Submatrix Detection

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1 Introduction

This set of notes concerns the submatrix detection problem, following [1].

Our setup is as follows: we observe a high dimensional random matrix, and want to test if it contains a submatrix (of much smaller size) with large entries. In particular, let

$$Y_{ij} = s_{ij} + \varepsilon_{ij}$$

for $i \in [N], j \in [M]$, and the ε_{ij} are iid $N(0,1)$. We test the following hypothesis:

$$H_0 : s_{ij} = 0 \quad \forall \quad i,j$$

versus

$$H_1 : \exists C \subset [N] \times [M] \quad \text{s.t.} \quad s_{ij} \geq a \quad \forall i,j \in C$$

References

[1] C. Butucea and Y. I. Ingster, "Detection of a sparse submatrix of a high-dimensional noisy matrix," vol. 19, no. 5.