UPPER LARGE DEVIATIONS FOR POWER-WEIGHTED EDGE LENGTHS IN SPATIAL RANDOM NETWORKS

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ABSTRACT. We study the large-volume asymptotics of the sum of power-weighted edge lengths $\sum_{e\in E} |e|^\alpha$ in Poisson-based spatial random networks. In the regime $\alpha > d$, we develop a set of sufficient conditions under which the upper large deviations asymptotics are characterized by a condensation phenomena, meaning that the excess is caused by a negligible portion of Poisson points. Moreover, the rate function can be expressed through a concrete optimization problem. This framework encompasses in particular directed and undirected variants of the k-nearest neighbor graph, as well as suitable β-skeletons.