University of Konstanz
Algorithmics Group
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Network Modeling
Winter Term 2011/2012

Assignments $\mathcal{N}^{\underline{o}}$ 2 - part i

released: 09.11.2011 **due:** 16.11.2011, 14:15h
(solutions can be handed over at the beginning of the lecture)

Task 1: $\mathcal{G}(n, c, p_1, p_2)$ as ERGM — 4 points

Reconsider the $\mathcal{G}(n, c, p_1, p_2)$ random graph model from the last assignments:

- Show that $\mathcal{G}(n, c, p_1, p_2)$ belongs to the ERGM class.
- How do the parameters p_1, p_2 of the $\mathcal{G}(n, c, p_1, p_2)$ model translate into the parameters of your ERG model?

Task 2: Dyad Dependency in ERGMs — 6 points

Let $\mathcal{G}$ the set of undirected, loopless graphs with $n = 3$ vertices and consider an exponential random graph model $(\mathcal{G}, P)$ with only one statistic, namely

(a) the *number of triangles* statistic $t(G)$ with associated parameter value $\ln 2$.

(b) the *the number of edges connecting actors with the same attribute value* statistic $m_a(G)$ with associated parameter value $\ln 2$. Let a divide the node set $\{1, 2, 3\}$ into *even* and *odd* numbers.

For each case, a) triangle statistic and b) homophily statistic, proof whether edge probabilities are dependent or independent. [note: in case b) there are different types of edges]