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Analysis of lung cancer image features associated with survival

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Lung cancer is one of the most common causes of cancer-related death in men and women throughout the world. An appropriate statistical model for survival analysis can provide assistance for treatment for lung cancer. The previous prognostic decision usually comes from manual pathologic interpretation of whole-slide microscopic image by skilled pathologist, which is obviously time consuming and biased. Currently, there is no standard way in which the feature information of microscopic image is applied into the diagnosis and therapy. In this paper, we propose an integrated framework for so-called image-based unbiased system that get prognostic decisions as output automatically when we input patients' images, which includes cell detection, segmentation, and statistical model for survival analysis. 121 patients information from TCGA has been used. We present a robust seed detection-based cell segmentation algorithm, which can accurately segment out individual cells. Based on cell segmentation, a set of cellular features are extracted using efficient feature descriptors. Due to the existence of high dimension of the data, we apply L1 regularization Cox model and surely independent screening (SIS) to reduce dimension in survival, then we chose the cut off of risk score by minimize AUC. Patients were classified into two groups (low-risk and high risk) and achieve significant difference of survival. Testing data set from UK clinical hospital was used to observe model performance on independent data.

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