the diagnostic pathology journal DIAGNOSTIC PATHOLOGY

13th European Congress on Digital Pathology Proceedings, diagnostic pathology 2016,8:138
**ISSN** 2364-4893
**DOI**: http://dx.doi.org/10.17629/www.diagnosticpathology.eu-2016-8:138

# Proceedings

## SY08.02 | **Image Analysis II**

### IMAGE ANALYSIS APPROACH TO DISTINGUISH LOBULAR STRUCTURES IN THE MAMMARY GLAND FROM WELL-DIFFERENTIATED BREAST CANCER WITH TUBULE FORMATION

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#### *Introduction/ Background*

Automated detection of diagnostically relevant regions of interest (ROI) is one of the major challenges in medical image analysis. In digital pathology using whole slide images (WSI), the detection of certain biological structures is necessary, because the capacity for analysis of cells and subcellular structures at high resolution is limited by available processing time and computational power. For some applications it is also important to exclude irrelevant or misleading components of the image. One important challenge of this type is well differentiated (low-grade/G1) breast cancer.

#### *Aims*

We aim at automatically distinguishing non-malignant lobular tissue from well-differentiated breast cancer to avoid erroneous evaluation of normal tissue in the detection of nuclear hormone receptor expression. A second goal of lobule detection is to exclude inflammation of non-malignant pre-existing structures from tumor immune cell scoring of breast cancer in onco-immunology.

#### *Methods*

Two approaches for lobule detection were applied: The first includes modules of own image analysis algorithms developed specifically for lobule detection combined with elements of a commercially available software platform (Definiens Developer®), and the second is a software package optimized for use with a multispectral camera system (Inform, Perkin-Elmer ®). Breast cancer samples were stained for estrogen receptor (ER), progesterone receptor (PR) and the lymphocyte marker CD8. The first approach starts with a texture-based supervised classification to detect lobule candidate regions and uses a nuclear density image to refine the candidate regions. The second approach uses a supervised machine learning method whose features and algorithm are not disclosed to the user. Manual annotations of lobular tissue by expert pathologists were used for evaluation of results.

#### *Results*

The accuracy of distinction between cancer areas and lobular structures decreased in cases with prominent glandular differentiation of the tumor. The major challenge was the separation of well-differentiated (G1) breast cancer with consistent hormone receptor expression from adjacent lobular areas. The second approach performed well on high-grade tumors and had advantages regarding speed and its convenient user interface. The modular first approach was superior on ER and PR images and successfully detected lobular areas even if the anatomical structure was disrupted by inflammation of infiltrating cancer cells. We conclude that modular approaches considering image context and allowing specific adjustments to the tissue of interest may be needed to overcome current limitations of automated ROI detection in clinical biopsy materials.