

- MARCOS MAZARI-ARMIDA, *Characterizing some classes of rings via superstability*. Department of Mathematical Sciences, Carnegie Mellon University, 5000 Forbes Ave, USA.

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In his work towards proving Shelah's categoricity conjecture (a generalization of Morely's categoricity theorem), Shelah introduced limit models as a replacement for saturated models. It turns out that the uniqueness of limit models in a tail of cardinal is an important property that extends the notion of superstability to AECs and which is equivalent to superstability for first-order theories. Thus an AEC is superstable if and only if it has uniqueness of limit models in a tail of cardinals.

In this talk, we show that the model-theoretic notion of superstability can be used to characterize several well-studied classes of rings.

THEOREM 1. *Let  $R$  an associative ring with an identity element.*

- *$R$  is left noetherian if and only if the class of left  $R$ -modules with embeddings is superstable.*
- *$R$  is left pure-semisimple if and only if the class of left  $R$ -modules with pure embeddings is superstable.*
- *$R$  is left perfect if and only if the class of flat left  $R$ -modules with pure embeddings is superstable.*
- *$R$  is left artinian if and only if the class of left  $R$ -modules with embeddings is superstable and the class of flat right  $R$ -modules with pure embeddings is superstable.*

It is worth mentioning that the class of flat left  $R$ -modules is not first-order axiomatizable. Therefore, the results of this talk use in an indispensable way non-elementary notions.

This talk is based on [1] and [2].

[1] MARCOS MAZARI-ARMIDA, *Superstability, noetherian rings and pure-semisimple rings*, **submitted**, <https://arxiv.org/abs/1908.02189> .

[2] MARCOS MAZARI-ARMIDA, *On superstability in the class of flat modules and perfect rings*, **submitted**, <https://arxiv.org/abs/1910.08389> .