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Editorial

An Intelligent Diagnosis Method of MRI in Classifying Prostate Cancerous Tissue Using SVM Algorithm with Different Kernels

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Prostate cancer (Pca) is the most common malignancy and the second most dominant cause of cancer-related deaths in men in Western countries, with an incidence rate composed over 200 per 100,000 men.[1] The early diagnosis of Pca will lead to an obvious increase of patients' survival, and as a result, a decrease of treatment costs.[2] Rapid and accurate diagnosis of Pca is crucial for improving outcomes.

Multiparametric prostate MRI (mp-MRI) is an emerging medical imaging modality that combines anatomic MRI with functional MRI technique, allowing for diagnosis, characterization, staging, and treatment strategy of Pca.[3] T2-weighted imaging (T2WI) provides abundant anatomical details and makes major contributions to the localization and characterization of abnormalities in the prostate.[4] T2WI images are capable of identifying the tumor lesion and assessing seminal vesicles, neurovascular bundles as well as prostate margins since T2WI allows for depicting the zonal anatomy and capsules, while the peripheral zone (PZ) is typically of intermediate to high signal intensity (SI) on T2WI images.[5,6] As it is reported, there exists a strong correlation between tumor density and various tumor biological markers including Gleason score, tumor stage, as well as surgical margin status.[7] Therefore, many studies have investigated the potential value of T2WI in localization of Pca. Recently, precision medicine has been introduced into routine clinical care with an increasing number of treatments being tailored to patient-specific characteristics. As a result, radiomics-based quantitative analysis for imaging data has been popularly and widely utilized.[8]

A recently published article in *Exploratory Research and Hypothesis in Medicine* by Ng *et al*. has compared different kernels of support vector machine (SVMs), one of the most popular supervised learning algorithms, to classify prostate cancerous tissues.[7] The application of MRI using SVM algorithm with different kernels has not only enabled automatic classification of prostate cancerous tissue but also provided a non-invasive solution to assess Pca. The outlined merits could be summarized as follows: 1) Different SVM Kernels have been used to classify Pca; 2) Pca patients have been recruited from their own hospital instead of the public databases. In their study, machine learning is adopted since computer-aided detection and diagnosis calculated by machine learning facilitates interpreting medical imaging findings and reducing interpretation times. The article by Ng *et al*. is a very thorough, beautifully written and illustrated research paper of the utilization of different kernels in SVMs to classify prostate cancerous tissues on T2WI images as compared to previous studies, whose limitations could be attributed to the exclusion of late stages of Pca,[9] without reference to the kernel used for the SVMs algorithm,[10] or a lower yield accuracy.[11] In conclusion, 17 features are extracted from the demarcated region of interest (ROI), and 5 features are retained by the principle component analysis (PCA) for SVM classification with the utilization of radical basis function (RBF), Gaussian, and lineal kernels. Consequently, SVMs using RBF yields the largest sensitivity and the second-largest accuracy.

The proposed application of MRI using SVM algorithm with different kernels could pave the way for identification of prostate cancerous tissue in a non-invasive method. In future, mp-MRI combining anatomical MR imaging with functional MRI sequences could provide more useful information in Pca detection, disease monitor during active surveillance and patient follow-up.

Abbreviations: mp-MRI, multiparametric prostate MRI; Pca, prostate cancer; RBF, radical basis function; SVMs, support vector machine; T2WI, T2-weighted imaging.

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Conflict of interest

The authors have no conflicts of interest related to this publication.

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References

[1] Arnold M, Karim-Kos HE, Coebergh JW, Byrnes G, Antilla A, Ferlay J, *et al*. Recent trends in incidence of five common cancers in 26 European countries since 1988: Analysis of the European Cancer Observatory. Eur J Cancer 2015;51(9):1164–1187. doi:10.1016/j.ejca.2013.09.002, PMID:24120180.

[2] Lee CH, Tan TW, Tan CH. Multiparametric MRI in Active Surveillance of Prostate Cancer: An Overview and a Practical Approach. Korean J Radiol 2021;22(7):1087–1099. doi:10.3348/kjr.2020.1224.

[3] Jing G, Xing P, Li Z, Ma X, Lu H, Shao C, *et al*. Prediction of clinically significant prostate cancer with a multimodal MRI-based radiomics nomogram. Front Oncol 2022;12:918830. doi:10.3389/fonc.2022.918830, PMID:35912175.

[4] Lee GH, Chatterjee A, Karademir I, Engelmann R, Yousuf A, Giurcanu M, *et al*. Comparing Radiologist Performance in Diagnosing Clinically Significant Prostate Cancer with Multiparametric versus Hybrid Multidimensional MRI. Radiology 2022;211895. doi:10.1148/radiol.211895, PMID:35880981.

[5] Cheng X, Chen Y, Xu H, Ye L, Tong S, Li H, *et al*. Avoiding Unnecessary Systematic Biopsy in Clinically Significant Prostate Cancer: Comparison Between MRI-Based Radiomics Model and PI-RADS Category. J Magn Reson Imaging 2022;doi:10.1002/jmri.28333, PMID:35852438.

[6] Midiri F, Vernuccio F, Purpura P, Alongi P, Bartolotta TV. Multiparametric MRI and Radiomics in Prostate Cancer: A Review of the Current Literature. Diagnostics (Basel) 2021;11(10):1829. doi:10.3390/diagnostics11101829, PMID:34679527.

[7] Shanei A, Etehadtavakol M, Azizian M, Ng EY. Comparison of Different Kernels in a Support Vector Machine to Classify Prostate Cancerous Tissues in T2-Weighted Magnetic Resonance Imaging. Explor Res Hypothesis Med 2023;8(1): 25–35. doi:10.14218/ERHM.2022.00013.

[8] Ren S, Tang HJ, Zhao R, Duan SF, Chen R, Wang ZQ. Application of Unenhanced Computed Tomography Texture Analysis to Differentiate Pancreatic Adenosquamous Carcinoma from Pancreatic Ductal Adenocarcinoma. Curr Med Sci 2022;42(1):217–225. doi:10.1007/s11596-022-2535-2, PMID:35089491.

[9] Siqueira LFS, Morais CLM, Araújo Júnior RF, de Araújo AA, Lima KMG. SVM for FT-MIR prostate cancer classification: An alternative to the traditional methods. J Chemometrics 2018;32(12):e3075. doi:10.1002/cem.3075.

[10] Rustam Z, Angie N. Prostate Cancer Classification Using Random Forest and Support Vector Machines. J Phys Conf Ser 2021;1752:012043. doi:10.1088/1742-6596/1752/1/012043.

[11] Zhang L, Li L, Tang M, Huan Y, Zhang X, Zhe X. A new approach to diagnosing prostate cancer through magnetic resonance imaging. Alex Eng J 2021;61(1):897–904. doi:10.1016/j.aej.2020.10.018.