

Joint histogram

A joint [histogram](#) is a multidimensional histogram created from a set of local pixel features. An entry in a joint histogram counts the number of pixels in the image that is described by a particular combination of feature values. Joint histograms can be compared with the same measures as color histograms.

The [joint histograms](#) of decomposed anisotropic and isotropic components of [DTI](#) were constructed in both contrast-enhancing and nonenhancing [tumor](#) regions. Patient [survival](#) was analyzed with joint histogram features and relevant clinical factors. The incremental prognostic values of histogram features were assessed using [receiver operating characteristic curve analysis](#). The correlation between the proportion of [diffusion](#) patterns and [tumor progression](#) rate was tested using the [Pearson's correlation coefficient](#).

They found that joint histogram features were associated with patient [survival](#) and improved survival model performance. Specifically, the proportion of nonenhancing tumor subregion with decreased isotropic diffusion and increased anisotropic diffusion was correlated with tumor progression rate ($P = .010$, $r = 0.35$), affected progression-free survival (hazard ratio = 1.08, $P < .001$), and overall survival (hazard ratio = 1.36, $P < .001$) in multivariate models.

Joint histogram features of [DTI](#) showed incremental prognostic values over clinical factors for [glioblastoma](#) patients. The nonenhancing tumor subregion with decreased isotropic diffusion and increased anisotropic diffusion may indicate a more infiltrative habitat and potential treatment target

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Li C, Wang S, Yan JL, Piper RJ, Liu H, Torheim T, Kim H, Zou J, Boonzaier NR, Sinha R, Matys T, Markowitz F, Price SJ. Intratumoral Heterogeneity of Glioblastoma Infiltration Revealed by Joint Histogram Analysis of Diffusion Tensor Imaging. *Neurosurgery*. 2019 Oct 1;85(4):524-534. doi: 10.1093/neuros/nyy388. PubMed PMID: 30239840.

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Last update: **2024/06/07 02:59**

