Code Analysis and Missing Details in the Paper

1. Dependency on GPy

- The codebase heavily relies on the `GPy` library for Gaussian Process (GP) emulation, including kernel definitions (`RBF`, `CausalRBF`), and model wrappers (`GPyModelWrapper`).
- The paper does not detail this dependency, which is critical for implementing the dynamic causal GP model described.

2. Custom Kernels

- The implementation uses a custom kernel, `CausalRBF`, found in `dcbo/bayes_opt/causal_kernels`
- The paper mentions "dynamic causal GP models" but does not elaborate on how these kernels are mathematically or programmatically constructed.

3. SEM Estimation

- The `fit_arcs` method in `dcbo/utils/sem_utils/sem_estimate.py` is a key part of fitting Structural Equation Models (SEMs) to observational data.
- The paper does not describe how SEMs are estimated or how the observational data is integrated into the causal model.

4. Acquisition Function Implementation

- The `evaluate_acquisition_function` method in `dcbo/bayes_opt/intervention_computations` evaluates and optimizes acquisition functions like causal expected improvement (CEI).
- While the paper introduces the concept of CEI, the implementation details (e.g., dynamic adjustments and numerical optimization) are absent.

5. Experimental Configurations

- Tutorials (e.g., `notebooks/stat_scm.ipynb`) provide configurations and parameter settings for experiments, including static and non-static Structural Causal Models (SCMs).
- These configurations are not described in the paper but are crucial for reproducing results.

6. Integration Across Time Steps

- The codebase includes functions like `_update_bo_model` and `_update_sufficient_statistics` in `dcbo/bases/root.py` to integrate interventional data across time steps.
- The paper mentions data transfer across time but does not explain how it is operationalized.

7. Testing and Validation

- Unit tests, regression tests, and integration tests (in the `tests/` directory) ensure correctness of the implementation.
- These validation mechanisms are not mentioned in the paper but play a crucial role in verifying the algorithm's performance.