

## Gray Level Co-occurrence Matrix (GLCM) Texture Features Analysis for Brain Tumor Classification Using MRI

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Medical imaging Physics is rapidly developing area of research in the world. The Gray-Level Co-occurrence Matrix (GLCM) is a method for extracting texture information from the medical images. Magnetic Resonance Image (MRI) is a non-invasive modality commonly used in cancer diagnosis. Tumors are classified as benign or malignant based on their biological behavior, histological characteristics, and potential for metastasis. This study applies GLCM texture feature analysis to classify brain MR images into benign tumors, malignant tumors, and normal brains. The aim is to differentiate between benign and malignant tumors and normal brains using GLCM features and to identify the most suitable machine learning model for classification. The features Contrast, Correlation, Energy, Homogeneity, Dissimilarity, Angular Second Moment (ASM), Entropy, Auto-correlation, Variance, Inverse Difference Momentum (IDM), Sum Average, Sum Entropy, Sum Variance, Different Entropy, and Different Variance in GLCM are used in this study. DICOM format images were used to select tumor ROIs (Region of Interests) in the MR images. ROIs were manually selected using MATLAB, and corresponding texture feature values were extracted. Statistical analysis was used to compare the feature values to identify the discriminant tumors and normal brains. ANOVA F-test was used to select the best feature performance. These features were then used to identify the most effective machine learning model. Among the features, correlation yielded the lowest ANOVA F-score (2.409331) and was excluded from further analysis. The Support Vector Machine (SVM) model demonstrated the highest classification accuracy of 86.67%. Therefore, SVM can be used to differentiate between malignant tumors, benign tumors, and normal brains with high accuracy. The study concludes that GLCM features excluding correlation can effectively differentiate malignant tumors, benign tumors, and normal brains. The SVM model enables the development of a high-performance ML model that can assist in the decision-making steps of the brain tumor diagnosis process in MRI.

**Keywords:** MRI, tumors, GLCM texture features, DICOM