Induced and coinduced modules in cluster-tilted algebras

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Let C be a tilted algebra and B the corresponding cluster-tilted algebra. We consider induction from mod C to mod B via the tensor product with B. It turns out that this functor has some interesting properties such as each projective B-module is induced by the corresponding projective C-module, but induction of any injective C-module results in the exact same module. Similarly, we introduce a dual construction called coinduction functor. Using both functors we construct an explicit injective resolution of each projective B-module. This gives rise to another proof of the known result that cluster-tilted algebras are 1-Gorenstein.

Moreover, if B is representation finite then every module is both induced and coinduced from some tilted algebra C. If B is not representation finite then every transjective module in B is either induced or coinduced from some C. However, the situation with regular modules turns out to be more complicated.

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