of NLG systems. The project considers that enhancing the commonsense reasoning capabilities of NLG systems is needed to automatically produce accurate, correct, and reliable texts that will be in line with real facts. The main research questions proposed in this project are: 1) How to address/mitigate the problem of hallucination? 2) How to ensure the provided information is reliable?

The project "Enhancing the modernization public sector organizations by deploying NLP to make their digital content CLEARER to those with cognitive disabilities" (CLEAR.TEXT)[8] is funded by the Spanish government and the European Union and its objective is to research, implement, deploy, evaluate, and ultimately provide robust technologies for NLP to support the authoring of accessible Spanish content for public sector organizations (at the local, regional and national level) that is intelligible to people with a cognitive disability, thereby widening their inclusion and empowerment in Europe. The research question that is being investigated is: 1) How to make the information clearer depending on the user's needs? For this, the project analyses the capabilities of LLMs, and derived tools, such as ChatGPT to generate automatic simplified summaries.

The project "Natural Language Technologies for dealing with dis- and misinformation" (NL4DISMIS)[9] is funded by the Generalitat Valenciana. The main hypothesis of this project is based on the existence of a direct relation between the use of human language (i.e., language models) and the user's behavior in digital media. Therefore, by modeling the language used within a contextualization at different linguistic levels, we can establish the relation between different entities, as well as the evolution of these entities and their relations over time. Simultaneously, it may be possible to infer new relations and predict future states or behaviors. The evolution of entities over time requires research on entity language models as well as knowledge representation based on digital entities. The main objective of the project is to detect dis- and misinformation in texts and automatically debunk misleading information through NLG and/or complement the information automatically. The research question to address is: 1) How to ensure the provided information is reliable?

The project "Language Technologies Plan for Valencian language" (NEL-VIVES)[10] is funded by PERTE Nueva Economía de la Lengua from the Spanish Government. This is a coordinated project between several Spanish intuitions from different regions (Catalonia, Basque Country, Galicia, and Valencian Region) with emphasis on the analysis and development of LLMs for low-resource Spanish official languages. The research question under this project is: 1) How can we preserve and promote languages in danger of digital extinction? In

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this sense, the subproject NEL-VIVES focuses on the Valencian language, in particular, the goal is to create corpora (text+voice) and develop language models for the different varieties of Valencian language.

In Ukraine, the coordination of AI development is entrusted to the Ministry of Digital Transformation. An advisory body, the AI Committee, has been established, bringing together researchers, businessmen, and policy makers. Ukrainian universities such as Kharkiv National University of Radio Electronics (NURE) and Ukrainian Catholic University (UCU) are independently advancing NLP technologies. To support startups, the Ukrainian Startup Fund[11], a state-funded initiative, has been established in 2020. Within the WG1 of Multi3Generation, a multimodal dataset, Multi30K-UK[12], has been created, containing images with descriptions in Ukrainian. In the conditions of Russia's military aggression against Ukraine, startups focused on detecting misinformation are emerging. For example, the AI startup Osavul has developed technology to combat propaganda and Russian disinformation, assisting the National Security and Defense Council (RNBO) and the Ministry of Defense in detecting information warfare activities on platforms like Telegram and Facebook.[13]

A common aspect of all the projects outlined here (the list of ongoing R&D projects in the Iberian Peninsula and those under development in Ukraine) is that they have the common ground of being inclusive, and interdisciplinary, crossing knowledge and methods from AI such as human-centered AI, computational models of narrative and discourse, neurosymbolism, cognitive vision, space, speech and language technologies and NLP areas such as cognitive linguistics, corpus linguistics, forensic linguistics, social semiotics, among others. But, mostly, they have the main interest in creating or generating responsible/ethical LLMs or other language models. In Section III, we lay out some particular concerns related to LLMs, namely ChatGPT.

III. ETHICS IN NATURAL LANGUAGE GENERATION

GPT stands for "Generative Pre-trained Transformer", and it follows older models that learn statistical regularities in language to a greater or lesser extent.[14] They synthesize existing content to make it appear to be new content by the power that the system has of recognizing and learning statistical regularities in language, inducting from information already stored in the system or information provided by new interactions with the user who provides the system with that information, and lately, predicting language patterns and escalating the use of its language resources in order to improve its performance. In this sense, the so-called generative language does not involve creativity, but rather different degrees

[11]https://usf.com.ua/

[12]https://aclanthology.org/2023.unlp-1.7

[13]www.osavul.cloud/ai-against-russian-ipso-ukrainian-startup-osavul-taught-neural-networks-to-fight-propaganda-how-to-sell-such-technology

