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Modules over bialgebroids and Beck modules

In his 1967 thesis, Beck proposed a notion of module over an object in a category. This provided a natural notion of coefficient module for André-Quillen (co)homology of any algebraic structure, generalizing the original case of commutative rings. In some cases, such as groups or Lie algebras, Beck modules are encoded by a bialgebra. The comultiplication then induces a well-behaved tensor product of modules. In work in progress with Raveen Tehara, we investigate "bialgebras with many objects" as a more general framework to encore Beck modules, where the tensor product of modules is still available. We will look at examples that fit into this framework but not that of bialgebras.