Fostering Multilingual Deliberation through Generative Artificial Intelligence*

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Abstract

Democracies worldwide face a plethora of challenges, ranging from electoral interference and disinformation to the rising of populism and authoritarianism. It is, hence, imperative to increase participation and broaden access to deliberative processes in order to strengthen democratic institutions and meet public expectations. However, despite the acknowledged importance of language in political deliberation, collaboration, and negotiation, little is known about how multilingualism affects politics and governance. In this context, this study proposes a comprehensive framework that enables multilingual deliberations based on state-of-the-art generative AI technologies. The framework identifies five key offerings namely, "Multilingual and Multicultural Deliberation Design", "Machine Translation and Interpretation for Citizen Deliberation", "Multilingual Deliberation Comprehension", "Online and Face-to-Face Multilingual Deliberation Support", and "Transparency, Trustworthiness, and Explainability in Citizen Deliberation". By utilizing Generative AI, the framework intends to address challenges related to cultural diversity and multilingualism that impede successful deliberative democracy. Lastly, a case study is presented that operationalises the framework into a technical solution.

Keywords

Generative AI, Large Language Models, Multilingual Deliberations, Deliberative Democracy

1. Introduction

Democracies around the globe face internal and external threats such as electoral interference, disinformation, as well as rising populism and authoritarianism. One answer to the quest for a more democratically legitimate Union and fulfilling citizens' expectations towards political institutions is the increase of participation and the broad access to the deliberative processes. Towards this end, the stringent necessity of creating a European Public Sphere before, and over,

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an economic union has been widely recognized [1].

However, in many cases deliberative democracy is hindered by barriers that are related to multilingualism as well as to cultural and social diversity. Political scientists know surprisingly little about how multilingualism affects politics and policy-making, even though language provides the basis for all interaction, collaboration, condensation, deliberation, and negotiation between political actors [2]. The challenges associated with comprehending public discourse underscore the complexity of adjusting to diverse linguistic and cultural environments within democratic procedures. These challenges frequently make it more difficult to collaborate, communicate, and reach consensus, which undermines the core ideas of deliberative democracy. In order to address these challenges and promote more inclusive and efficient democratic practices, a deeper comprehension of the interactions between language, culture, and politics is necessary.

In this context, this work proposes a framework for enabling multilingual deliberation. The framework utilises state-of-the-art generative AI technologies to address challenges related to cultural diversity and multilingualism that impede deliberative democracy. A case study is also presented that operationalises the framework into a technical solution.

The rest of this paper is structured as follows. Section 2 presents the background and Section 3 the research approach followed in this work. Section 4 analyses the challenges related to multilingual deliberation. The framework for enabling multilingual deliberation based on generative AI is then presented in Section 5 and its proposed technical solution in Section 6. Finally, Section 7 concludes this work.

2. Background

2.1. Linguistic Justice and Multilingual Deliberations

Today's globalized landscape increases the complexity of the traditional notion of national public sphere [3, 4]. Although a shared public sphere is essential to citizens deliberations and the upholding of justice in democratic contexts, it is difficult to achieve because of the heterogeneous linguistic settings of the participants. To address this problem, literature has focused on establishing linguistic regimes in compound multilingual states through territorial division. However, linguistic diversity remains a problem of politically connected communities. Towards addressing this problem, linguistic justice that fosters conditions favorable to sharing the public sphere revolves around the equal recognition of all host language groups and the avoidance of language-based segregation. The "Multilingual Convergence" framework for achieving linguistic justice [5] has been proposed to address potential challenges in reconciling these principles.

Intersectionality is an important factor that enables addressing systemic exclusions. Although recent innovation practices that realize the importance of intersectionality are founded on inclusive principles, they tend to exclude specific groups they need to address the most, while their tools are not responsive enough to intersectionality claims [6]. These linguistic disparities can create significant barriers to democracy and, specifically, to politicians that try to effectively communicate and deliberate within citizens from diverse communities and vice versa [7]. A

thorough investigation of the connection between multilingualism and social exclusion has been already conducted [8].

Translation is often utilised as a common practice to political discussions in the European Union's multilingual public sphere. Translation has the potential to incorporate marginalised groups, challenging institutionalised norms of deliberation, and could serve as a means to view linguistic diversity as a democratic resource in heterogeneous societies and public spaces, without the need for a shared language or national identity [7, 9].

