Detecting Prostate Cancer using Deep Learning: Leveraging Heterogeneous Information Networks (HINs) for Feature Extraction"

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1 Research Problem Background

Prostate Cancer is a widespread problem among men worldwide which has a very significant impact on death rates over various populations. Early detection and correct diagnosis of cancer are very important for effectively treating patients. As per previous research, machine learning and deep learning models show very good results in detecting and diagnosing cancer, including medical images. Deep learning models such as Convolutional Neural Networks (CNN), residual networks (ResNet), VGG19 and many more have the capability of understanding complex patterns of medical images which results in more accurate and efficient diagnosis of cancer. However, the extraction of significant features in deep learning models is still a challenge.

2 Research Question

"How can heterogeneous information networks (HINs) be effectively leveraged for feature extraction in deep learning models to improve the accuracy of prostate cancer detection?"

3 Justification

It is very important to detect prostate cancer in its early stages to improve the patient's diagnosis and by this, we can reduce the death rates.(2) The reason for using deep learning techniques for the detection of prostate cancer as it can understand patterns of complex datasets efficiently and it has proven results in previous research(3, 4). Integrating the Heterogenous Information Networks (HINs) (1) based feature extraction with the deep learning models to effectively address the limitations of previous research and also improves the performance

metrics from previous research and also contributes to the healthcare and medical sector.

4 Specific Items to Be Addressed

- Exploration of data (EDA) as it can be very noisy data and do preprocessing and preparation of the data model building.
- Image Preprocessing such as cropping, resizing, and standardising the size of images for model interpretation.
- Extracting the significant features from the images using Heterogeneous Information Networks (HINs).
- Handling class imbalance problem by doing oversampling, undersampling and generating synthetic data.
- Applying various deep learning models for classification and comparing the evaluation metrics before and after the application of Heterogeneous Information Networks (HINs).

References

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