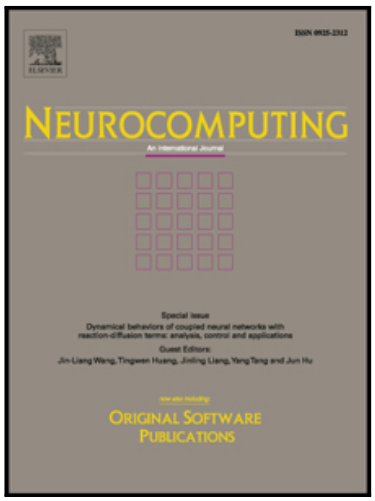

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Optimizing the Cervix Cytological Examination based on Deep Learning and Dynamic Shape Modelling

Afaf Tareef[a,*], Yang Song[a], Heng Huang[b], Yue Wang[c], Dagan Feng[a], Mei Chen[d,e], Weidong Cai[a]

[a] *Biomedical and Multimedia Information Technology (BMIT) Research Group, School of Information Technologies, University of Sydney, Australia.*
[b] *Department of Computer Science and Engineering, University of Texas at Arlington, USA.*
[c] *Bradley Department of Electrical and Computer Engineering, Virginia Polytechnic Institute and State University, USA.*
[d] *Computer Engineering Department, University of Albany State University of New York, USA*
[e] *Robotics Institute, Carnegie Mellon University, USA*

Abstract

The task of segmenting nuclei and cytoplasm in Papanicolau smear images is one of the most challenging tasks in automated cervix cytological analysis owing to the high degree of overlapping, the multiform shape of the cells and their complex structures resulting from inconsistent staining, poor contrast, and the presence of inflammatory cells. This article presents a robust variational segmentation framework based on superpixelwise convolutional neutral network and a learned shape prior enabling an accurate analysis of overlapping cervical mass. The cellular components of Pap image are first classified by automatic feature learning and classification model. Then, a learning shape prior model is employed to delineate the actual contour of each individual cytoplasm inside the overlapping mass. The shape prior is dynamically modelled during the segmentation process as a weighted linear combination of shape templates from an over-complete shape dictionary under sparsity constraints. We provide quantitative and qualitative assessment of the proposed method using two databases of 153 cervical cytology images, with 870 cells in total, synthesised by accumulating real isolated cervical cells to generate overlapping cellular masses

*Corresponding author
Email address: atar8654@uni.sydney.edu.au (Afaf Tareef)