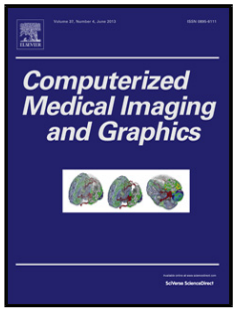

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Deep convolutional neural networks for automatic classification of gastric carcinoma using whole slide images in digital histopathology

Harshita Sharma[a,*], Norman Zerbe[b], Iris Klempert[b], Olaf Hellwich[a], Peter Hufnagl[b]

[a] *Computer Vision and Remote Sensing, Technical University Berlin, Berlin, Germany*
[b] *Department of Digital Pathology and IT, Institute of Pathology, Charité University Hospital, Berlin, Germany*

Abstract

Deep learning using convolutional neural networks is an actively emerging field in histological image analysis. This study explores deep learning methods for computer-aided classification in H&E stained histopathological whole slide images of gastric carcinoma. An introductory convolutional neural network architecture is proposed for two computerized applications, namely, *cancer classification* based on immunohistochemical response and *necrosis detection* based on the existence of tumor necrosis in the tissue. Classification performance of the developed deep learning approach is quantitatively compared with traditional image analysis methods in digital histopathology requiring prior computation of handcrafted features, such as statistical measures using gray level co-occurrence matrix, Gabor filter-bank responses, LBP histograms, gray histograms, HSV histograms and RGB histograms, followed by random forest machine learning. Additionally, the widely known AlexNet deep convolutional framework is comparatively analyzed for the corresponding classification problems. The proposed convolutional neural network architecture reports favorable results, with an overall classification accuracy of 0.6990 for cancer classification and 0.8144 for necrosis detection.

Keywords: Deep learning, Convolutional neural networks, Gastric carcinoma, Digital pathology, Histopathological image analysis, Cancer classification, Necrosis detection

*Corresponding author
Email address: harshita.sharma@campus.tu-berlin.de (Harshita Sharma)
URL: www.cv.tu-berlin.de (Harshita Sharma)