1154-68-2004 **Adam Brown**, **Omer Bobrowski**, **Elizabeth Munch** and **Bei Wang*** (beiwang@sci.utah.edu), Scientific Computing and Imaging Institute, University of Utah, 72 South Central Campus Drive, Salt Lake City, UT 84112. *Probabilistic Convergence and Stability of Random Mapper Graphs.* Preliminary report.

We study the probabilistic convergence between the mapper graph and the Reeb graph of a topological space X equipped with a continuous function $f : X \to R$. Our techniques are based on the interleaving distance of constructible cosheaves and topological estimation via kernel density estimates. Following Munch and Wang (2018), we first show that the mapper graph of (X, f) approximates the Reeb graph of the same space. We then construct an isomorphism between the mapper of (X, f) to the mapper of a super-level set of a probability density function concentrated on (X, f). Finally, building on the approach of Bobrowski et al. (2017), we show that, with high probability, we can recover the mapper of the super-level set given a sufficiently large sample. We introduce a variant of the classic mapper graph of Singh et al. (2007), referred to as the enhanced mapper graph. We show that the enhanced mapper graph reduces the information loss during summarization and may be of independent interest. Our work is the first to consider the mapper construction using the theory of cosheaves in a probabilistic setting. It is part of an ongoing effort to combine sheaf theory, probability, and statistics, to support topological data analysis with random data. (Received September 17, 2019)