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*Theory of interleavings on categories with lax  $[0, \infty)$ -action and the hom tree functor.*

The interleaving distance is a powerful tool in TDA which has been shown to provide a metric for such topological signatures as persistence diagrams and Reeb graphs. In this talk we generalize the idea of interleavings to a broader class of objects, namely categories with lax  $[0, \infty)$ -action. This allows us to show that many commonly used distances, such as the  $L_\infty$  and Hausdorff metrics, are in fact special cases of interleaving distances. In addition, there is a natural way to define morphisms between these categories that generalizes the stability results of TDA to a broad class of objects by showing that the morphisms are 1-Lipschitz. As an application of this result, we will give an example of such a morphism, known as the hom-tree functor, which provides a new bound on the Reeb graph interleaving distance. (Received September 17, 2016)