Modelling and analysis of social network data from rank preferences

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0.1 Introduction

Hi How are you bruh?

0.2 Posterior

Let's define the posterior of the community representation.

$l((w);D) = \sum_{i=1}^{n}\sum_{k=1}^{p}(\alpha-1)ln(w_{i,k}) - \beta ln(w_{i,k}) + \sum_{i=1}^{n}\sum_{j=1}^{K} ln(\lambda_{i,\rho_j}) - ln(\sum_{j\neq i}\lambda_{i,j} - \sum_{l=1}^{j-1}\lambda_{i,\rho_l})$

To make the optimization easier, we can compute the gradient of the posterior according to the parameter $w_{r,s}$

With $\frac{\partial\lambda_{i,j}}{\partial w_{r,s}} = 1_{i=r}w_{j,s} + 1_{j=r}w_{i,s}$

We have : $\frac{\partial l((w);D)}{\partial w_{r,s}} = \frac{a-1}{w_{r,s}} - b + \sum_{j=1}^{K}\frac{1}{\lambda_{r,\rho_j^{(r)}}} w_{\rho_j^{(r)},s} + \sum_{i=1;i\neq r}^{n}\sum_{j=1}^{K}\frac{1}{\lambda_{i,r}} w_{i,s} 1_{\rho_j^{(r)}=r} - \sum_{j=1}^{K}\frac{1}{\sum_{j\neq r}\lambda_{r,j} - \sum_{l=1}^{j-1}\lambda_{r,\rho_l^{(r)}}}\sum_{j\neq r} w_{j,s} - \sum_{i=1;i\neq r}^{n}\sum_{j=1}^{K}\frac{1}{\sum_{j\neq i}\lambda_{i,j} - \sum_{l=1}^{j-1}\lambda_{i,\rho_l^{(i)}}} w_{i,s}$

$+ \sum_{j=1}^{K}\frac{1}{\sum_{j\neq r}\lambda_{r,j} - \sum_{l=1}^{j-1}\lambda_{r,\rho_l^{(r)}}}\sum_{l=1}^{j-1} w_{\rho_l^{(r)},s} + \sum_{i=1;i\neq r}^{n}\sum_{j=1}^{K}\frac{1}{\sum_{j\neq i}\lambda_{i,j} - \sum_{l=1}^{j-1}\lambda_{i,\rho_l^{(i)}}}\sum_{l=1}^{j-1} 1_{\rho_l^{(i)}=r} w_{i,s}$