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Perspective

Voices from the algorithm: Large language models in social research

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ABSTRACT

Research on energy and society often relies on online data collection. In particular, there has been an increase in the use of online techniques such as video software for qualitative research since the pandemic. We suggest that the rapid growth in generative AI and Large Language Models such as Chat-GPT mean that they may be utilised by research participants; particularly in research where participants may be less knowledgeable about the topic under discussion, such as emerging energy technologies. Drawing on examples from recent research, we argue that social scientists need to be cautious in assuming that the voices of our participants are genuinely theirs.

1. Main body

Social scientists are often engaged with eliciting the views and opinions of members of the public. Amongst the most prevalent methods are surveys, interviews, and discussion-based formats such as focus groups and deliberative workshops. Digital methods are an approach gaining popularity in the social sciences [1]. Surveys have long taken advantage of online formats – they allow rapid reach to large groups of participants, ease of filling quotas for socio-demographic representativeness, and convenient and accurate ways to gather and process data for analysis. Online crowdsourcing platforms enable the fast recruitment of large and diverse samples of participants, including hard-to-reach populations [2]. Discussion-based formats, meanwhile, experienced an online revolution during the Covid-19 pandemic, as researchers were unable to conduct data collection face-to-face [3]. Although online deliberation is not new, improvements in video conferencing software and their increasing public availability, combined with the pandemic-induced imperative to innovate methodologically, meant that growing numbers of social scientists have added online techniques to their toolbox [4,5].

Discussions of the promise and pitfalls of online qualitative research emphasise issues around establishing rapport, digital inclusion, technical difficulties, and challenges accessing participants' 'emotional' register [6–8]. At the same time, these papers note that online

techniques enable data collection from globally dispersed populations, improving the accessibility of research participation, as well as reducing the cost and logistical challenges of organising in-person events. Research has found that online deliberation, whilst experiencing challenges which make it distinct from face-to-face deliberation, can meet the requirements of deliberative research whilst being a rewarding and useful process for both participants and researchers [7].

In this Perspective, we argue that the promise of online deliberation is experiencing a new, serious challenge. The use of Large Language Models (LLMs), a form of generative AI, means that participants can respond in a voice which belongs not to them, but to a black-boxed algorithm. This issue might particularly impact researchers working on complex, technical topics – a situation often encountered by social scientists working on novel energy topics, for instance around new energy technologies. Deliberative workshops are often used to understand public perceptions of complex, technical or emerging areas of science, technology and policy [9], where there may be little prior awareness and where the long-term impacts of socio-technical change are unclear [10]. In such circumstances, participants may envisage an advantage to using LLMs to cover a perceived knowledge gap. Researchers attempt to mitigate this as much as possible, for instance by using accessible language and stimulus materials, and advising people that no special knowledge is required and that all opinions are welcome. However, real or perceived knowledge gaps could encourage participants' use of LLMs,

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arguably more so than research on personally familiar topics such as energy routines and practices.

Concerns have previously been raised about the authenticity of participant responses in online research, particularly in methodological approaches that involve a time delay between the researcher asking the question and the participant responding, such as email interviewing. These delays provide the time and space for interviewees to construct particular responses [11] or to delegate the task of answering to someone else, without the interviewer being aware of this [12]. Most of these prior concerns have been raised in relation to other people potentially responding in place of, or influencing the participant when there is a gap between the question being asked and answered. However, given the ability of LLMs to “produce supposedly uncannily human-like demonstrations of language production” [13], and recently even the promotion of their ability to compose chat responses [14], we argue that it is increasingly pertinent to consider their potential use by participants in real-time online research.

In October 2023, we conducted an online focus group ($n = 15$) on Zoom, on the topic of ‘UK public perceptions of greenhouse gas removal’ - an energy topic which encounters particularly low prior awareness and familiarity amongst members of the public [15]. Participants were randomly recruited from the general population using social media, and offered a financial incentive for their time. Participants were asked not to use the chat function, because we wanted to encourage free-flowing discussion; however, several had poor internet connections or were struggling with their cameras, therefore we also wrote our questions in the chat to ensure that they were accessible to everyone. We then received this response, written in the chat:

“Greenhouse gas removal has some real potential as a climate solution. But it’s important to remember that it’s not a silver bullet [...] [Pause] There are a few potential ways that greenhouse gas removal could be implemented. One idea is to use carbon capture and storage, where carbon dioxide is captured from power plants or other sources and stored underground. Another idea is bioenergy with carbon capture and storage, where biomass is used to generate energy and the carbon dioxide is captured and stored.”

A few days later, I (the lead author) happened to be analysing some responses to open-ended survey questions ($n = 2027$) on a similar topic but from an entirely separate project, which had been distributed to a quota sample of the UK general population. One of the responses was as follows:

“Carbon removal refers to various methods and technologies aimed at removing carbon dioxide from the atmosphere to mitigate climate change. It is generally considered an important component of climate change mitigation strategies. It is important to note that carbon removal should not be seen as a substitute for reducing emissions.”

These raised alarm bells, because they appear to reflect a particular type of syntax used by LLMs such as Chat-GPT [16] (a freely-available and highly popular LLM). The responses above are fairly typical of an LLM response on this topic, particularly the way in which various technologies are listed and described, and the point that they should not substitute for emission reduction. The tone of the language is also typical – authoritative yet neutral, accessible yet well-informed.

However, it is important to emphasise that we currently have no way of identifying whether these are actually LLM-generated responses or not. They are broadly in-line with the views of many experts, which could simply denote a very well-informed participant, albeit one with a rather official-sounding way of expressing themselves. (In the case of the first extract, the participant had previously stated that they were unfamiliar with the topic; in the case of the second extract, the same participant posted similar responses to other questions in the survey. No other participants were flagged for this issue). Equally, they could have been copying and pasting from an internet search engine, which has always been possible for online data collection and raises in itself

important issues for research. For example, existing research has highlighted concerns about misinformation, algorithmic bias and online information quality [17].

