Dokuz Eylül University Faculty of Science
Department of Mathematics

SEMINAR

Pure Homological Algebra on Grothendieck Monoidal Categories

Sinem Odabaşı

Universidad de Murcia
email: sinem.odabasi1@um.es

ABSTRACT

For any commutative ring R, R-Mod and R-mod denote the category of R-modules and finitely presented R-modules, respectively. Then R may be viewed as an additive category having just one object R with morphism group $\mathrm{Hom}(R, R) := R$. Then R-Mod is just the category $\mathrm{Add}(R, \mathrm{Ab})$ of additive abelian group valued functors. Conversely, for a small additive category A, $\mathrm{Add}(A, \mathrm{Ab})$ can be seen as a generalization of a ring. This comparison between modules and functors plays an important role in (Relative) Homological Algebra and Representation Theory. Among them, it helps us to handle the pure-exact structure in R-Mod as the usual exact structure of certain subcategories of S-Mod, for some ring S with enough idempotents. These correspondences are precisely given by functors $\mathrm{Hom}(-,-)$ and $-\otimes-$. In [Craw94], it was shown that the Hom functor would continue doing its duty for any additive category $\mathcal{A}$ whenever $\mathcal{A}$ is locally finitely presentable.

In this talk, we claim to work on the second case, i.e., the link between purity and functor categories through the tensor functor $-\otimes-$ when a category $\mathcal{V}$ has a symmetric closed monoidal structure $\otimes$. For that, we are needed to deal with not only additive but also $\mathcal{V}$-enriched functors. Then we see that the theory can be developed for Grothendieck and locally finitely presentable base categories. Later, we see the applicability of the result on certain nontrivial examples such as the category of complexes and quasi-coherent sheaves. This is a joint work with Henrik Holm.

References

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Adress: Department of Mathematics, Faculty of Science, Dokuz Eylül University, Tınaztepe Campus, 35390, Buca, İzmir, Turkey