Various approaches have proposed in the literature for the reconciliation of multilingualism and deliberative democracy. These include, for example, multilingual (face-to-face) translation, linguistic federalism [10], and lingua franca [11].

2.2. Interpretation in Deliberation

Interpreters play a pivotal role in deliberations, by facilitating effective oral communication and collaboration among participants who speak different or the same language. Their role encompasses cultural nuances and context comprehension to ensure an accurate representation of participants' perspectives [12]. The enabler all of the above is the effective extraction of important information from the source and its rephrasing as to forward only the necessary parts in an understandable manner. In other words, the interpreter has, to some extent, read the minds of the participants, and produce interpretations according to his own judgment [13]. However, the engagement of interpreters in deliberation processes introduces notable challenges that impede the fluidity and liveliness of conversations.

The inherent nature of interpretation, with the need for real-time translation, often results in increased latency as interpreters meticulously convey speakers' messages accurately [14]. This delay can disrupt the natural flow of dialogue, potentially hindering the dynamic exchange of ideas. Moreover, interpretation may lead to a loss of spontaneity in participants' interactions, dampening the vibrancy that characterises deliberations. On the other hand, interpreters tend to simplify, standardise, and neutralise language and, thus, reduce the potential for conflict [12]. Finally, it is suggested that interpreters are not neutral [15].

2.3. Machine and Speech Translation

Since the inception of the transformer architecture, sequence-to-sequence tasks including machine translation (MT) have been effectively resolved through its implementation when sufficient in-domain training data are available [16]. MT has attained unprecedented performance levels, and by overcoming the complexity of language patterns, has enabled the transfer of natural language meaning in a seamless way. In sufficiently high-resource settings, MT reached translation quality levels comparable to humans [17]. For speech translation from high-quality input speech, comparability to human interpretation is becoming possible [18], although the systems only "translate all words uttered".

Current neural machine translation systems have demonstrated amazing performance with regards to quality evaluation metrics in isolated settings. However several details need to be addressed concerning effective MT. An important setback regarding generative LLMs in the field of MT, is the lack of alignment between the source and target languages. Moreover, the

cultural aspect of MT that has been noted in the past [19], still persists. This aspect is of critical importance in transferring the meaning of text, in cases where cultural elements are deeply intertwined within it. A similar limitation faced by neural machine translation systems and models concerns minority languages or dialects where terminology and language usage may differ, but at the same time textual re-sources for machine learning tasks are limited, resulting in poorer quality models [20], something that hinders equal representation of all languages. Lastly, neural models and systems remain opaque, needing advanced explainability methods for their operation to be thoroughly understood and output quality to be estimated without reference translations.

2.4. Deliberation Comprehension

Natural language understanding models can be utilised effectively for deliberation comprehension. More specifically, by employing such models, it is expected that dialogue can be effectively, consistently and coherently deconstructed into arguments, summarised, and stored in a persistent, information rich representation format that allows conclusions to be drawn from [21].

Even though neural-based natural language comprehension systems are widely considered as state-of-the-art, they lack consistent knowledge that would allow for robust encoding of meaning into numeric representations. This knowledge is essential for argumentation and deliberation since the cultural aspect naturally present in such texts is of vital importance regarding effective comprehension. Furthermore, argument extraction requires high quality models in order to effectively retrieve and perform the necessary transformations upon the original argumentation; something that requires extensive amounts of specialised data that are not always guaranteed to exist. The neural natural language models also remain opaque - a considerable disadvantage in deliberation comprehension.

3. Research Approach

This work combines two methods for the development of the multilingual deliberation framework; the design science [22], and the action research [23]. Both of them paradigms seek to directly intervene in real-world domains and bring about changes in them, which makes them extremely similar and complementary [24].

The design research methodology is applicable to the domain of information systems and includes; problem identification and conceptualisation; definition of the solution's objectives; design and development of the solution; demonstration; evaluation; communication. For the problem identification and conceptualisation phase, a thorough understanding of the problem domain was achieved by searching and studying relevant literature and identifying research gaps and areas that require further intervention. Specific focus was given to literature review of LLMs and their applications in various aspects of multilingual deliberations. This task uses design science principles to conceptualize the framework that addresses the challenges and requirements specific to multilingual deliberations and, consequently, define the solution's objectives. During the phase for the design and development of the solution, an first prototype of the framework was created based on the conceptual design, which was iteratively refined

with regards to its usability, functionality, and scalability resulting in the final version of the framework. Finally, the demonstration and evaluation of the framework was made using a case study that operationalises the framework into a technical solution mainly based on generative AI technologies and LLMs. Action research was also leveraged in most of the design research phases, which emphasizes collaboration and ethical considerations in addressing real-world problems.

