

Postgraduate student: **Christos Sakellarios**

Thesis Title:

## **Decision Support System for Classification of Urinary Bladder Cancer from Histopathological Images**

Abstract:

This study describes the development of a computerized decision support system for grading urinary bladder cancer as of high or low malignancy according to the WHO/ISUP grading system, based on features from microscopy tissue slides.

**Material and Methods:** Tissues from the urinary bladder of 56 patients, were stained with Haematoxylin and Eosin and assessed for their histological tumor grade (high or low), by an experienced pathologist. The tissue slides were firstly digitized and then segmented with a fuzzy c-means clustering algorithm. The purpose of the segmentation aim was to discriminate nuclei from background tissue. The accuracy of the fuzzy c-means algorithm was compared to the image processing tool, "Image pro". Following segmentation, 34 morphological and textural features were extracted from each of the segmented nuclei. In order to classify cases as of high or low grade, a pattern recognition system was developed, where 5 different classifiers were tested (k nearest neighbour, linear discriminant analysis, bayessian, support vector machine, probabilistic neural network). For each classifier, the best feature combination was found by employing the exhaustive search method and evaluating the system's performance (Leave One Out, Cross Validation, External Cross Validation). Finally, a multi-classifier scheme was designed, employing 5 classifiers, for improving system accuracy.

**Results:** The computer-based decision support system achieved overall accuracy 89% in discriminating high from low grade samples. The precision in correctly classifying high grade cases accuracy was 75% and low grade cases 96%.

### Examining Committee

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