Part I
Image

1 Segmentation

1.1 Qaiser 2017

This paper [1] applies 1) persistent homology to extract features, 2) CNN to classify, and 3) Ensemble Random Forest to tumor segmentation problems.

1.1.1 Motivation

Different Topological Structure for tumor and normal regions. Specifically, degree of connectivity is different. So quantify these features by PH.

1.1.2 Method

Overview Use CNN to divide to patches, PH to create PH profiles, use KLD (Kullback-Leibler divergence) as a distance function between the profiles to perform kNN.

2 Classification

2.1 Chittajallu 2018

This paper [2] uses persistence landscape and persistence image to train machine learning models.

References

[1] T. Qaiser, Y.-W. Tsang, D. Epstein, and N. Rajpoot, "Tumor segmentation in whole slide images using persistent homology and deep convolutional features," in *Medical Image Understanding and Analysis* (M. Valdés Hernández and V. González-Castro, eds.), (Cham), pp. 320–329, Springer International Publishing, 2017.

[2] D. R. Chittajallu, N. Siekierski, S. Lee, S. Gerber, J. Beezley, D. Manthey, D. Gutman, and L. Cooper, "Vectorized persistent homology representations for characterizing glandular architecture in histology images," in *2018 IEEE 15th International Symposium on Biomedical Imaging (ISBI 2018)*, pp. 232–235, April 2018.