[14]They also use neural networks on data, but it is not relevant for this point of discussion.

of 'concealed regurgitation' facilitated by smart algorithms that allow the recognition of patterns but are incapable of understanding natural human language in the way humans do. In addition, LLMs are trained with zillions and zillions of data that are only accessible to very few who can afford to use the data created by everyone. As far as the use of AI for creative purposes, initiatives such as "AI, Generation and Creativity" (AIGC) give rise to the AIGC models used and trained by informed users to create their own unique content generation models [?]. The technology creates content based on algorithms, models, and rules, but does not dispense the user as the provider of data, as its content is generated based on user-inputted keywords or requirements via crowdsourcing techniques or others. User-generated content is increasingly influencing editorial choices of content. AI tools can be a supplement rather than a replacement for human creativity and it is up to humans to find the balance between efficiency and creativity.

We wish to emphasize that we are not against LLMs and acknowledge their potential and usefulness to the human being. However, we ought to stress that this needs to be done responsibly and respect the Code of Ethical Conduct. No nation or corporation should have the power and control over the most fundamental inalienable rights of individuals, especially when it concerns their unique linguistic, and cultural identity, as well as the core values. Language is an integral part of our human identity and the most direct expression of our culture, which are sovereign assets of their native speakers. We believe that it is essential to debate on international laws to protect the collective identity of citizens. By our promotion of a deep study of languages, we imply that linguistic values should be safeguarded. Furthermore, we hold the belief that while Large Language Models (LLMs) can be beneficial, they may not necessarily represent the ideal solution for numerous tasks or objectives.

There are reasonable concerns over misuse, leaks in data protection, missing regulations related to confidentiality, and lack of anonymization of individual records, among others, as admitted by the men at the cutting edge of the technology. Faced with the dangers brought by the power of the technology that can be used in the wrong direction, it urges the adoption of legislation foreseeing authenticity, security, reliability, and integrity of (proprietary) information. To put it bluntly, without creating the mechanisms necessary to minimize dangerous risks and their societal impact, a 'blind' adoption of LLMs in NLP tasks including fully automatic high-quality machine translation (FAHQMT), summarisation, and text simplification should be still considered an illusion comparable to the hallucinations that appear here and there in the outputs of LLM-based systems. As a matter of fact, society needs to know if/when it can rely or not rely on the current technology, and be aware of the implications in case of misuse or overlooking of the technology's flaws. Even if the outputs of the new models appear often better than those produced by humans, no one should be 'fooled' by a machine that does not have a conscience of what is generated when the content

produced is not totally reliable. In our view, effective linguistic quality control and fact-checking (among others) should be collectively addressed by professional experts. Currently, with a few exceptions [**?**], there is a lack of scientific evaluation for the new NLG technologies.

Section IV presents a series of initiatives within Multi3Generation that aim to establish a network of researchers who could have an interest in participating in the development and evaluation of resources of the type just illustrated or in combining these resources in hybrid systems or developing improved and controlled NLG models.

IV. MULTI3GENERATION INITIATIVES

Multi3Generation gathers a network of researchers who work on the progress of multilingual, multimodal, and multi-task NLG. Within the scope of the Action, several initiatives can be emphasized: Short Term Scientific Missions (STSMs), Training Schools (TS); and specific workshops. In IV-A, IV-B, and IV-C, we present the outcomes of the activities accomplished up to now.

A. Short Term Scientific Missions

Short Term Scientific Missions allow researchers to visit groups and institutions located in countries participating in Multi3Generation to create synergies as well as to improve their research abilities. It is an efficient mechanism to promote joint collaborations as well as to disseminate research in NLG among different countries. From the beginning of the Action up to now, 20 STSMs have been completed[15], all of them focusing on the NLG topics. It is worth mentioning them here because they focused on exploring NLG and its applications to sectors, such as education as well as those addressing the improvement of NLG by integrating knowledge, multimodal information, or analyzing more efficient methods. The topics were: (1) multi-task sequence learning for syntax; (2) analysis and introspection of multilingual representations; (3) image captioning using relational context from generated scene graphs; (4) fusion mechanisms in claim verification models; (5) natural language grounding; (6) generating fact-checking explanations in low-resource settings; (7) morphological typology awareness in multilingual NLP evaluation; (8) enhancing NLG with knowledge acquisition/integration; (9) exploring the interplay between grammatical and cultural gender for debiased NLG; (10) text summarization as a digital tool to be applied in writing for academic purposes; (11) investigating the discrepancy in probing techniques for verb understanding in image-language transformers; (12) challenges and obstacles zero-shot multimodal reasoning with language; (13) Graph2Seq models for NLG tasks; (14) NLG and text summarization: exploring use cases in education; (15) using knowledge graphs to improve NLG tasks; (16) multimodal interactions in the collaborative industrial environment – empirical and analytical methods; (17) generating code from multilingual prompts; (18) fusion of multimedia information

in deep learning models; (19) digitalization of humanities; (20) counting repetitive actions using pretrained video-and-language models. Some of these STSMs can result into research articles or transnational collaborative projects.

