

# On the Theoretical Limits and Structure of Optimal Designs in Group Testing Regression

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## 摘要

In this work, we investigate D-optimal designs for group testing regression models. Under idealized settings where both covariates and group structures are fully controllable, we characterize the theoretical limits of estimation efficiency and the associated optimal design structure. For the single-covariate case under the complementary log-log link, analytical results show that the optimal design has a simple form and is invariant in a canonical scale. For multiple covariates under constraints, optimal designs are characterized numerically, revealing that key structural features from the single-covariate case persist in more general settings. The results provide theoretical benchmarks for evaluating design efficiency and guiding the construction of practical designs.

Key words: Canonical form; Complementary log-log link; D-optimality; Group testing regression