1163-05-145 **Beate G. Zimmer*** (beate.zimmer@tamucc.edu) and **Reid B. Porter**. *Rand Error Calculations for Watershed Segmentations and Connected Component Segmentations.* Preliminary report.

To segment images, a notion of affinities between adjoining pixels is helpful. We assume that affinities are real-valued and unique, with positive affinities denoting similarity and negative affinities denoting dissimilarity. With those affinities, an image becomes as a 4-connected weighted graph. Kruskal's algorithm greedily constructs a maximum spanning tree. Both connected components (CC) and watershed (WS) segmentations can be done through deciding which edges of an MST to cut. For CC, the negative MST edges are cut, for WS only edges, all of whose MST neighbors on at least one side have a lower weight than the edge in question are cut. In using edge-errors to assess a segmentation, one misclassified edge might connect two large segments but still have a very low error. The Rand error calculates the error over all pixel pairs and is then normalized by the number of pixel pairs. We show how to adapt Kruskal's algorithm to keep track of how many correct and incorrect new connections each edge that is added to the MST makes. We then approximate the Rand error with a differentiable loss function and use deep learning to learn the affinities in a new image with this loss function. This method also extends to a hierarchy of a watershed cut followed by a connected component cut. (Received August 22, 2020)