
# Texture Based Computational Models of Glioblastoma Phenotypes in Radiological Images

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## Introduction

Quantitative image analysis can make better use of the MRI data content by comprehensive image features analysis. The latter effort has created the new field of “radiomics”. Our goal is to apply radiomics to the three phenotypes of GBM (necrosis, contrast enhancement, and edema) using computation of texture features based on Laplacian of Gaussian (LoG) filter.

## Methods

Multi-texture types were applied to 41 GBM patients (Necrosis (N) = 36 samples, Contrast Enhancement (CE) = 41 samples, Edema (E) = 40 samples) data which were obtained from the cancer genome atlas (TCGA). Utilizing T1 post contrast and its corresponding fluid attenuated inversion recovery (FLAIR) by 3D Slicer tool, we rigidly registered images and segmented GBM phenotypes. Texture extraction from each of phenotypes was performed using the LoG. A total of nine texture features derived from quantified functions, namely, average, standard deviation and entropy, were calculated for each of the GBM phenotypes. A comparative study based on the three predictive models (Decision tree {DT}, discriminant analysis {DA}, and probabilistic neural network {PNN}) was used to discriminate between GBM phenotypes.

## Results

Experimental evaluation showed that the texture feature extraction based on LoG provide the highest accuracy, sensitivity and specificity value of 87.18%, 97.22%, and 97.53% respectively. Moreover, from 36 N, 41 CE and 40 E phenotypes, confusion matrix showed that 35 N, 35 CE and 32 E were correctly classified using DA classifier.

## Conclusions

The proposed computational model was able to provide a wide range of textures and phenotype structures. This type of radiomic texture has the potential to accurately and automatically identify and quantitate GBM phenotypes.

## Learning Objectives

We recommend using the format, "By the conclusion of this session, participants should be able to: 1) Describe the importance of texture analyses to identify GBM phenotypes, 2) Discuss, in small groups, the scientifc approach of texture analysis, 3) Identify an effective treatment pathways involving texture analysis