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Average Distance and Maximum Induced Forest

With the help of the Graffiti system, Fajtlowicz conjectured around 1992 that the average distance between two vertices of a connected graph G is at most half the maximum order of an induced bipartite subgraph of G , denoted $\alpha_2(G)$. We prove a strengthening of this conjecture by showing that the average distance between two vertices of a connected graph G is at most half the maximum order of an induced forest, denoted $F(G)$. Moreover, we characterize the graphs maximizing the average distance among all graphs G having a fixed number of vertices and a fixed value of $F(G)$ or $\alpha_2(G)$. Finally, we conjecture that the average distance between two vertices of a connected graph is at most half the maximum order of an induced linear forest (where a linear forest is a union of chains).

This is joint work with Pierre Hansen (HEC Montréal) and Alain Hertz, Rim Kilani and David Schindl (Ecole Polytechnique de Montréal).