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Master thesis summary

AUTOMATED COMPUTERIZED 2D,3D CHARACTERIZATION OF TUMORS IN PROSTATE CANCER

The project revolves around the analysis of T2w MRI images from Stavanger Hospital, with a primary focus on improving cancer detection and classification based on py-radiomics features. It unfolds in three distinct scenarios, each aimed at achieving more efficient results through the optimization of hyperparameters and the consideration of risk factors.

The overarching objectives of the project are as follows:

1. **Mesh Data Acquisition**: The first phase involves the extraction of mesh data representing the prostate gland. This step provides a foundational understanding of the prostate's structure.

2. **Tumor Mesh Data**: In the second phase, mesh data specific to tumors is obtained. This data forms the basis for further analysis and characterization.

3. **Morphologic Characterization**: The acquired mesh data is subjected to morphological analysis. This step involves the calculation of various morphological measures, with a focus on conforming to the PI-RADS v2.1 standards. These measures provide valuable insights into the shape and characteristics of both the prostate gland and tumors.

4. **Cancer Differentiation**: The primary aim of the project is to differentiate between clinically significant and non-clinically significant prostate cancers. By leveraging the morphological features obtained in the previous steps, the project strives to offer a clearer and more interpretable rationale for the classification of tumors. This newfound clarity will greatly assist radiologists in understanding why a particular tumor is categorized in a specific manner.

5. **Additional Goal**: Depending on available time and resources, an additional goal is to provide morphological features of the prostate gland itself. This information could be used to identify potential cases where further assessment, often referred to as "surveillance," is needed.

The main driving force behind this project is the need for improved transparency in the tumor detection and classification process. While existing tools can detect and classify tumors, they often lack transparency in their decision-making. Radiologists may find it challenging to grasp the underlying reasons for a specific diagnosis. By utilizing morphological features, particularly those aligned with the PI-RADS v2.1 standards, I implemented different machine learning algorithms on the extracted shape features ,the choice of ML over deep learning or deep or neural network belong to that ML explainable which is required aspect in medical field. The project aims to provide a more intuitive and comprehensible framework for radiologists. This, in turn, empowers them to make more informed and confident decisions regarding the clinical significance of detected tumors.

In summary, the project's core mission is to enhance the interpretability of tumor detection and classification by leveraging morphological insights derived from T2w MRI images. Through meticulous analysis and adherence to established standards, the project endeavors to provide radiologists with a clearer understanding of why certain tumors are classified as clinically significant or non-clinically significant, ultimately improving patient care and diagnosis.