Two-Sample Tests of Differential Expression on Gene Networks

Differential expression of gene sets

- Gene expression data for two groups with **two different phenotypes**.
- Identify **significant expression changes** between the two phenotypes.
- Often interested in doing the analysis at the **biological function** level : **identify differentially expressed pathways.**

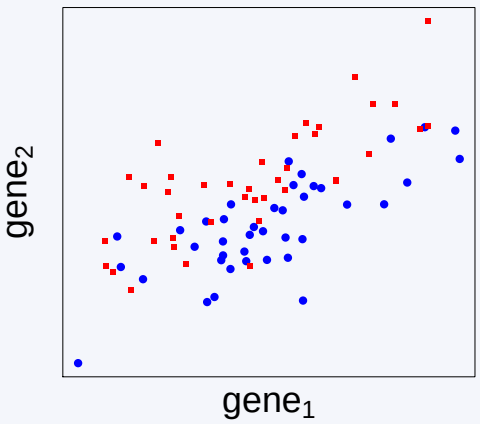
Two-step approach

- Test differential expression of genes,
- Test **enrichment** of gene sets in DE genes.

Issue : Not testing the right thing.

Two-Sample Tests of Differential Expression on Gene Networks

Multivariate Two-Sample Test



- Consider that samples arise from a **multivariate normal** distribution in gene set space.
- Test $\mu_1 = \mu_2$ using T^2 (Mahalanobis distance between samples).
- Issue : **Loses power quickly in high dimension.**
- Idea : Reduce dimension using network structure.