

Issues and Points of Suspicion in the Paper

1. Acquisition Function

- The Expected Improvement (EI) formulation discussed in the paper does not include essential components of uncertainty. Moreover, the simplified approach to the exploration-exploitation trade-off appears insufficient for robust optimization.
- In the early stages of exploration, the use of y_t^* might not provide meaningful guidance for optimization. The paper does not address this critical issue.

2. Algorithmic Details

- Algorithm 1 does not clearly describe the initialization and maintenance of DI^* (optimal interventional data).
- The phrase "Append optimal interventional data" is ambiguous; the paper does not define what constitutes an "optimal" intervention.
- There are no explicit stopping criteria for the optimization at each time step beyond the budget H .

3. Theoretical Gaps

- The assumption of additivity of target functions (Assumption 2) is a strong assumption that lacks proper justification.
- Theorem 1 relies on independent Gaussian Processes (GPs) for different functions. This independence assumption may not hold in practical applications.
- The transfer of interventional information across time steps (§3.1) assumes stationarity in causal mechanisms. This assumption might not be realistic for many real-world scenarios.

4. Experimental Evaluation

- The comparison with baselines may be unfair, as ABO and BO are required to intervene on all manipulative variables, which could bias the results.
- The "Gap" metric in Equation (4) appears to be arbitrarily constructed and may not reflect performance needs in practical scenarios.
- The economic example (ECON.) is based on an oversimplified causal model, which might fail to capture the complexities of real economic dynamics.

5. Implementation Questions

- The paper does not address computational complexity or scaling issues, which are critical for the practicality of the method.
- There is no discussion of hyperparameter selection for the GP models, leaving an important aspect of implementation unaddressed.

- The handling of missing data and noise in the real-world examples is not thoroughly explained.

6. Conceptual Issues

- The distinction between static and dynamic causal effects is not clearly defined, creating ambiguity in the theoretical framework.
- The relationship between the proposed method and reinforcement learning is not adequately elaborated.
- Potential challenges related to causal sufficiency and unmeasured confounders are not discussed, which could limit the applicability of the method.

7. Time-Varying Aspects

- The treatment of non-stationarity is limited to specific types of changes and does not address broader structural variations.
- The paper provides limited discussion on how structural changes in the causal graph would be handled over time.