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Exceptional Modules over Hereditary Algebras

This talk starts by a short reference to the fact that over an algebraically closed field K, every basic, connected, finite dimensional hereditary algebra A is isomorphic to a path algebra KQ, where Q is a finite, connected and acyclic quiver. This may suffice to believe that studying the path algebra of these simple quivers leads to interesting results in some other areas. Hence, each finite dimensional module over A could be considered as a structure on the associated quiver Q, called a representation of Q, which will be introduced via examples, and the notion of dimension vector becomes clear.

As a bit more technical aim, I will talk about the idea of canonical decomposition of a given dimension vector. In particular, we will look at some of the motivations for this problem, addressed by V. Kac, A. Schofield and some others. Namely, a generic behaviour (in the sense of algebraic geometry) that occurs in the affine variety $Rep(Q, \alpha)$, where points are representations of the quiver Q, all of the same dimension vector α. This is important if we recall that by the well-known Krull-Schmidt theorem every finite dimensional module M over A uniquely decomposes into indecomposable summands.

Although the problem could be stated in a more general setting, in this talk we assume Q is finite, connected and acyclic. If time permits, a class of modules with strong homological properties, known as Exceptional, will be introduced and their prominent role in the canonical decomposition will be highlighted.