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**Henry Adams\*** (henrya@math.stanford.edu), 76 Barnes Court, #101, Stanford, CA 94305,  
and **Gunnar Carlsson** and **Atanas Atanasov**. *Topological data analysis and the nudged elastic  
band method*. Preliminary report.

Imagine one has a dataset  $X$  which is a finite and possibly noisy sampling of an unknown space  $Y \subset \mathbb{R}^n$ . Using only  $X$ , can one recover information about  $Y$ ? With persistent homology, one can estimate the homology groups  $H_*(Y)$  (see *Computing persistent homology*). We present another approach, in which we assume  $Y$  is a CW complex and we approximate its  $k$ -skeleton  $Y^k$ . For  $k = 1$ , our approach is an adaptation of the nudged elastic band method (NEB) from chemistry, which locates minimum energy transition paths between stable configuration states (see *Nudged elastic band method for finding minimum energy paths of transitions*). We note two ways in which our NEB method may be of use. First, in the persistent homology pipeline, it may help one find a model for  $Y$  matching the estimated homology groups. Second, it may reduce the need to restrict to dense core subsets of  $X$ , as is often necessary before applying persistent homology. We test the NEB method on several datasets. (Received September 23, 2009)