4. Multilingual Deliberation Challenges

Deliberative democracy in many cases is hindered by barriers that are related to multilingualism as well as to cultural and social diversity. For example, since "Tomorrow's Europe", Europe's first transnational deliberative experiment, several pan-European initiatives have been organised to enable people from across Europe to share their ideas and help shape the EU's common future, including the European Citizens Initiative (ECI) and the Conference on the Future of Europe (CoFoE). The outcomes of these cross-border deliberative experiments have revealed various challenges that are related to deliberative democracy's scientific theories, deliberative methods and practices, as well as technological solutions employed.

The design of deliberative democracy includes aspects such as selection methods, timing, facilitation, format and structure, etc. which, when not considered, can result in unintended consequences. For example, the selection process may lead to not equal representation of different socio-cultural groups and countries, the timing may not allow diverse groups of participants to achieve common understanding, the facilitators may not be able to appreciate and interact with people who identify with cultures different from their own, etc. As a result, various deliberation designs for reconciling deliberative democracy and multilingualism should be rigorously explored and evaluated.

Moreover, online deliberations, versus face-to-face sessions, tend to disproportionately represent specific groups of people (e.g., young, male, and white users), attracting more ideologically moderate individuals, generating more negative emotions, and exhibiting a lower chance of reaching a consensus [25]. To ensure successful deliberations and fair representation of different views, effective methods and tools for integrating face-to-face with online deliberations as well as multimodal means of communication (text, audio, and video) should be considered and evaluated. These tools should be able to effectively analyse large volumes of online contributions and con-dense them in a comprehensive manner.

In multilingual deliberations, participants have the opportunity to express their arguments in their mother tongue and interpreters or translation tools are involved to facilitate the process. However, it is possible that interpreters slow down the discussion and disrupt the natural flow of dialogue, potentially hindering the dynamic ex-change of ideas [10]. On the other hand, interpreters tend to simplify, standardise, and neutralise language and thus it is believed that they can reduce the potential for conflict [2]. Moreover, many theories on deliberative democracy suggest that instead of focusing on the common language, we should move the attention towards the notion of a shared understanding [26]. As a result, existing machine and speech translation tools should be enhanced enabling interpret-like condensation that can be dynamically adapted based on the context of the deliberation (e.g., energy in the room,

polarisation, fluidity and liveliness of conversations etc.) as well as to capture different cultural nuances and social codes and perceptions in language.

Finally, political scientists know surprisingly little about how multilingualism affects politics and policymaking. For example, although language barriers may lead to misunderstandings, confusion, and tension between political actors, recent studies suggest that multilingualism entails that the language(s) of EU politics tend to be utilitarian, simple, standardised, neutral, decultured, and de-ideologised. As a result, a multi-dimensional evaluation of multiple deliberative methods and design methods combined with advanced tools should be performed in order to enable understanding the impact of multilingualism in the democratic process.

5. A Framework for Enabling Multilingual Deliberation based on Generative Artificial Intelligence

Efforts for enabling multilingual deliberation capitalise on two main pillars: (a) contemporary research on democratic quality, participation, misinformation mitigation, and deliberative democracy in relations to multilingualism as well as to socio-political aspects of diverse European landscape examining mechanisms, methods, and design settings (e.g., selection methods, timing, facilitation, format and structure, scoping, and settings of deliberations) to enhance multilingual and multicultural participation, to improve perceived trust and responsiveness, and to augment the quality of consensus proposals, legislative and policy recommendations and (b) state-of-the-art technological advancements related to computational linguistics, language technologies, including Large Language Models, Explainable Artificial Intelligence, Knowledge Graphs and neuro-symbolic AI architectures to develop innovative software components related to machine and speech translation as well as to multilingual argument mining and deliberation management.

