

## **An analysis of the "Order Dependency Problem" existing in LLMs**

The quest for order conflicts among the geriatric sociology, group or organizations incivility undermines the contestation whereby the order-of-entry to be the first two years or more than two. The order dependence problem in large language models LLMs order of how input data is given to the model and how it in turn generates results tends to border on its compromise. Although LLMs affect how information is compartmentalised and called up, they are structured to comprehend and incorporate diverse pieces of text dependent on the information they were trained on. This problem is particularly relevant for cases where specific LLMs are expected to perform a series of tasks such as answering multiple choice questions MCQs or provide consistent when varying the order of the input.

### **Definition**

Order dependency arises when a model's response to a query is biased by the arrangement of information rather than purely the content. For instance, when given a set of multiple-choice answers, an LLM might favor choices that appear earlier in the list, irrespective of whether they are the correct answer. This suggests that the model's output is not entirely based on understanding or logic, but rather on the presentation of the options.

### **Manifestation in the Real World**

The order dependency problem can be illustrated by accurate MCQ, but this is not the only approach. The problem can arise in many other real-life situations as well:

**Survey results interpretation:** The application of LLMs in the analysis of survey results may face challenges due to the order of presentation of options or questions to the model. If they, for instance, apply a rating system on specific items, the model may end up paying too much attention to the first ratings.

**Document summaries:** When summarizing documents, if the model takes the sections one after the other, the first section may be given excessive importance thereby distorting the final summary which ends up being too much biased towards the first part of the document.

**Chatbots and Conversational Agents:** For such kind of interactive AI systems dialogue may affect a given response. A chatbot may give more importance to the earlier part of the conversation while responding to a user and that may result into misunderstanding the user or the user's problem.

**Recommendation Systems:** Order dependency could also manifest itself in recommendation systems. A model can design an action that tries to assume that the first few elements given to its inputs are of great relevance.

## Techniques to Mitigate the Issue

Several techniques have been explored to reduce the impact of order dependency in LLMs:

**Randomization of Inputs:** A straightforward approach is to randomize the order of input options before presenting them to the model. By doing this multiple times and averaging the results, the model's inherent bias toward any specific position can be reduced.

**Ensemble Methods:** Using ensemble techniques, where multiple models process the input in different sequences, can help mitigate bias. The final output is aggregated across the models, reducing the influence of any single order.

**Fine-tuning and Curriculum Learning:** Fine-tuning the LLM on data that is specifically designed to address order dependency can help the model become less sensitive to input sequences. Curriculum learning, where models are trained on progressively more complex tasks, can also reduce this bias by exposing the model to diverse input sequences.

**Prompt Engineering:** Careful design of prompts that explicitly instruct the model to consider all input equally, regardless of order, may help to minimize this bias.