

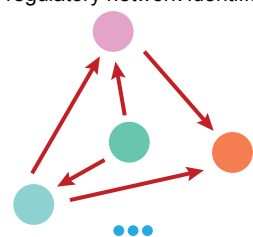
Canon

Output: Causal relationship

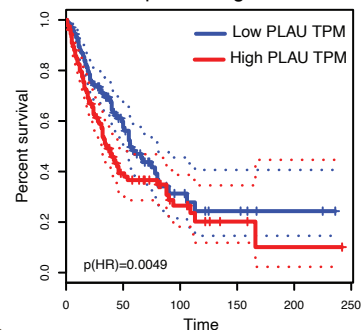
$$H_0: \alpha = 0$$

$$x \overset{?}{\rightarrow} y$$

Gene regulatory network identification

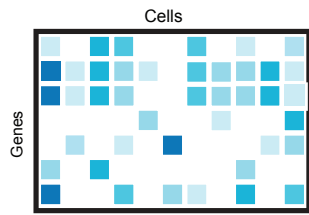


Clinical therapeutic targets detection



Data input

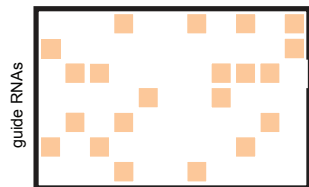
Single-cell CRISPR



High Low



Cells

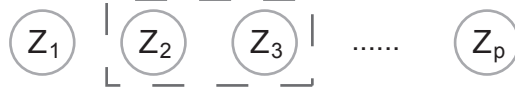


Perturbed Not perturbed

Perturbed gene expression

$$x = Z\beta + \epsilon_x$$

Instrumental variables selection



Downstream gene expression

$$y = Z\beta\alpha + Z\eta + \epsilon_y$$

Off-target effects adjustment

