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The Betti Numbers on the Linear Strand and a Bound on the Regularity for Path Ideals of Rooted Trees

Let $\Gamma = (V, E)$ be a finite, simple graph having vertex set $V = \{x_1, \dots, x_n\}$ and edge set E . Furthermore, let k be a field and identify V with the variables in the polynomial ring $S := k[x_1, \dots, x_n]$. Associated to Γ is the edge ideal $I_\Gamma \subset S$ where the minimal generating set of I_Γ corresponds to the edge set, E , of Γ . Since an edge can be viewed as a path of length 1, the notion of an edge ideal can be generalized to that of a path ideal. Given a positive integer t , we let $I_t(\Gamma) \subset S$ be the ideal whose minimal generating set corresponds to the length $t - 1$ paths in Γ . In this talk, we will consider the situation where Γ is a directed, rooted tree on a finite vertex set. For this case, we provide an explicit formula for the Betti numbers occurring on the linear strand of $S/I_t(\Gamma)$ for $t \geq 2$ as well as provide a bound for the Castelnuovo-Mumford regularity of $S/I_t(\Gamma)$ for $t \geq 2$.