α-Diperfect digraphs and BE-Diperfect digraphs

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In 1982, Berge [1] defined the class of α-diperfect digraphs. A digraph D is α-diperfect if every induced subdigraph of H of D satisfies the following property: for every maximum stable set S of H there is a path partition $\mathcal{P}$ of H in which every $P \in \mathcal{P}$ contains exactly one vertex of S. Berge conjectured a characterization of α-diperfect digraphs by forbidding some induced super-orientations of odd cycles. In 2018, Sambinelli, Nunes da Silva and Lee [3] proposed a similar class of digraphs. A digraph D is BE-diperfect if every induced subdigraph of H of D satisfies the following property: for every maximum stable set S of H there is a path partition $\mathcal{P}$ of H in which (i) every $P \in \mathcal{P}$ contains exactly one vertex of S and (ii) P either begins or ends at a vertex of S. They also conjectured that the BE-diperfect digraphs can be characterized by forbidding some induced super-orientations of odd cycles; we refer to this as the Begin-End Conjecture. In 2023, de Paula Silva, Nunes da Silva and Lee [2] presented an infinite family of counterexamples to Berge's Conjecture. On the other hand, these digraphs are not counterexamples to the Begin-End Conjecture. In this talk, we will present open problems and our recent results for these two classes of digraphs.

References

[1] C. Berge. Diperfect graphs. *Combinatorica*, 2(3):213–222, 1982.

[2] C. A. de Paula Silva, C. Nunes da Silva, and O. Lee. A family of counterexamples for a conjecture of Berge on α-diperfect digraphs. *Discrete Mathematics*, 346(8):113458, 2023. ISSN 0012-365X.

[3] M. Sambinelli. *Partition problems in graphs and digraphs*. PhD thesis, Universidade Estadual de Campinas - UNICAMP, 2018.