Capitalizing on these pillars, five key offerings are proposed that enable the creation of multilingual deliberation spaces in Europe: (i) *Multilingual and Multicultural Deliberation Design*, (ii) *Machine Translation and Interpretation for Citizen Deliberation*, (iii) *Multilingual Deliberation Comprehension*, (iv) *Online and Face-to-Face Multilingual Deliberation Support*, and (v) *Transparency, Trustworthiness, and Explainability in Citizen Deliberation.*

Multilingual and Multicultural Deliberation Design. Based on the framework, the design of multilingual deliberations should be enabled in a robust and scientifically sound manner, including aspects such as participant selection methods, timing, facilitation, format and structure, translation, scoping, processes, methods, settings, experts' involvement, etc. as well as communication channels (i.e., online, and face-to-face) and effective connection points of these channels in the case of hybrid approaches.

Machine Translation and Interpretation for Citizen Deliberation. The framework enhances existing machine and speech translation technologies so as to address the specific needs of citizen deliberations by bridging linguistic, social, and cultural divides, and handling multiple deliberation modalities including text, speech, and video in both face-to-face and online deliberation channels. To this end, this offering capitalizes on, and fine-tunes open European LLMs to enable interpreter-like machine translation that can be dynamically adapted according to the existing deliberation conditions. It enables interpret-like condensation that

can be dynamically adapted based on the context of the deliberation (e.g., energy in the room, polarisation, etc.) and capture different cultural nuances and social codes and perceptions in language. In addition, real-time speech translation in face-to-face deliberations, video subtitling, and online text contribution translation are enhanced. End-to-end neural systems need to be employed to handle issues including synchronisation and low latency of data streams.

Multilingual Deliberation Comprehension. The interpretation, structuring, and presentation of multilingual deliberative content should be performed in a coherent and culturally aware manner. Towards this direction, LLMs and neuro-symbolic architectures can be employed to analyse deliberation content, and consequently identify and extract key components from online and face-to-face deliberations (e.g., topics, ideas, arguments), ensuring that the essence of discussions is captured irrespective of the language used. MT enhances the accuracy of argument extraction and presentation in multilingual contexts, ensuring that every voice is heard. Through culturally aware MT, deliberative comprehension, and knowledge structuring, the complete structure that incorporates all elements of the deliberation is created in the form of a multilingual Argumentation Knowledge Graph. This facilitates users in navigating through complex deliberation threads and fostering a more informed and engaged participation.

Online and Face-to-Face Multilingual Deliberation Support. Sophisticated AI tools can be harnessed to ensure that deliberations are, not only accessible to citizens with diverse linguistic and cultural backgrounds, but also substantively rich and well-organised, fostering a productive and democratic exchange of ideas. A focus on content moderation and quality control methods is required, implementing advanced AI algorithms that scrutinise deliberative content to filter out irrelevant or inappropriate material. Through intelligent argument clustering algorithms, similar arguments and ideas can be grouped and presented in a structured manner allowing participants to easily navigate through the deliberation themes and engage with content that resonates with their interests or expertise. Additionally, AI-driven fact-checking tools can verify the accuracy of statements and claims. Finally, advanced data visualisation techniques can be used to generate mind maps and draft reports, translating complex deliberative discussions into visually appealing and easy-to-understand formats, summarising the outcomes and key points of deliberations.

Transparency, Trustworthiness, and Explainability in Citizen Deliberation. This offering goes one step beyond delivering robust, accurate, more empathetic and culture-aware translation services, by focusing on model explainability, enhancing transparency, accountability and trust in the LLM models. Explainability of LLMs is vital, as it provides insights into the translation and summarization choices made by the models, ensuring that social and cultural aspects are accurately conveyed.

Evaluation. The evaluation of a Generative AI based multilingual deliberation aims to comprehensively discern its influence on democratic quality aspects, including participation rates, deliberation quality, misinformation trends, etc.. Such an evaluation could be based on assessing dimensions like the quality of information, the quality of the deliberation, the presence of misinformation, but also the dynamics of the participation (e.g., the inclusiveness of and trust in the deliberation process), and the policy impact of the deliberation (e.g., track the shifts of public opinion among participants). Finally, various approaches like quantitative and/or LLM-based qualitative analysis can be employed to track belief changes and conduct automated multilingual content analysis of political discussions.

