Packing List-Colorings and the Proper Connection Number of Connected Graphs

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The *proper connection number* of a connected graph G is the minimum number of colors t required for a proper connected t-coloring of G; that is, an edge coloring of G such that between every pair of distinct vertices there exists a properly colored path.

We also consider list and list-packing versions of this number. Given a list L-edge-assignment of G, with $|L| = k$, an *L-packing proper connected coloring* of G is a collection of k mutually disjoint proper connected colorings $c_1, c_2, \ldots, c_k$ of the edges of G; that is, these colorings satisfy the conditions that for every vertex $v \in V(G)$ we have $c_i(v) \in L(v)$, and $c_i(v) \neq c_j(v)$ whenever $i \neq j$.

We discuss the origin of list-packing colorings and provide new results on this topic.