

Summary of the paper: Self-consistency improves chain of thought reasoning in language models

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April 2024

The paper "Self-consistency improves chain of thought reasoning in language models" proposed a novel prompting method called self-consistency [Wan+22]. This prompting method mimics the human process of taking on different paths to reach the same solution in order to increase their confidence that the solution is correct. Similarly, self-consistency allows the model to carefully solve the problem in many different ways, and find the answer that is most consistent while excluding the answers that are very different.

This method outperforms traditional searching methods like greedy search, while still preserving simplicity without using very complicated architecture like ensembled models.

When choosing the correct result from multiple number of paths of reasoning, there are two methods of aggregating them. The first is a simply counting, or unweighted sum, of the results produced. The other is using a weighted sum according to the exponential of the sum of the log probability of generating the given sequence of tokens that leads to the result. The performance between normalized weighted sum (with respect to output length) and unweighted sum are close to each other, due to the fact that the conditional probability of generating the tokens is different. However, the unnormalized weighted sum presents a drastic decrease in performance. Taking the weighted average (normalized and unnormalized) also hurts the performance. In short, simply taking the unweighted sum is sufficient and leads to the optimal performance.

One of the major limitations is the computation cost, as increasing the number of paths leads to increasing computation costs. Meanwhile, though this approach increases the chances of getting the correct result, the correctness of text/reasoning generated by language models is not guaranteed, controllable, or always reliable.

Except for merely getting the correct result to a problem during inference time. This technique can also be applied to refine our training dataset to generated better supervised data.

References

- [Wan+22] Xuezhi Wang et al. “Self-consistency improves chain of thought reasoning in language models”. In: *arXiv preprint arXiv:2203.11171* (2022).