Generative AI: Challenges and Opportunities in the Context of India

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Abstract

The recent rise in popularity of generative AI fueled increased interest in understanding the cross-cultural performance of such models when used for content creation. India, with its large population and rich cultural diversity, offers an ideal context for analyzing the potential of generative AI in content creation and for exploring the challenges of adapting this technology to diverse cultures globally. This position paper aims to draw attention to several unique challenges that generative AI may encounter in the Indian context and to initiate a discussion on potential research directions to enhance the reliability of generative AI in this context.

1. Introduction

The field of Artificial Intelligence aims at developing systems that exhibit human-like intelligence by mimicking human behavior on a variety of tasks. In the last couple of decades, AI has become increasingly ubiquitous in our daily lives through computing applications such as search, recommendation, recognition, and translation. As a next frontier, recent progress in the area of *Generative AI* has demonstrated remarkable performance in realizing one of the more difficult aspects of human behavior – the ability of *creation*. Generative AI models such as Large-scale Language Models (LLMs) and large text-to-image models can learn to generate highly realistic and human-like content in the form of text, images, videos and more.

With the advent of freely available online generative AI tools such as GPT (for text generation), and Midjourney (for image generation), these technologies have truly revolutionized the way humans create content - be it for work, communication, or artistic expression. The virality of such Generative AI tools has been nothing less than phenomenal. For example, the popular text generation tool ChatGPT [9] obtained its first one million users only in first week of its launch, and is currently leading the charts with estimated 1 billion website visits a month with an active user base of 100 million [11]. Similarly, popular text-to-image generation models like Midjourney [6], and Stable Diffusion Online [13] has seen more than 4 million monthly users [12].

Although developed mainly in the United States and Europe, Generative AI tools have garnered millions of users worldwide. For instance, ChatGPT, an AI tool developed and deployed by the American AI lab OpenAI, receives more than 80 % of its traffic from outside the United States. While this indicates the universal need for Generative AI tools across the world, it can also lead to challenges of poor cross-cultural performance of generative AI. Such AI tools reflect the cultural values, notions, and understandings of the AI developers, while the beliefs, values, and world views of users of such models can be vastly different from their American or European counterparts [10].

In [10], the authors provide a framework for understanding the potential incongruities of current AI systems that can reflect across various cultures, their beliefs, and traditions. In this paper, we build on [10] and further detail such issues in the context of India. With large population and phenomenal cultural diversity, India presents an interesting context for evaluating the cultural adequacy of generative AI. India has been one of the top consumers of generative AI tools currently, with the second highest global user base (7.1%) of ChatGPT only behind United States (15.73%) [11]. With over 900 million internet users, India was the second largest online/digital market in the world, only behind China [2], and is expected to see a consistent rise in internet penetration with more than 1.1 billion Indians gaining access to the internet by 2030 [4]. With such a high potential user base in sight, it is important to discuss about the potential inadequacies of the generative AI models in the context of India.

To this end, we start with outlining several unique characteristics of Indian society that can play a key role when it comes to adaption of generative AI in India. Further, we discuss several potential challenges associated with the development and deployment of generative technologies in India some of which are also applicable to other cultures around the world. By considering these challenges, we hope to stimulate further discussion and research on how to adapt

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generative AI for the diverse cultural landscape of India. We believe solutions to these challenges can provide a strong framework to tackle similar challenges for other cultures.

2. Unique Characteristics of Indian Society

Large population: India holds the distinction of being the most populous country in the world [3]. The sheer magnitude of its population, combined with an open market economy and a consistent rise in internet penetration, demands a monumental scale of operations for generative AI technology.

Diversity and heterogeneity: India is widely considered to have one of the most diverse cultures in the world. The languages, philosophies, traditions, and beliefs vary significantly across the country, shaped by local nature, history, and demographics. Home to the majority of the world's major religions, each with its own distinct traditions and belief systems, India boasts a staggering 121 spoken languages as mother tongues along with 1600 different dialects and 86 written scripts [8]. Furthermore, this diversity goes beyond just socio-cultural aspects and extends to economic disparities as well. India exhibits a considerable variation in individual income and living standards across the country, resulting in vastly different life experiences among various communities and individuals. Further, the contrast in the level of education is remarkably high as India has both the one of the largest pool of STEM graduates [15] and the highest number of illiterate people at the same time [7, 14].

Family and community-based identity: A unique characteristic of Indian society, often overlooked in technology designs, is the profound importance of family and community connections. In fact, this aspect adds another layer to India's diversity - diversity of age. With a significant portion of the young population living with their families, often spanning three generations under one roof, models and designs may need to be tuned accordingly to account for this familial and community-based identity.

Building upon the unique characteristics of India discussed earlier, these aspects present intriguing paradigms for generative AI models. In the subsequent sections of this paper, we delineate several challenges that arise due to these distinctive features of Indian society and propose potential research directions to address them. Furthermore, we explore the opportunities that modern AI, with appropriate adjustments, can offer for India.

3. Challenges

3.1. Linguistic freedom and language imposition

Present-day text and image generation models only support a small number of languages, with their primary language being English. Moreover, the generation capability of these models varies heavily across the languages. The lack of multi-lingual capabilities of such Generative AI models results in severe accessibility barriers for a significant chunk of the Indian population - inadvertently taking away their linguistic freedom, and forcing them to learn a language foreign to them at the cost of erasure of their own linguistic tradition. India has already lost more than 250 languages in the last 50 years [1], and if linguistic diversity is not accounted for while building the AI systems, then the rapid spread of Generative AI technologies may unfortunately accelerate the rate of erasure further.