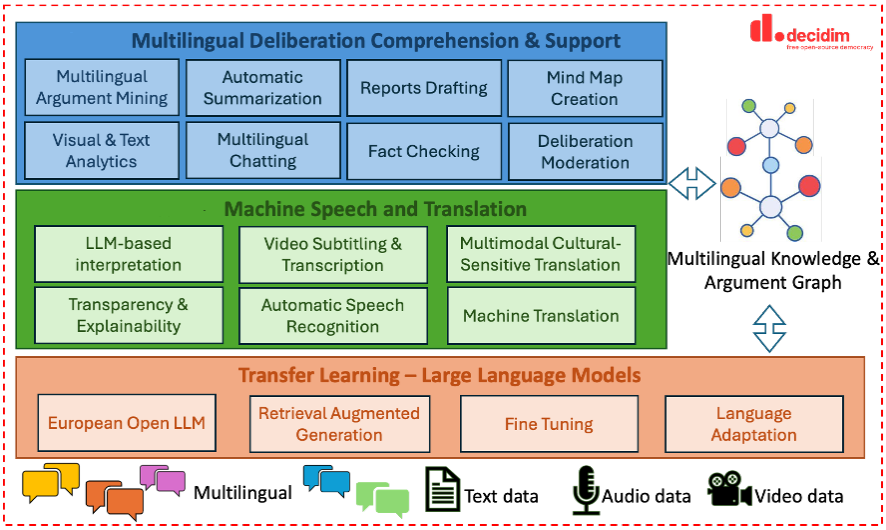

Figure 1: An Architecture for enabling Multilingual Deliberations using Generative Artificial Intelligence

6. Multilingual Deliberations based on Generative Artificial Intelligence: A Technical Solution

A technical approach for enabling multilingual deliberations can be based on the interplay of advanced state-of-the-art technologies related to computational linguistics, Automatic Speech Recognition (ASR), language technologies, including Large Language Models (LLMs), eXplainable AI (XAI), knowledge graphs, neuro symbolic reasoning and architectures, video streaming etc. An generic architecture is presented in Fig. 1.

The approach offers a set of services to assist multilingual deliberations. These include (1) services for comprehending and supporting multilingual deliberations, and (2) services for machine speech and translation in multilingual deliberations. The latest enable live automatic transcription and translation supporting interpretation for face-to-face deliberation sessions, video streaming caption, and subtitle creation as well as for multimodal (video, audio, text) citizen contribution transcription and translation.

To enable the *comprehension and support of multilingual deliberations*, this approach supports the following services: (1) Multilingual Argument Mining, (2) Automatic Summarisation, (3) Automatic Reports Drafting, (4) Mind Map Creation, (5) Visual and Text Analytics of deliberations, (6) Multilingual Chatting, (7) Fact Checking, and (8) Automatic Deliberation moderation. These services support both face-to-face and online public deliberations, and enable the analysis of multilingual deliberation content and the extraction, structure, and connection of basic deliberation elements such as topics, ideas, arguments, evaluation facts etc. They are based on open LLMs enhanced by the symbolic representation of deliberations ensuring the accuracy of argument extraction in public deliberations. They allow better understanding the nuanced meanings and context of arguments in public deliberations, and transparent and interpretable

representations of arguments, and ensure that the extracted arguments adhere to logical consistency and coherence. The extracted arguments are structured and semantically enhanced in a multilingual argument and knowledge graph (see the description later in this section).

The functionality of the deliberation comprehension and support services is supported by the functionality provided by the *machine and speech translation* services to present their results in a multilingual manner considering multicultural aspects. The latest include:

- LLM-based interpretation. This service implements the LLMs-based condensing and rewriting of the deliberations by considering its semantic meaning. It extracts important information from deliberations, contributing to efficient information processing by making it more accessible while at the same time simplifies complex language, clarifies nuances, and aids in communication for individuals with different dialects or language variations.
- Video subtitling and transcription. This service enables the creation of subtitles of video streams of face-to-face deliberations. It also implements the multimodal transcription (video, audio, text) of citizen contributions in online deliberations.
- Multimodal cultural-sensitive translation. It is responsible for translating face-to-face and online deliberations in multi-cultural settings. By providing translation support, it allows participants from different cultural backgrounds to engage fully in discussions, share their perspectives, and contribute to decision-making processes.
- Transparency and explainability. It uses explainability techniques for LLMs, including but not limited to methods such as layer-wise relevance propagation, attention visualization, and feature attribution, which help in tracing model decisions back to input data. Additionally, interpretable (surrogate) models and human-in-the-loop systems can be employed to provide greater transparency and understanding of LLM outputs.
- Automatic Speech Recognition. It transforms speech into text by considering subtle nuances in communication, varying tones, dialects, colloquial expressions, and domain-specific terminologies in order to achieve faithful representation. This process utilises modern hardware such as GPUs to ensure minimal computation latency. The service is supports a variety of languages, in recognition of the importance of multilinguality.
- Machine translation. It is built on robust baseline MT neural-based models that have been rigorously developed and tested (e.g., ELITR[1]). Open-source multilingual models (e.g., BLOOM, MISTRAL) can be fine-tuned and adapted to the specific needs of multilingual and multicultural public deliberations. The service also focuses on maintain the flow and contextual integrity of translations across entire documents or transcripts, ensuring that the translated content is linguistically accurate, contextually relevant and coherent.

