AI-powered prostate MRI reading with Prostate.Carcinoma.ai

The radiologists F. Burn, MD (l) and A.Cornelius, MD (r) are experts in prostate cancer imaging

„The development of innovative healthcare solutions needs strategical cooperations with competent and motivated partners, who have capability to face the challenges and concepts to establish a well digitalized radiology. FUSE-AI understands how to enrich with quality the healthcare market in radiology."
- Felice Burn, MD

„AI in radiology is the logical consequence of the ongoing developments in recent years to reach a new level of medical and clinical care. For me, even the first results from Prostate.Carcinoma.ai plug-in in mint Lesion™ were a substantial improvement!"
- Alexander Cornelius, MD

Introduction

With an incidence of 1.4 M worldwide[i], prostate cancer and its detection make up a significant amount of the work of a radiologist.

Since MRI scans of the prostate prior to biopsy are highly recommended and are already implemented in certain guidelines, e.g. the NICE guideline[ii], capacities to handle the increasing workload need to be created. Artificial intelligence (AI) has the potential to take prostate cancer diagnostics to a new level, providing faster, high-quality and time-efficient diagnoses. AI and machine learning technologies facilitate the workflow by assisting in diagnosis, management and treatment of a wide variety of medical conditions, prostate cancer being one of them. In MRI data, modified U-Net structures are proven architectures that can help with detection, annotation and segmentation of suspicious ROIs.

Based on this knowledge, the company FUSE-AI has developed a software that uses modified U-Net architectures to create voxel-wise segmentations of the prostate, prostate zones and suspicious lesions. Internal validation has proven that automatic and manual prostate segmentation, have a high spatial agreement and accuracy.

Product Description

Prostate.Carcinoma.ai is an AI- powered software to facilitate prostate MRI analysis. It provides reliable and reproducible analysis of MRI image data, determines exact prostate and lesion volumes and coordinates of VOIs, refining them when necessary.

Prostate.Carcinoma.ai will be integrated into the prostate reading workflow and provides fully automated 3D segmentation of the prostate, as well as the detection and segmentation of prostate lesions in MR T2 weighted images. The segmented lesions are automatically classified as malignant or benign and mapped to the prostate lesion scheme. Image data is transferred to FUSE-AI by using state-of-the-art DICOM anonymization.

New use cases can be integrated seamlessly without extending the communication interface. The combined software makes prostate MRI analysis easier, more time-efficient and convenient for the radiologist.

Our product prototype is currently evaluated in a clinical study and will be available as a plug-in for mint Lesion™ in 2022.

Benefits

Improved analysis time

Time pressure is reported as critical factor for the creation of thorough radiological reports. The increasing workload makes it necessary, that software relieves the radiologist with image analysis while ensuring adherence to quality standards. By using Prostate.Carcinoma.ai, the reporting time can be reduced: the software automatically generates markings of prostate and suspicious lesions. ROIs can be reviewed and manually adapted afterwards. Therefore, time-consuming manual markings are oftentimes not necessary.

Enhanced diagnostic quality

The quality of MRI analysis can be described by the number of true positive/negative and false positive/negative carcinoma detections and the therefrom derived diagnostic accuracy measures: sensitivity, specificity as well as the positive and negative predicitive value. Depending on the experience level of the reader, over- and underdiagnosis of prostate carcinoma in MRI is a well-known phenomenon. Prostate.Carcinoma.ai helps radiologists with the detection of suspicious ROIs. Clinical data describing and comparing the diagnostic accuracy of prostate MRI reading with and without Prostate.Carcinoma.ai is currently being collected.

More detailed information

By providing a reliable and reproducible analysis of prostate MRI, exact prostate and lesion volumes and coordinates of ROIs can be determined.
This information can be of use for an exact PSA density calculation as well as simplifying the targeting of suspicious lesions in ultrasound-guided biopsy.

References:

i Sung H et. al. (2021): Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries, CA 71(3) 209-2049

ii National Institute of Health and Care Excellence (2019): NICE guideline [NG131] Prostate Cancer: Diagnosis and Management. Accessible via **https://www.nice.org.uk/guidance/ng131/chapter/recommendations**