Perspective
Volume 10:11, 2021

Journal of Integrative Oncology

ISSN: 2329-6771 Open Access

Automated Segmentation of Nucleus, Cytoplasm, and Background of Pap-Smear Images Using a Trainable Pixel Level Classifier

Unnati Bhatia*

Department of Internal Medicine, Maulana Azad Medical College, New Delhi, India

Introduction

Cervical cancer ranks as the fourth most prevalent cancer affecting women worldwide and its early detection provides the opportunity to help save a life. Automated diagnosis and classification of cervical cancer from pap-smear images has become a necessity as it enables accurate, reliable and timely analysis of the condition?progress. Segmentation is a fundamental aspect of enabling successful automated pap-smear image analysis. In this paper, a potent algorithm for segmentation of the pap-smear image into the nucleus, cytoplasm, and background using pixel level information is proposed. Methods: First, a number of pixels from the nuclei, cytoplasm, and background are extracted from five hundred images. Second, the selected pixels are trained using noise reduction, edge detection, and texture filters to produce a pixel level classifier. Third, the pixel level classifier is validated using test set and 5- fold cross validation using Fast Random Forest, Nave Bayes, and J48 classification techniques. An extensive evaluation of the algorithm and comparison with the benchmark ground truth measurements shows promising results. Comparison of the segmented images nucleus and cytoplasm parameters (nucleus area, longest diameter, roundness, perimeter and cytoplasm area, longest diameter, roundness, perimeter) with the ground truth segmented image feature parameters (nucleus area, longest diameter, roundness, perimeter and cytoplasm area, longest diameter, roundness, perimeter) yielded average errors of 0.94, 0.93, 0.02, 0.63, 0.96, 0.37, 0.13 and 0.96mm respectively. Validation of the proposed pixel level classifier with 5-fold cross-validation yielded a classification accuracy of 98.48%, 94.25% and 98.45% using Fast Random Forest, Nave Bayes, and J48 classification methods respectively. Finally, validation with a test dataset yielded a classification accuracy of 98.48% and 98.98%using Fast Random Forest and J48 Classification methods respectively. This paper articulates a potent approach to the segmentation of cervical cells into the nucleus, cytoplasm, and background using pixel level information. The experimental results show that the approach gives good classification and achieves a pixel classification average accuracy of 98%. The method serves as a basis for first level segmentation of pap-smear images for diagnosis and classification of cervical cancer from pap-smear images using nucleus and cytoplasm pixel level information.

Cervical cancer is a cancer arising from the cervix. It is due to the abnormal growth of cells that have the ability to invade or spread to other parts of the body. Early on, typically no symptoms are seen. Later symptoms may include abnormal vaginal bleeding, pelvic pain or pain during sexual intercourse. While bleeding after sex may not be serious, it may also indicate the presence of cervical cancer. HPV vaccines protect against two to seven high-risk strains of this family of viruses and may prevent up to 90% of cervical cancers. As a risk of cancer still exists, guidelines recommend continuing regular Pap tests.

Human Papillomavirus

HPV types 16 and 18 are the cause of 75% of cervical cancer cases globally, while 31 and 45 are the causes of another 10%. Women who have sex with men who have many other sexual partners or women who have many sexual partners have a greater risk. Genital warts, which are a form of benign tumor of epithelial cells, are also caused by various strains of HPV. However, these serotypes are usually not related to cervical cancer. Having multiple strains at the same time is common, including those that can cause cervical cancer along with those that cause warts. Infection with HPV is generally believed to be required for cervical cancer to occur.

Precancerous lesions

Cervical intraepithelial neoplasia, the potential precursor to cervical cancer, is often diagnosed on examination of cervical biopsies by a pathologist. For premalignant dysplastic changes, cervical intraepithelial neoplasia grading is used. The naming and histologic classification of cervical carcinoma precursor lesions has changed many times over the 20th century. The World Health Organization classification. System was descriptive of the lesions, naming them mild, moderate, or severe dysplasia or carcinoma in situ (CIS). The term cervical intraepithelial neoplasia (CIN) was developed to place emphasis on the spectrum of abnormality in these

***Corresponding author:** Unnati Bhatia, Department of Internal Medicine, Maulana Azad Medical College, New Delhi, India*

Received date: November 01, 2021; **Accepted date:** November 17, 2021; **Published date:** November 25, 2021

lesions, and to help standardize treatment. It classifies mild dysplasia as CIN1, moderate dysplasia as CIN2, and severe dysplasia and CIS as CIN3. More recently, CIN2 and CIN3 have been combined into CIN2/3. These results are what a pathologist might report from a biopsy.

How to cite this article: Bhatia Unnati. "Automated Segmentation of Nucleus, Cytoplasm, and Background of Pap-Smear Images Using a Trainable Pixel Level Classifier." *J Integr Oncol* 10 (2021) : 11.