Apart from scripted languages, Dialects are also an integral part of Indian culture that historically put equal emphasis on both written and verbal traditions. In a recent report by the World Economic Forum (WEF), it is estimated that about 60% of internet users in India prefer to consume vernacular content [4]. As the demand for vernacular content grows in India, generative AI models that can generate high-quality content in regional languages and dialects will be crucial. Current day generative AI models are not suitable to be applied directly to script-less languages, and dialects that do not have a rationalized grammar structure. Such limitations would pose new challenges to the accessibility and usability of generative AI models for a large proportion of the Indian population with little or no literacy in written languages.

3.2. Misrepresentation of cultural iconography

Every cultural tradition expresses its unique identity through distinct iconography. Such iconography may consist of but is not limited to: artifacts, literature, attire, monuments, festivities, and lexicon. Users from a specific culture would expect the generative AI to correctly understand the vocabulary of their culture, and to accurately represent the iconography of their culture in the generated content (text, image, or video). However, a lack of cultural representation in the training data, and dataset biases can result in inaccurate representations of cultural iconography in the generated outputs. Such outcomes can not only be unsatisfactory but can also lead to the minimization of the cultural identity of the user.

India is home to thousands of diverse cultural traditions, and many of them are under-represented in the digital data that is typically used for training large-scale generative models. Many such communities are either poorly connected to the digital world due to a lack of internet penetration or prefer the limited expression of their cultural identity

on digital media. Collecting and annotating data for these population groups is a challenge since the centralized data collection and annotation pipeline cannot account for the fine nuances between cultural identities.

3.3. Sense of authenticity

Users from cultures that have largely been aloof from the digital technological revolution in the past decade put varying trust in AI generated content and can detect fake/misleading content with lower confidence as compared to their Western counterparts who are at the forefront of using and building such technologies. One recent survey titled Trust in Artificial Intelligence revealed stark differences in trust and acceptance of AI systems across countries, with major emerging economies such as India and Brazil showing much higher values of trust in AI systems as compared to developed economies such as the USA, Japan, and France [5]. The responses further showed that more than 90% of Indian users would believe that AI would produce output that is accurate, have a positive impact on humanity, and is safe and secure to use. With the trust in the AI system being high, the margins for error become extremely low - posing a challenge of safety and reliability.

3.4. Unwarranted centralization of knowledge systems

India has a long history of continuous knowledge systems and traditions that evolved in a decentralized and organic manner throughout her civilizational history. Such knowledge systems operated in a highly decentralized fashion, with the institutions and stakeholders spread across the spectrum of geography, social structure, and organizational structure. The growing trend of centralized AI development with one entity (such as a large multi-national software company) developing and disbursing the technology across the world is fundamentally at loggerheads with the operating principles of such decentralized systems. If such decentralized institutions are not offered an equitable role in the AI development process, it can promote unwarranted centralization of knowledge at the cost of diminishing indigenous knowledge traditions.

3.5. Sustainable scaling

As the world's largest country in terms of population, the rising popularity of Generative AI systems can soon face the challenges of scaling [3]. Each query given to present-day Generative AI models demands a significant amount of computing resources, to the extent that it creates sizable carbon footprint. For an emerging economy with a modest per capita income, innovation must be made to be able to scale up such systems *sustainably* for a large user base in India.

4. Opportunities and Research Directions

4.1. Decentralized dataset collection and annotation

The challenges of diversity and misrepresentation can be linked to a couple of deficiencies of the current generative AI development pipeline: centralized collection/annotation of the data, and the need for the large amounts of data for training. In the context of India, with the presence of thousands of cultural/linguistic groups, a centralized data collection and annotation system can not capture the nuances of various cultural and linguistic features. Research is needed to identify alternate (possibly decentralized) means of collecting and annotating data, where each community can contribute, verify, and control the data they provide for training such large-scale generative models. Further, depending on the size of the cultural groups, the amount of data collected may not be enough to train data-intensive generative models. It is important to research the ways to make the models more data-equitable so that a diverse set of cultural nuances can be learned even when the proportion of the data available for minority cultures is small compared to the larger cultural groups.

4.2. Multi-lingual and cross-lingual support

As discussed in Sec. 3, lingual diversity in India poses a great challenge for generative AI models. While present day generative AI models such as ChatGPT support upwards of 95 languages, it is still underwhelming in the context of India. Further research is needed in order to expand the multi-lingual capability of such models. Further, it is important to make sure that the performance of the model is reliable across all the languages that it supports, and the answers are consistent for the same query when asked in different languages.

4.3. Innovative modes of AI interaction

When it comes to present day Generative AI systems, by far, the most common modes of interaction have been textual prompting and image conditioning. The cultural background shapes the preferences for mode of interaction, thus, it is possible that people belonging to a certain cultural background would prefer to use voice as a prompting medium instead of text, or prefer using multi-lingual prompts as opposed to single language prompts. Designing novel modes of interaction by studying the cultural and behavioral cues of diverse sets of users can become a rewarding research direction in the context of India.

5. Conclusion and Future Work

In conclusion, India's linguistic diversity, cultural nuances, and growing demand for vernacular content present significant challenges for generative AI. Addressing these

challenges will require a concerted effort from researchers and developers to create models that can accurately reflect the perspectives and values of India's diverse communities. By doing so, we can harness the full potential of generative AI and enable it to contribute to India's cultural and linguistic richness. Even further, since the significant part of the generative AI users are from India, there is an incentive to address these challenges in Indian context which can provide a framework for resolving similar issues for various cultures around the world.

As a future work, we plan to perform detailed technical analysis of generative AI models in the Indian context, and conduct experiments for collecting empirical evidence to support some of the challenges we discussed.

6. Acknowledgements

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