Making assorted networks by re-wiring

We will generate scale-free networks according to the parameters listed in Table 1 using the classic BA-algorithm. Following network generation, we will update the networks as following:

1. Assign nodes randomly as male (0) or female (1).
2. Calculate temporary value of sex-assortativity in the network (r_t).
3. If r_t is not within ϵ of r, randomly choose a proportion α of 0–1 edges (i.e, a male–female edge) if $r \geq 0$ and re-wire them or if $r < 0$, choose a proportion α of 0–0 and 1–1 edges and re-wire the.
4. Repeat step 3 until $|r_f - r_t| \leq \epsilon$.

Table 1: Design of pilot study to test rewiring algorithm.

Variable	Value
Sex-assortativity, r	-0.3, -0.2, - 0.1, 0, 0.1, 0.2, 0.3
Degree distribution, $p(k)$	$\frac{k^{-\alpha}}{\zeta(\alpha)}$
Mean degree, $<k>$	10
Network size, N	500, $1 \cdot 10^3$, $1.5 \cdot 10^3$
Tolerance, ϵ	0.035
Rewiring proportion, α	0.2

Notes:

- 15 replicates of each size and assortativity
- Takes less than one hour to run
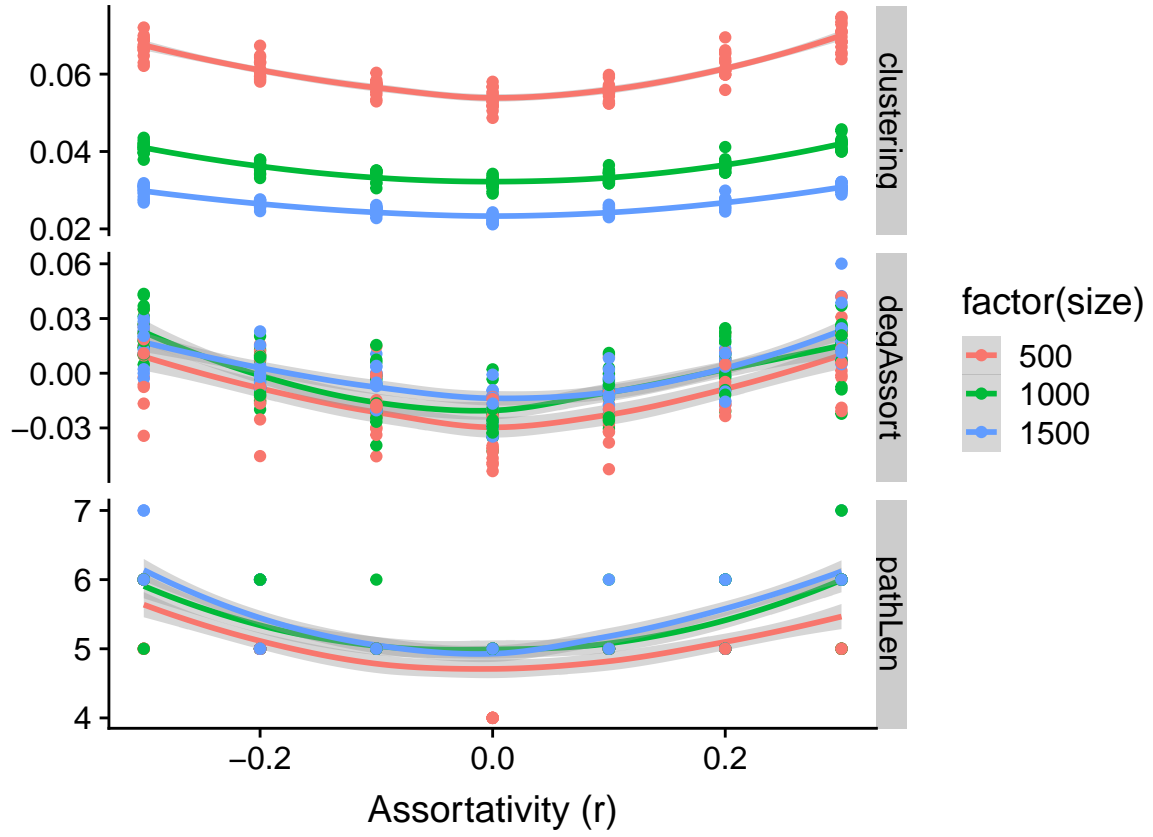- Algorithm needs to be re-run to remove multiple edges

