Existence of maximal ideals in Leavitt path algebras

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Abstract

The origin of the algebraic structure Leavitt path algebra, which is constructed on a directed graph, partly lies on rings not having IBN. A ring R is said to have Invariant Basis Number property, or more simply IBN, in case no two free left R-modules of different rank are isomorphic. In the 1960's, W. G. Leavitt constructed some non-IBN algebras - what we now call Leavitt algebras. The Leavitt path algebra of a directed graph with one vertex and m loops turns out to be Leavitt algebra R of type $(1, m)$, that is a non-IBN algebra where R is isomorphic to m-copies of R as a left module and not isomorphic to n-copies of R for any $1 < n < m$. Another interesting connection of this structure to analysis is that, a Leavitt path algebra over the complex field is a dense subset of the graph C^*-algebra it is associated with. This structure has been of interest for the last 15 years and widely studied by both algebraists and analysts.

It is well-known that in a ring with identity, any ideal is contained in a maximal ideal, however for a non-unital ring the existence of a maximal ideal is not always guarantied. Also, any maximal ideal is not necessarily a prime ideal in a non-unital case. In this talk, for the particular example of a Leavitt path algebra (which is non-unital if the number of vertices of the graph on which it is constructed, is infinite) we discuss the existence of maximal ideals and its characterization via the graph properties. Following the literature, we will also talk about the graded and non-graded prime and primitive ideal structure of Leavitt path algebras.