In this dissertation, we solve a conjecture raised by Victor Kac in 1982 concerning the so-called locally semi-simple representations of quivers. A quiver is a directed graph, and a representation of a quiver is an assignment of vector spaces and (appropriately sized) linear maps to each vertex and arrow, respectively. One of the fundamental questions in the representation theory of quivers (more generally, of finite-dimensional algebras) is to classify all indecomposable representations. Based on the complexity of the indecomposable representations, quivers come in three flavors: finite, infinite-tame, or wild. Especially in the wild case, the classification problem is known to be very difficult (if not impossible). Therefore, one is naturally led to study special classes of quiver representations.

The main objects of study in this dissertation are the so-called locally semi-simple representations. They arise most naturally when studying quiver representations within the general framework of invariant theory. The main result of this dissertation shows that an acyclic quiver is tame (i.e. either Dynkin or Euclidean) if and only if every representation with a semi-simple endomorphism ring is in fact locally semi-simple. This result confirms Kac’s conjecture and shows the validity of Kac’s conjecture precisely captures the tameness of a quiver.