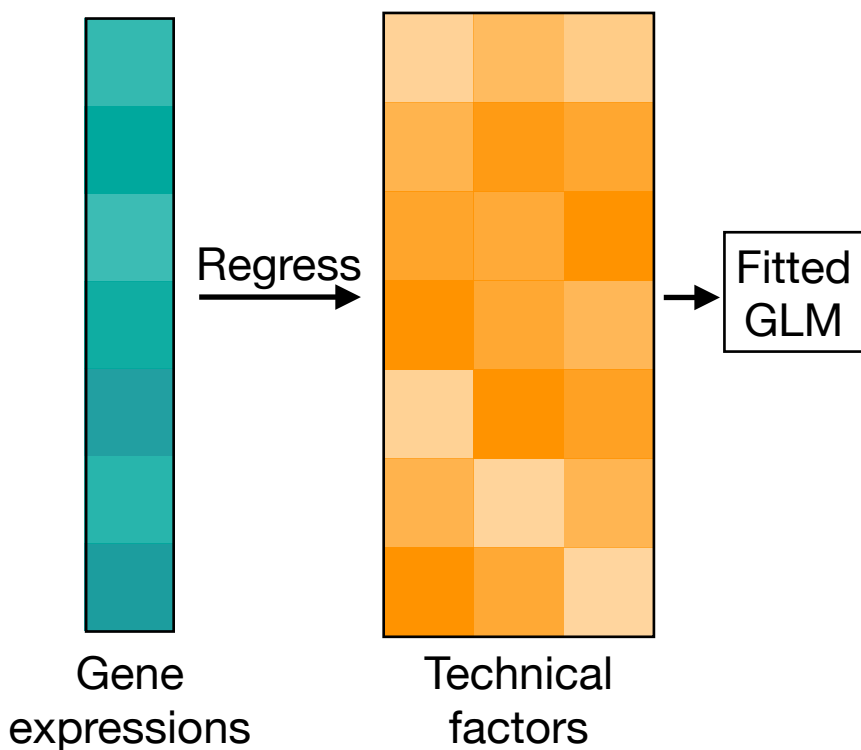


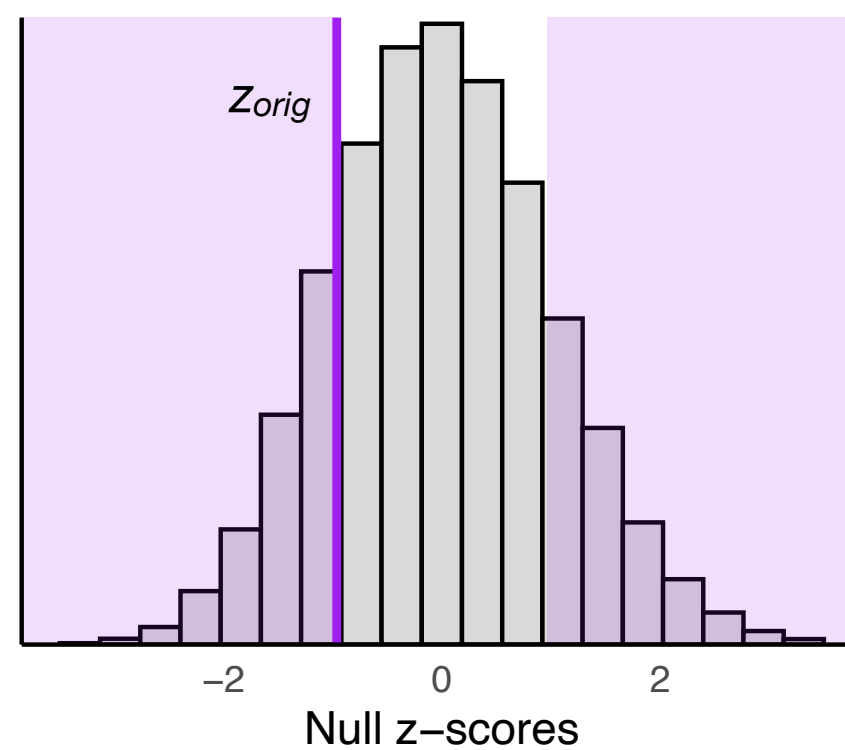
a

1 Regress gene expressions onto technical factors.

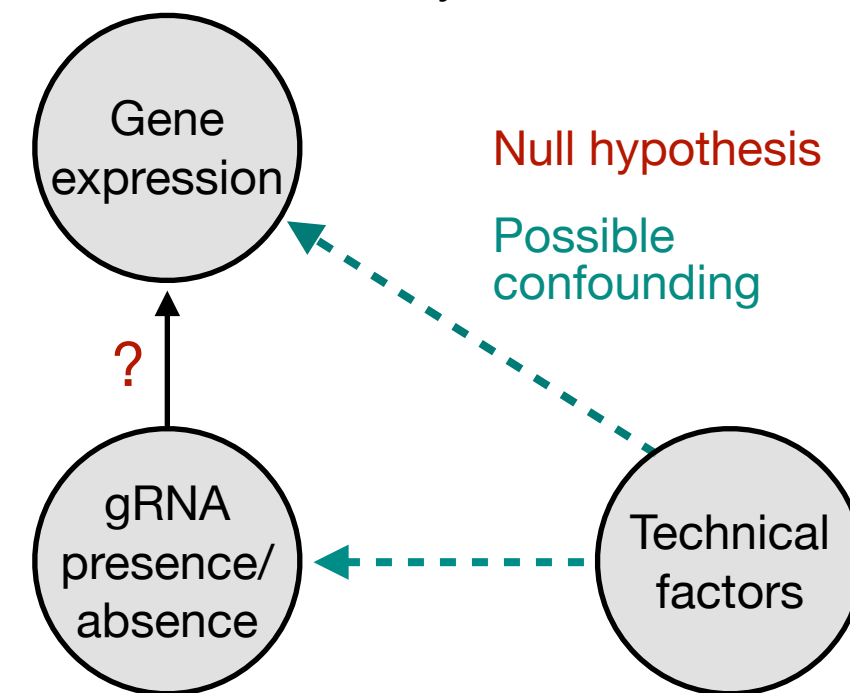


4

Compute the p -value by comparing original z-score to null z-scores.