B. Training Schools

Multi3Generation organized two training schools and is preparing a third one. These training schools were designed to attract young, early career academics in specific topics of the COST Action. The training schools address NLG challenges in the digital realm, specifically in human-machine interaction in selected application areas of emerging societal significance, such as language technologies, which affect EU citizens in an accessible, multilingual Europe. They also target professional and recreational needs that will have strong economic and societal impacts.

1) Creative Natural Language Generation: The training school on Creative Natural Language Generation[16] brought together experts on computationally-oriented methodologies with experts on theories and insights from the humanities (computational linguistics, psychology, media studies, philological and literary studies, etc.). From this interdisciplinarity and clash of ideas, students could (i) learn different theories to construct metaphorical expressions using affection, persuasive and even humorous language, visualize some pilot computational experiments on typical creative genres, and judge the level/type of creativity of an AI metaphor generator; (ii) learn what rule-based automatic text generation (ATG) task is, and explore how to generate text capturing the expressivity of natural languages in machine-representation systems, such as knowledge bases, taxonomies, and ontologies, namely grasp the difficult task of writing automatically the basic plot of a novel; (iii) learn to develop linguistic resources for NLG using NooJ; (iv) get acquainted with techniques to annotate sentiment and emotions in literary texts, and learn how to create and use domain-specific languages (DSLs) to annotate literary texts, with benefits such as compactness, familiarity, and completeness, among others. Students also were offered a step-by-step tutorial on context-free grammar and annotated empathic expressions through a domain-specific language called EmpathyDSL, created for the specific task; (v) have an overview of multilingual language resources and NLP tools and services available in CLARIN, discover new resources, deposit and preserve newly created ones, find tools that can process and annotate them, and test important CLARIN services, such as the Virtual Language Observatory and Switchboard; (vi) reflect on the many facets of affective expressions in multilingual text; (vii) generate comics with meaning, intent, and humor, which integrate words and images to support more possibilities than either a text or an image alone can offer and imbue events with strong emotions. This rich combination of research topics will certainly turn into interesting, avant-garde projects.

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[15]https://multi3generation.eu/funding-opportunities/
short-term-scientific-missions/

[16]https://multi3generation.eu/2022/06/24/m3g-cost-action-training-school-on-creative-natural-language-generation/

2) Representation Mediated Multimodality: Undoubtedly, multimodality is a key issue within NLG, as more and more inputs go beyond texts, also including video, images, audio, etc. The training school on Representation Mediated Multimodality[17] aimed to provide a joint perspective on the theoretical, methodological and applied understanding of representation-mediated multimodal sense-making at the interface of language, knowledge representation and reasoning, and visuo-auditory computing. A primary topic developed in this TS was grounded meaning-making. Grounding is a challenge for NLG since it has to do with the semiotic construction of language. Linguistic expressions and/or relational categorizations are called grounded when they are linked to non-linguistic, especially quantitative perceptual data, such as information coming from modalities such as vision and audition in space-time. Such perceptual data could pertain to, for instance, dynamic spatio-temporal phenomena both in an embodied as well as disembodied interaction context. Grounding is, in essence, a key aspect of semiotic construction, e.g., enabling high-level meaning acquisition, and analogy, and has been a long-standing challenge in AI and related disciplines. Within the central topic of grounding, other topics covered in this TS were: explainable multimodal commonsense understanding, multimodal generation/synthesis for communication, multimodal summarization, multimodal interpretation-guided decision-support, adaptation & autonomy, and analytical visualization. The topics covered benefited not only researchers and experts in the NLG field but anyone interested in human-machine interaction and NLP, as the contents of the TS have a direct application in both public and private human-centered technological services.

