On the chromatic edge stability index of graphs

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Given a non-trivial graph G, the minimum cardinality of a set of edges F in G such that $\chi'(G \setminus F) < \chi'(G)$ is called the chromatic edge stability index of G, denoted by $es_{\chi'}(G)$, and such a (smallest) set F is called a (minimum) mitigating set. In this talk we investigate graphs with extremal and near-extremal values of $es_{\chi'}(G)$. We establish that the odd cycles and K_2 are exactly the regular connected graphs with the chromatic edge stability index 1; on the other hand, we present that it is NP-hard to verify whether a graph G has $es_{\chi'}(G) = 1$. We also prove that every minimum mitigating set of an r-regular graph G, where $r \neq 4$, with $es_{\chi'}(G) = 2$ is a matching. Furthermore, we propose a conjecture that for every graph G there exists a minimum mitigating set, which is a matching, and prove that the conjecture holds for graphs G with $es_{\chi'}(G) \in \{1, 2, \lfloor n/2 \rfloor - 1, \lfloor n/2 \rfloor\}$, and for bipartite graphs.