E. Garduño and G.T. Herman, Superiorization of the ML-EM algorithm, *IEEE Transactions on Nuclear Science*, Vol. 61, pp. 162-172, (**2014**). DOI:10.1109/TNS.2013.2283529.

A reconstructed image in positron emission tomography (PET) should be such that its likelihood, assuming a Poisson model, is high given the observed detector readings. The expectation maximization (EM) methodology leads to an iterative algorithm, called ML-EM, that converges in the limit to an image that maximizes this likelihood. An undesirable property of the algorithm is that it produces images with irregular high amplitude patterns as the number of iterations increases. One approach to alleviate these high amplitude patterns is to use a stopping rule that terminates the process before the appearance of the undesirable high amplitude patterns; one recently-proposed stopping rule results in the method called MLEM-STOP. This paper takes a different approach by applying the recently developed superiorization methodology to ML-EM. Superiorization is an automated procedure for turning an iterative algorithm for producing images that satisfy a primary criterion (in our case that of having a high likelihood given the observed detector readings) into its superiorized version that will be as good as the original algorithm according to the primary criterion, but will in addition produce images that are also good according to a secondary criterion. The approach is demonstrated for two secondary criteria, one provided by an assumed Gaussian prior distribution and the other based on total variation minimization. It is demonstrated that the superiorization methodology achieves its aim for both these criteria. It is further shown by a study, using statistical hypothesis testing on simulated collection of PET data from the human head, that for either secondary criterion the superiorized version of ML-EM outperforms MLEM-STOP for the task of estimating activity within neuroanatomical structures.