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We define a simple, explicit map sending a morphism $f : M \rightarrow N$ of pointwise finite dimensional persistence modules to a matching between the barcodes of M and N . Our main result is that, in a precise sense, the quality of this matching is tightly controlled by the lengths of the longest intervals in the barcodes of $\ker f$ and $\operatorname{coker} f$. As an immediate corollary, we obtain a new proof of the algebraic stability of persistence, a fundamental result in the theory of persistent homology. In contrast to previous proofs, ours shows explicitly how a δ -interleaving morphism between two persistence modules induces a δ -matching between the barcodes of the two modules. Our main result also specializes to a structure theorem for submodules and quotients of persistence modules.

Joint work with Michael Lesnick (IMA, Minneapolis, MN).