

# On the spectra and spectral radii of token graphs

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## Abstract

Let  $G$  be a graph on  $n$  vertices. The  $k$ -token graph (or symmetric  $k$ -th power) of  $G$ , denoted by  $F_k(G)$ , has as vertices the  $\binom{n}{k}$   $k$ -subsets of vertices from  $G$ , and two vertices are adjacent when their symmetric difference is a pair of adjacent vertices in  $G$ . In particular,  $F_k(K_n)$  is the Johnson graph  $J(n, k)$ , which is a distance-regular graph used in coding theory.

In this talk, we present some results concerning the (adjacency and Laplacian) spectrum of  $F_k(G)$  in terms of the spectrum of  $G$ . For instance, when  $G$  is walk-regular, an exact value for the spectral radius  $\rho$  (or maximum eigenvalue) of  $F_k(G)$  is obtained. When  $G$  is distance-regular, other eigenvalues of its 2-token graph are derived using the theory of equitable partitions.

Besides, a generalization of Aldous' spectral gap conjecture (which is now a theorem) is proposed.