C. Workshops and other events

Multi3Generation was represented in workshops or conferences (invited participant and/or organizer) listed here: (1) the 6th conference of the European Language Resource Coordination.[18] The talk focused on "Multi3Generation – Multimodal Data for Natural Language Generation: Current Contributions and Future Perspectives" of Multi3Generation in the topic Think BIG. For Europe's Multilingual FUTURE; (2) the 13th International Conference on Natural Language Generation, Dublin, Ireland[19]; (3) the round table "The European panorama of linguistic technologies"[20] of the summer course at the Escola Técnica Superior de Enxeñaría @ Campus Vida of the University of Santiago de Compostela; (4) the Spanish online round table "NLP in International Projects" for the DiverTLes community, Meeting of Natural Language Processing Companies, a forum organized by PERTE Nueva economía de la lengua[21]; (5) the online colloquium "In Translation"[22]

organized by the Institute of Humanities, Faculty of Human and Social Studies, Mykolas Romeris University, Vilnius, Lithuania. The talk's topic was "Linguistic resources for the translation of creative language"; (6) the 23rd Annual Conference of the European Association for Machine Translation with a meta-paper on the COST Action; (7) the organization of the workshop: COST Action Multilingual, Multimodal and Multitask Language Generation, co-located with the 24th Annual Conference of The European Association for Machine Translation, which took place in Tampere, Finland.[23] Some of the participation in these events resulted in publications.[24]

Multi3Generation continues to provide the opportunity for professional training of young people through the reinforcement of digital skills at all levels of qualification and teaching and training modalities. In addition, Multi3Generation promotes the improvement of NLG systems using knowledge-enhanced approaches. It notes that LLMs based on Transformers can be adjusted and fine-tuned to enhance accuracy and control in text generation. These adjustments would result in more natural, varied text, while also addressing issues like biases and misleading content. This level of control is essential for effectively applying NLG systems in real-world contexts within industry and society.

V. CONCLUSIONS AND FUTURE WORK

This paper presented an outlook on current NLG, highlighted some concerns with regard to the use of LLMs and outlined the need to complementary approaches. After the announcement of the great leap forward of AI, it is time for a deep thorough reflection of the implications of AI in the life of humans in general. In the context of Multi3Generation, we put forth a range of initiatives aimed at addressing intricate challenges in the NLG field. Additionally, we present ongoing projects located in two distinct European regions: the western corner, represented by the Iberian Peninsula (Portugal and Sapin), and the Eastern European region of Ukraine. The primary objective is to develop and improve a collaborative strategy for emerging models. Many projects will result from the release of OpenAI in multidisciplinary areas and topics. Our main concern is: will and should AI be possible without including the science of language in all its sub-fields (psycholinguistics, social linguistics, among others)? The main reason for this question is related to the fact that linguistic-based methods have been left behind in the field/history and discussions of AI as if the processing of language is a task that can be done without linguists. It appears to us that, as a science, linguistics has been 'cantoned' from language models for decades. It has not been given the importance that it has or the role it must play. There is also a great discrepancy with regard to the attention that some languages have been given in comparison to others. While English is the most processed language of all for the reason that it works as "*lingua franca*", some languages still lack the amount and quality of

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resources that they also deserve (low-resource languages). We understand that these shortcomings of AI and NLP in terms of interdisciplinarity and languages coverage led to trends and applications that present researchers and developers with the feeling of uncertainty of where and how to move next, especially with regard to human control of AI and generation of language without any form of discrimination. In the spirit of the interdisciplinarity of the COST Action Multi3Generation, we believe that more research is needed in order to create new and/or better resources and tools that capture human/expert knowledge required to build knowledge-based technologies (systems and products) and make sure that these systems are ethically developed, not developed with data that belongs to everyone being exploited by just a few. We envision the future of AI with knowledge-based linguistic methodologies being used and an increment in human resources from the human sciences, allowing linguists to share the drive in a process that has language as the object of these resources and tools. These human experts will capture human/expert knowledge required to build knowledge-based technologies (systems and products) and decide on the linguistic integrity of a language system, independently of the model that is under development. Our main concern is whether AI can/should be achievable without incorporating the science of language in all its branches, including psycholinguistics, social linguistics, among others.

AUTHOR CONTRIBUTIONS

Anabela Barreiro, Multi3Generation's chair, coordinated the article, organized the structure of the manuscript, wrote the Abstract and all Sections of the article, except the totality of Section II, and revised the article as a whole.

Elena Lloret, Multi3Generation's vice-chair, wrote part of Section II, commented on some sections of the article and revised the article as a whole.

Oleksii Turuta, Multi3Generation's working group 3 leader, wrote part of Section II, commented on some sections of the article and revised the article as a whole.

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