

[P14] Effect of degree cutoff on graphicality of scale-free networks*Yongjoo Baek, KAIST*

We study graphicality of scale-free networks with arbitrary degree cutoffs in the thermodynamic limit, which refers to realizability of degree sequences randomly generated with the degree exponent γ and the upper degree cutoff k_c as the number of nodes N goes to infinity. While a recent study[†] found that only degree sequences with $\gamma > 2$ or $\gamma < 0$ are graphical if $k_c = N - 1$ using the graphicality criterion proved by Erdős and Gallai[‡], we generalize the study to different upper cutoffs. To ensure graphicality of degree sequences, it is found that the upper cutoff must be lower than $k_c \sim N^{1/\gamma}$ for $\gamma < 2$, whereas any upper cutoff is allowed for $\gamma > 2$. This is also numerically verified, using both random and deterministic sampling of degree sequences. Our result can be interpreted as giving the fundamental constraint on the structure of scale-free networks, which is independent of network generation mechanism.

[†] C. I. Del Genio, T. Gross, and K. E. Bassler, *Phys. Rev. Lett.* **107**, 178701 (2011).

[‡] P. Erdős and T. Gallai, *Matematikai lapok* **11**, 264 (1960).