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Comparative User Experiments in Cognitive Pitfalls of Climate Change Information

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Abstract:

Maps, charts, and graphs are efficient means for communicating climate information (Fish, 2020). However, they could also be abused to distort reality due to cognitive biases about global warming and climate change (Carlotta & Jack, 2020). Cognitive biases can be either intentional or unintentional. If they mislead readers and cause negative consequences under certain conditions, they may become cognitive pitfalls. A typical example is exhibited by climate-change deniers who consciously or unconsciously exaggerate cognitive biases such as confirmation bias and anchor bias. By casting doubt on well-supported theories and providing biased interpretations, they tend to convey climate disinformation and discredit climate science (Treen K, 2020). Since climate-change deniers themselves are caught in a cognitive pitfall, they accuse scientists of changing the colors of maps to accentuate global heating and extreme temperature (Roland, 2022; Tommaso, 2022). Deniers also set pitfalls on social media by posting weather maps out of context, tampering with photos, or misleading the derivation process. Climate disinformation can go viral on social media, thereby confusing people into believing that scientists are misleading with scary-looking climate maps. Distorted public sentiment may fuel the creation of further misconceptions. Irrational judgments caused by cognitive pitfalls might trigger long-term harmful consequences.

Much work has been done to address the disinformation problem and to increase knowledge about climate change. Zhao & Luo (2021) highlighted the importance of visualization techniques as debiasing tools to facilitate actions of climate change mitigation. The World Bank Group and the United Nations Framework Convention on Climate Change have established several climate change knowledge portals to provide global data on historical and future climate, vulnerabilities, and impacts (WBG, 2022; UNFCCC, 20222). Divanis & Meng (2021) built a climate event portal based on citizen science to tackle the misconception that climate change is happening far away from our doorsteps and to communicate scientific processes to citizens in a more transparent way. While the knowledge of climate change is conveyed through different portals, the combat against misinformation is limited to articles with static diagrams. To our knowledge, no work is available that is dedicated to counteracting cognitive pitfalls in social media with interactive methods.

This study reports the work progresses of an on-going project, which addresses two social media simulators. One is developed with interactive function to remind potential cognitive biases embedded in the posts related to climate change. For instance, pop-ups or acoustic tones are deployed as pitfall alerting functions, select and right click as a short cut to track the source the posts, visual storytelling elements serve for narrative explanations, and interactive swipers are inserted for comparative purposes. The other one simulates the normal social media environment. A test dataset about climate changes is collected that should simulate a selected number of cognitive biases. Two participant groups are invited to test two simulators. The user experience and performance will be compared, which aims to test the effectiveness and efficiency of the reminder function. A map-based web portal with visual analytical tools is then prototypically implemented to demonstrate how cognitive pitfall can be induced, analyzed and explained.

The initial stages of the project are focused on visualizing and understanding the nature of cognitive pitfalls. The web portal equipped with maps and a set of visual analytical tools should allow users to get a comprehensive understanding of where and which cognitive biases may creep in the data flow of climate change and how some seemingly beneficial mental shortcuts for daily life may become misleading in uncertain complex situations. Meanwhile, this web portal should add new values to cartographic teaching and learning. Through controlled experiments, many theoretically well-designed map examples can be interactively revisited to uncover possible cognitive pitfalls that have not been unnoticed so far. This can help enrich existing design rules. The far-reaching goal of the on-going project is not only to reveal, but also to counteract cognitive pitfalls.

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