An additional functionality supporting the services is the **streaming** functionality, which is accomplished by using and re-using existing software frameworks including open source (e.g., PeerTube, LBRY) or commercial (e.g., Youtube) streaming or video platforms, and/or software to install a local platform. Important factors to consider is the potential to scale up to millions of concurrent users, and the highly efficient and scalable integration of the necessary content processing services (e.g., automatic speech recognition with transcription etc.).

[1]https://elitr.eu/

A *real time translation and streaming management* service is also foreseen to optimise related issues in multilingual settings, ensuring seamless integration with the other services of the framework. It monitors and adjusts the streaming quality based on the available bandwidth and user preferences, ensuring minimal disruption during translation streaming. Computation latency is properly managed to ensure minimal user-perceived delay and maintaining high performance. Seamless integration with various streaming platforms is ensured, maintaining synchronisation between all assets. Finally, adaptive buffering and syncing techniques are employed, dynamically adjusting buffering based on the analysis of current streaming data and predicted data flow, ensuring smooth user experience.

The core technology for the development of both deliberation comprehension and support, and machine speech and translation services is LLMs. In this context, **European Open Large Language Models** (e.g., BLOOM [27], Mistral 7B[2]) are exploited that, being able to possess advanced reasoning and linguistic abilities, they have reached unprecedented levels of natural language understanding and generation, unlocking in the process a plethora of novel applications. Since LLMs are extremely costly to train, efficient ways to harness their power have been explored, such as prompt engineering, prompt learning, and fine tuning. Prompt engineering enables designing effective prompts to elicit desired responses from the LLM without altering the model's weights. Individual techniques include chain of thought reasoning and in-context learning. Fine tuning methods are also employed for **language adaptation**, where LLMs that were originally trained in a source language are adapted to a target language. Regarding the augmentation of the reasoning capacities of LLMs, in-context learning as well as chain of thought prompting are utilised. In addition, graph-based **Retrieval Augmented Generation** is employed to augment the factual capabilities of the LLMs. RAG systems rely on extensive datasets of curated texts that contain factually correct information. These datasets are split into chunks, and embeddings are created for each chunk. By storing both in vector stores, retrieving them based on similarity mechanisms and supplying them to the model as additional input, the output is better grounded to the truth.

Finally, **Knowledge Graphs** are utilized to structure and store data (both domain knowledge acquired and the structured arguments from the deliberations) and are used by individual services of the project to perform specialized tasks. They are structured based on domain fitting dictionaries (e.g., AIF [28] and OLiA [29]) in order to achieve standardization of the information stored. Neuro-symbolic systems are used to connect the power of Large Language Models and to the symbolic representation of Knowledge Graphs.

7. Conclusion

Democracies face a plethora of internal and external threats including electoral interference and disinformation. Hence, enhancing participation to deliberative processes emerges as a crucial response. Nevertheless, challenges related to multilingualism and cultural diversity of citizens hinder the effectiveness of deliberative democracy. To address these issues, generative AI is a promising approach that has already been employed to develop a plethora of applications to enable communication with citizens in various domains (e.g. [30]).

[2]https://mistral.ai/news/announcing\-mistral\-7b/

This work introduces a framework for enabling multilingual deliberation among citizens. Leveraging state-of-the-art generative AI technologies, the framework addresses barriers related to cultural diversity and multilingualism that often hinder deliberative democracy. Through the presentation of a case study, a technical solution is offered to the complex challenges faced in democratic deliberations. We believe that the proposed framework revolutionizes democratic deliberations by allowing citizens from diverse linguistic and cultural backgrounds to actively participate in decision-making processes.

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