That said, the growth of use in LLMs means that it is surprising that we had not previously considered this issue in our research. For example, Chat-GPT now has over 180 million users, and in January 2023 set the record for the fastest-growing consumer application ever [18]¹, with correspondingly high and fast-growing energy requirements [19]. The very fact that we cannot assert whether these were LLM responses or not demonstrates a considerable weak spot in our understanding of the limitations of online data collection. Despite potential challenges for researchers in the potential ‘misuse’ of LLMs, which can be difficult to distinguish from human-authored text [20], many social researchers may not see themselves as directly impacted by the growth of LLMs, and may not even be aware of the rapid pace of advancements in the field. Therefore, despite our lack of ability to conclusively assert that this is what we are seeing in the data above, we argue that this warrants consideration by everyone engaged in social science research. In particular, we should consider the implications for online deliberation, at a time when online methods may be attractive to researchers operating on a short timescale, a limited budget, or with a global or geographically-dispersed sample. The rapid advancement of text-to-video AI models could additionally raise challenges for authenticity. Overall, the growth in LLM usage could create a significant new distinction between online and face-to-face methods of qualitative data collection.

The use of LLMs in study responses is likely to be an emerging issue which could seriously impact the robustness of our data and findings, since we have no idea whether someone is responding as ‘themselves’ or not. We note that our monetary incentive to participants may have exacerbated this issue, since someone who is primarily motivated by the income may have less of an incentive to respond ‘authentically’ than someone who desires to influence research or policy outcomes.² Whilst existing work has considered issues of authenticity in online research in relation to invented or fraudulent identities (e.g. [11]), we suggest that more attention should be paid to authenticity in terms of participant response, given the aim of research is often to elicit the subjective views of participants [12]. Of course, this raises complex questions about authentic voice, an issue which has been previously raised in disability studies where participants often “challenge normative constructions of typical speech and voice” [21].

LLMs could also bring numerous potential benefits for researchers, opening up new opportunities. LLMs provide a common platform for sharing information and ideas, which could assist researchers, stakeholders and the general public to collaborate and develop new strategies for addressing complex challenges such as climate change [22]. LLMs may also offer the chance for participants to explore a topic in more depth and with more dialogic participation with knowledge-provision tools, compared to passively receiving information from either researchers or search engines.

LLMs could have numerous impacts – many of them highly positive – on research processes and outputs (see [22,23] for more discussion on research uses). Some research even explores whether LLMs could viably substitute for human participants in surveys and interviews by simulating ‘representative’ human responses and thus reducing the cost and effort of data collection [24–26], although Fell (2024) advises ‘extreme caution’ over their use in energy social surveys, and highlights a number of ethical concerns around algorithmic bias and fake survey responses [26]. However, these papers all assume that the researchers themselves

¹ Since overtaken by Instagram Threads in July 2023.

² We offer monetary incentives to our study participants, in-line with ethical guidelines on ‘reasonable compensation’ for time and inconvenience, as well as to reduce barriers to participation and ease recruitment. However, monetary reimbursement has advantages and disadvantages, and is subject to debate.

are exercising control over whether to use an LLM in their research, rather than dealing with a unilateral (and undisclosed) decision by one or more participants.

Mitigating the issue of LLM responses is challenging. Writing questions in the chat is important for inclusion if a participant is experiencing barriers to participation, such as faulty equipment, background noise, connection issues, or physiological barriers such as speech or hearing impediments. Tools to prevent copying and pasting from LLMs to survey platforms or chat functions could be beneficial, but for the most part the responsibility for developing such tools would lie with the software developers, and cannot stop someone from simply reading the LLM text out loud. Meanwhile tools which can identify LLM text are currently being developed [27], and are of high interest in pedagogy, in light of an urgent need to identify their use in student assignments [28], but have not yet widely crossed over into research use. These could be developed and used more widely by social researchers, although mainly as an additional data cleaning technique, since assessing responses at the same time as facilitating an online discussion would probably be impractical. Importantly, such tools are currently imperfect, and could lead to 'genuine' responses being removed inadvertently, as well as creating additional inclusion risks, for instance if people using translation software are erroneously flagged as an LLM response. LLMs also have a well-documented tendency to occasionally 'hallucinate' responses, generating content which appears plausible but is entirely fictional [22], which again could help to flag unusual responses but runs a severe risk of exclusion, particularly since extracting factual information from participants is seldom the goal of deliberative research.

In an effort to guard against the use of LLM responses, researchers may choose to include a request for participants not to use them within project information and consenting documents. However, without more robust ways of distinguishing LLM responses, mentioning them in research materials may simply alert participants to the possibility of their use. We suggest that there is a need for social researchers to better understand the potential use of LLMs, particularly amongst those who may be less aware of developments in the generative AI field. Thus, training programmes and professional development will likely have to evolve, although this can have significant cost and delivery implications. With the increased use of online research following the pandemic, questions around the suitability of online methods for social science research are of the "utmost importance" [3]. Therefore we argue that this issue must be given due consideration, because the growth in LLM usage could create a significant new distinction between online and face-to-face methods of data collection.

CRediT authorship contribution statement

Emily Cox: Writing – original draft, Investigation, Data curation, Conceptualization. **Fiona Shirani:** Writing – review & editing, Methodology. **Paul Rouse:** Writing – review & editing, Data curation.

Declaration of competing interest

The authors declare that the work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Data availability

No data was used for the research described in the article.

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