A boosting approach for prostate cancer detection using multi-parametric MRI

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ABSTRACT

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1. INTRODUCTION

On a worldwide scale, prostate cancer (PCa) has been reported as the second most frequently diagnosed men cancers accounting for 13.6%.[1] Statistically, the estimated number of new diagnosed cases was 899,000 with no less than 258,100 estimated deaths.[1] In United States, aside from skin cancer, PCa was declared to be the most commonly diagnosed cancer among men, implying that around one in seven men will be diagnosed with PCa during their lifetime.[2]

Since its introduction in mid-1980s, prostate-specific antigen (PSA) is widely used for PCa screening[3] and has shown to improve early detection of PCa.[4] However, several trials conducted in Europe and United States conclude that PSA screening suffers from low specificity.[5–7] Thus, current research focus on developing new screening methods to improve PCa detection. In this perspective, Magnetic resonance imaging (MRI) techniques have recently shown promising results for PCa detection. Furthermore, three different modalities are currently investigated: (i) T_2 Weighted (T_2-W) MRI, (ii) Dynamic Contrast-Enhanced (DCE) MRI and (iii) Apparent Diffusion Coefficient (ADC).

Several researches have been carried out in order to investigate the contributions of machine learning classifiers for PCa detection using 3T multi-parametric MRI such as Support Vector Machines (SVM),[8–12] probabilistic boosting tree[13] or probabilistic neural network.[13]

In this research, we investigate the performance of gradient boosting for PCa detection using 3T multi-parametric MRI. Two different features extraction strategies have been chosen in order to feed the classifier: (i) voxel-based and (ii) 3D-texton-based. An evaluation of both strategies as well as the contribution of each modality is provided.

2. MATERIAL AND METHODS

2.1 Data

Here, right a paragraph on how the data were acquired and which features were extracted

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2.2 Classification framework

2.2.1 Feature extraction strategies

- voxel-based

- 3d-texton-based

2.2.2 Gradient boosting

2.3 Validation model

k-cross validation

3. RESULTS

Include the two figures with one for voxel-based and the other one for texton-based and discuss briefly.

4. DISCUSSION

Discuss the results.

- Single modality is not working as good as multi-parametric

- Which single modality is better.

- What is the increase of the zone information.

- Voxel-based vs texton-based

5. CONCLUSION

5.1 Future works

- Check the difference with other features usually extracted.

- Check the results difference with a registration of the three modalities.

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