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Edgar Lobaton*, edgar.lobaton@ncsu.edu, and **Qian Ge**. *A Consensus-Based Framework for Image Segmentation using Topological Persistence*. Preliminary report.

It is unlikely for a single algorithm with a fixed set of parameters to segment a group of images successfully due to the broad variety of content that can be present in each image. However, it can be observed that the desired segmentation boundaries are often detected more consistently than other boundaries in the output of state-of-the-art segmentation results. We propose a new approach to capture the consensus of information from a set of segmentations generated by varying parameters of different algorithms. First, a probabilistic model is introduced which captures the likelihood of the discrete combinatorial structure present in a segmentation, as well as the variability of a specific segmentation as bounded perturbations of their boundaries. This model is used to construct a disconnectivity probability map which identifies the likelihood of having a segmentation boundary present in a small neighborhood. A formal analysis illustrates the conditions under which we can recover a covering set for the boundaries of a good segmentation from this probability map. In order to identify some candidates for good segmentations from real images, we analyze the level-sets of the disconnectivity probability map using tools from topological persistence. (Received August 29, 2016)