Figure 1: Values of clustering, degree assortativity, and path length with varying assortativity for networks generated using rewiring algorithm.
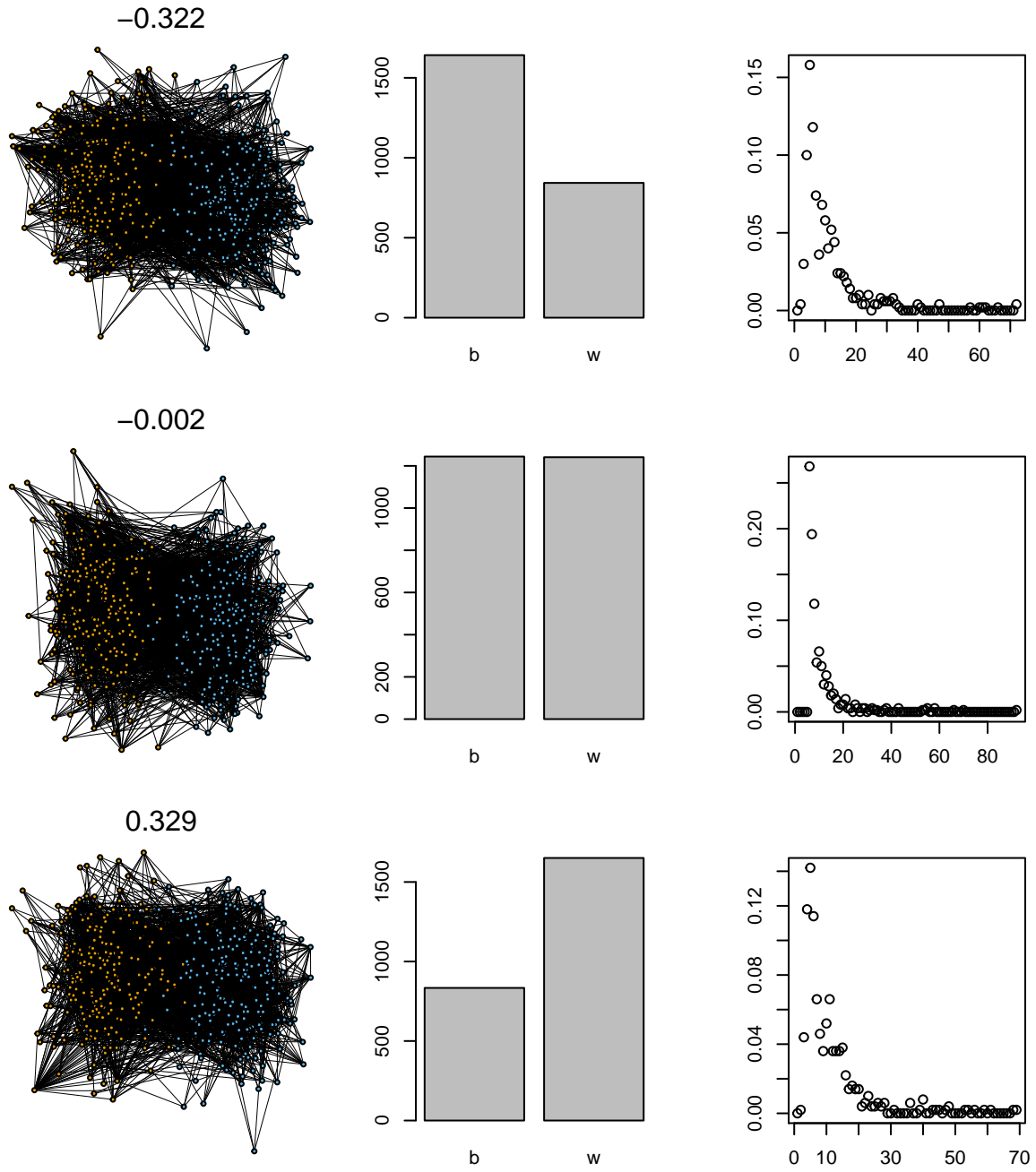
Figure 2: Networks generated using rewiring algorithm (N=500) with corresponding edge and degree distributions. Edge distribution shows number of edges within module (sex) and between module (sex).