In LLM planning, the discriminator needs to get up to 90% accuracy for tree search to start outperforming simple re-ranking.

When is Tree Search Useful for LLM Planning? It Depends on the Discriminator

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A Generator-Discriminator Framework of Language Agents

- **Generator**: Propose (partial) action sequences.
- **Discriminator**: Evaluates the outcomes of these actions.
- **Planning method**: Ranks the actions according to their outcomes and manages the interaction between the two models.

Simulation Experiments with Oracle

End-to-end evaluation results (the first row) and average inference time in log scale (the second row) of our simulation experiments with oracle.

Intrinsic Evaluation of LLM-Based Discriminators

Discrimination accuracy of observation-enhanced LLMs. The best performance is achieved using both kinds of environmental observations.

Conclusions

- Advanced planning methods, i.e., iterative correction and tree search, demand highly accurate discriminators (up to 90% accuracy) to achieve decent improvements over the simpler method, re-ranking.
- Using environmental feedback, we improve the discrimination accuracy of LLMs. Yet, our end-to-end evaluations suggest they have barely met the need for advanced planning methods to show significant improvements over re-ranking.
- Advanced planning methods may not adequately balance accuracy and efficiency when using LLM-based discriminators. In our experiments, compared to the other two methods, tree search is at least 10–20 times slower but leads to negligible performance gains.

End-to-end execution accuracy on text-to-SQL parsing.

Error analysis of examples where re-ranking outperforms advanced planning methods.

(1) **Discrimination error**: The discriminator assigns a higher score for wrong programs than correct ones, which is not recoverable by any planning method.

(2) **Exploration error**: The planning method has not found the correct program before termination.

Discrimination accuracy of observation-enhanced LLMs. The best performance is achieved using both kinds of environmental observations.