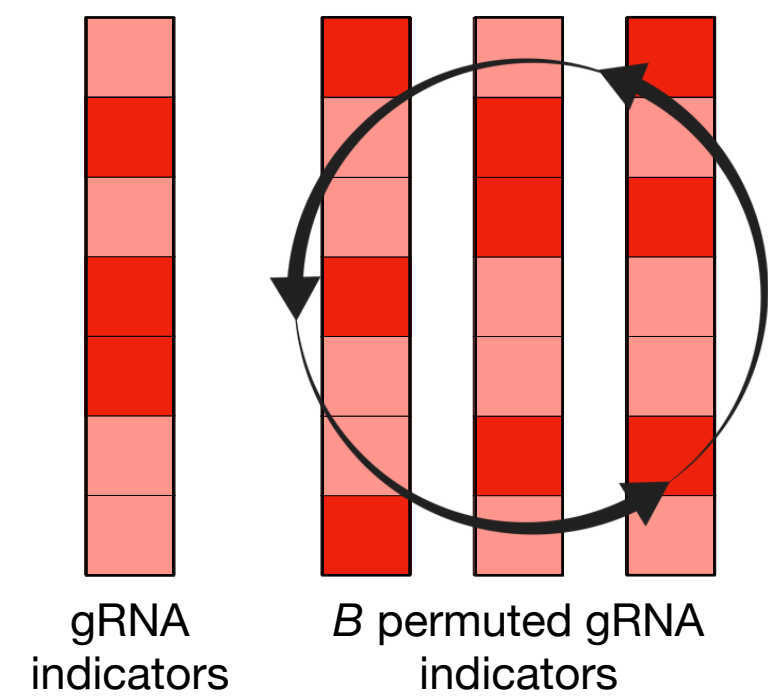
**b**

Relationship between variables in analysis



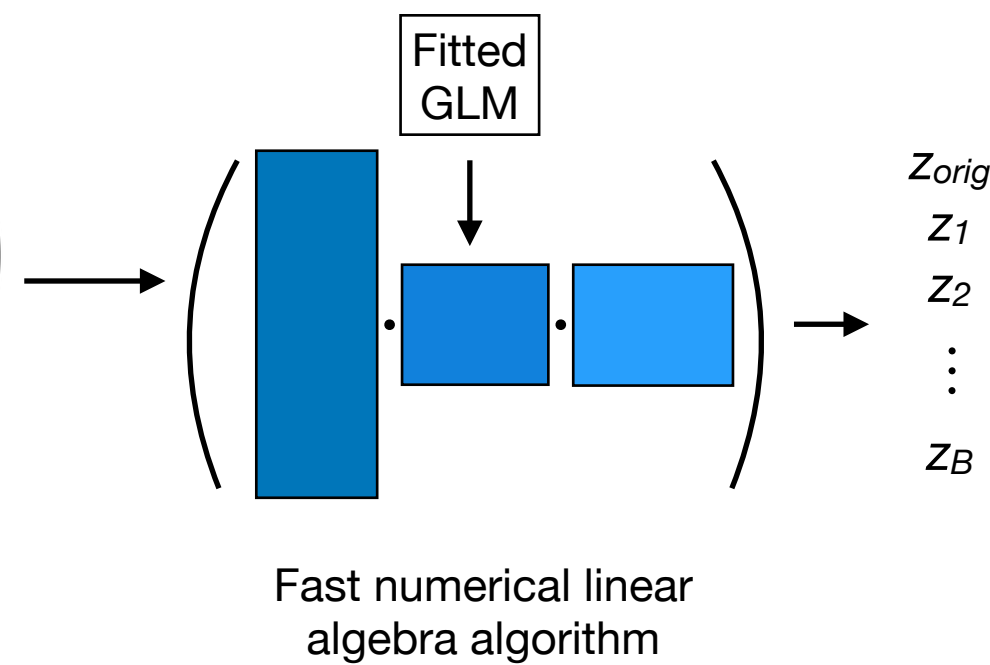
2

Permute gRNA indicator vector B times.



3

Compute z-scores for original and permuted gRNA indicator vectors.

**c**