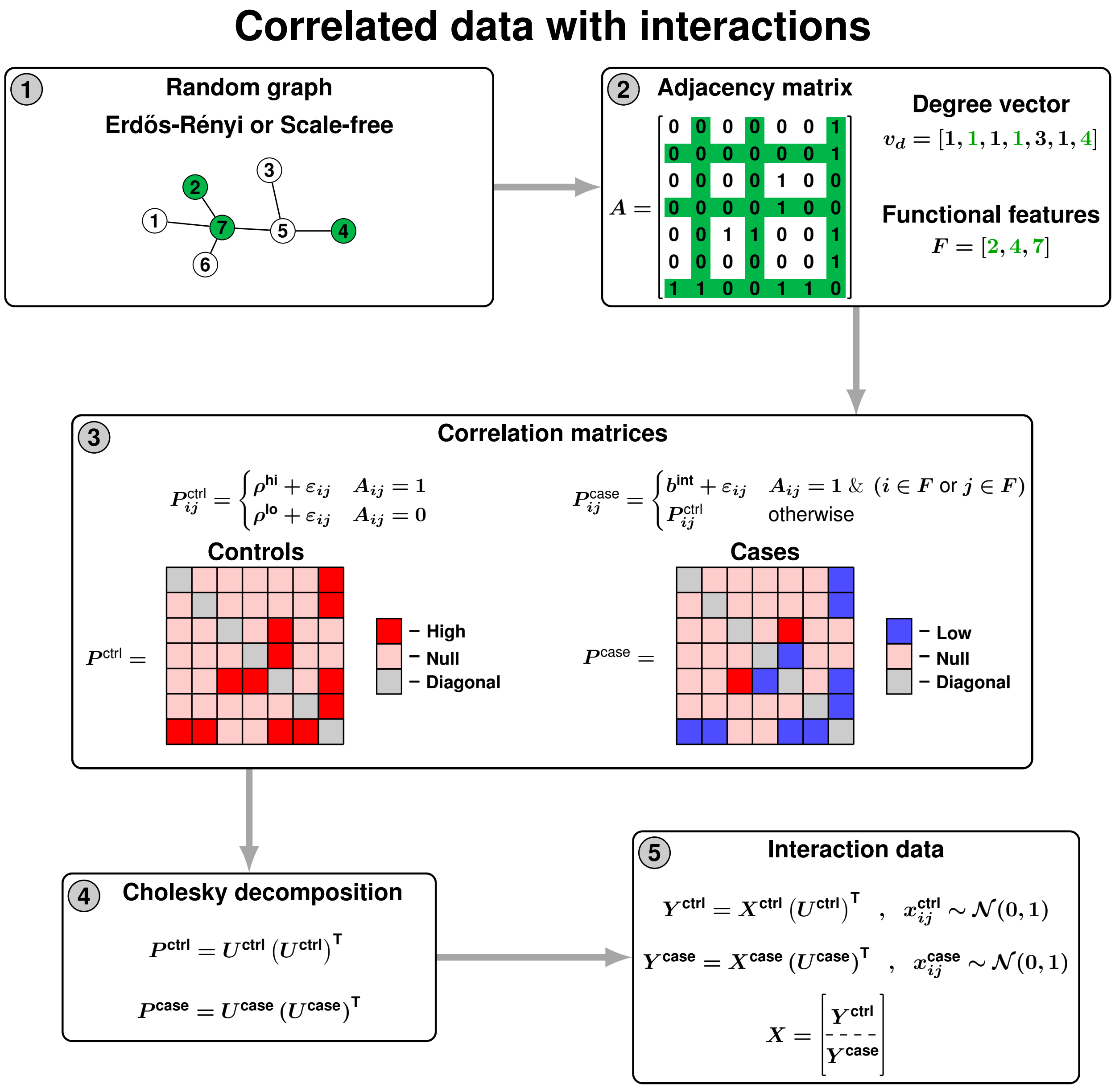
Correlated data with interactions
1
Random graph
Erdős-Rényi or Scale-free
2
Adjacency matrix
$A = \begin{bmatrix} 0&0&0&0&0&0&1\\ 0&0&0&0&0&0&1\\ 0&0&0&0&1&0&0\\ 0&0&0&0&1&0&0\\ 0&0&1&1&0&0&1\\ 0&0&0&0&0&0&1\\ 1&1&0&0&1&1&0 \end{bmatrix}$
Degree vector
$v_d = [1, 1, 1, 1, 3, 1, 4]$
Functional features
$F = [2, 4, 7]$
3
Correlation matrices
$P_{ij}^{\text{ctrl}} = \begin{cases} \rho^{\text{hi}} + \varepsilon_{ij} & A_{ij} = 1 \\ \rho^{\text{lo}} + \varepsilon_{ij} & A_{ij} = 0 \end{cases}$
$P_{ij}^{\text{case}} = \begin{cases} b^{\text{int}} + \varepsilon_{ij} & A_{ij} = 1 \;\&\; (i \in F \text{ or } j \in F) \\ P_{ij}^{\text{ctrl}} & \text{otherwise} \end{cases}$
Controls
$P^{\text{ctrl}} =$
High
Null
Diagonal
Cases
$P^{\text{case}} =$
Low
Null
Diagonal
4
Cholesky decomposition
$P^{\text{ctrl}} = U^{\text{ctrl}} \left(U^{\text{ctrl}}\right)^{\mathsf{T}}$
$P^{\text{case}} = U^{\text{case}} \left(U^{\text{case}}\right)^{\mathsf{T}}$
5
Interaction data
$Y^{\text{ctrl}} = X^{\text{ctrl}} \left(U^{\text{ctrl}}\right)^{\mathsf{T}}, \quad x_{ij}^{\text{ctrl}} \sim \mathcal{N}(0,1)$
$Y^{\text{case}} = X^{\text{case}} \left(U^{\text{case}}\right)^{\mathsf{T}}, \quad x_{ij}^{\text{case}} \sim \mathcal{N}(0,1)$
$X = \begin{bmatrix} Y^{\text{ctrl}} \\ \hdashline Y^{\text{case}} \end{bmatrix}$