Harder-Narasimhan and Persistence modules: single central charge

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The Harder-Narasimhan type of a quiver representation is a discrete invariant parameterised by a real-valued function (called a central charge) defined on the vertices of the quiver. We investigate the strength and limitations of the Harder-Narasimhan type for several families of quiver representations which arise in Topological Data Analysis. In order to evaluate the discriminative power of this invariant, we consider families of persistence modules whose irreducible decomposition is known: (1) for zigzag (and hence, ordinary) persistence modules, we completely characterise the set of central charges for which the Harder-Narasimhan type is a complete invariant (2) we extend the preceding characterisation to rectangle-decomposable multiparameter persistence modules of arbitrary dimension; and finally, (3) in the framework of persistence of circle-valued maps, we show that the barcode can be partially recovered using the Harder-Narasimhan type with a suitable choice of central charge.

This work is detailed in the following preprints https://arxiv.org/abs/2303.16075 (Sections 4 and 5.2) and https://arxiv.org/abs/2211.07553.

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