Latent Space Model simulations

June 26, 2018

1 Independent Covariate

1.1 Description

This simulation tests the effect of adding additive and multiplicative random effects (latent factors) while fitting models with and without unobserved covariates.

1.2 Pseudo-code

```
Set intercept = -1
Set beta = [1, 1, 1]
Set gamma = 1
Set n = 20 (network size)
For each run:
  Set seed
  Generate X1
    Independently assign each node one of two groups, with equal
        probability.
    For each dyad (i,j),
      X1 = 1 if i and j are in the same group
      X1 = -1 if i and j are in different groups
  Generate X2
    Indpendently assign each node a "position" from a standard normal
        distribution.
    For each dyad (i,j), X2 = the "distance" between i and j
  Generate X3
```

```
    For each dyad, X3 = independent standard normal draw
Generate Z
    Same as X1, but independently generated
For each rep:
    Set seed
    Generate noise (epsilon): standard normal draw for each dyad
    Set Y1 = X1*beta[1] + X2*beta[2] + X3*beta[3] + epsilon
    Set Y2 = X1*beta[1] + X2*beta[2] + X3*beta[3] + gamma*Z + epsilon
    Fit the following models and record results:
        Y1 ~ X1 + X2 + X3
        Y1 ~ X1 + X2 + X3 + additive latent effects
        Y1 ~ X1 + X2 + X3 + additive + multiplicative latent effects
        Y2 ~ X1 + X2 + X3 + Z
        Y2 ~ X1 + X2 + X3 + Z + additive latent effects
        Y2 ~ X1 + X2 + X3 + Z + additive + multiplicative latent effects
```

1.3   Results

1.4   Files

- Code/independent_covariate.R

- Results/independent_covariate.R

- Code/indepenent_covariate_results_analysis.R

2   Independent Covariate - Additive

2.1   Description

This simulation is designed to be an extension of the first, except for independent covariates that would be "best" fit by additive random effects.