A bipartite experiment consists of one set of units being assigned treatments and another set of units for which we measure outcomes. The two sets of units are connected by a bipartite graph, governing how the treated units can affect the outcome units. The bipartite framework naturally arises in marketplace experiments where, for example, experimenters may seek to investigate the effect of discounting goods on buyer behavior.

In this paper, we consider estimation of the average total treatment effect in the bipartite experimental framework under a linear exposure-response model. We introduce the Exposure Reweighted Linear (ERL) estimator, and show that the estimator is unbiased, consistent and asymptotically normal, provided that the bipartite graph is sufficiently sparse. To facilitate inference, we introduce an unbiased and consistent estimator of the variance of the ERL point estimator. In addition, we introduce a cluster-based design, Exposure-Design, that uses heuristics to increase the precision of the ERL estimator by realizing a desirable exposure distribution. Finally, we demonstrate the application of the described methodology to marketplace experiments using a publicly available Amazon user-item review dataset.

The full version of the paper is available at: https://arxiv.org/abs/2103.06392.

CCS Concepts: • General and reference → Experimentation; Empirical studies; Estimation.

Additional Key Words and Phrases: causal inference, experimental design, interference, bipartite experiments

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