Contribution ID : **7** Type : **Talk**

Machine Learning-based Scatter Correction for a Dual-Panel Positron Emission Mammography Scanner

Thursday, 6 June 2024 10:05 (25)

Positron Emission Mammography (PEM) is a Nuclear Medicine technique for breast imaging based on a dedicated scanner assembled with parallel dual-panel detector arrays. Patient positioning in close contact with the scanner enhances spatial resolution and sensitivity in comparison with ring-based scanners, but this geometry hinders the adaptation of conventional attenuation and scatter correction methods, which affects the quantitative assessment of studies. In this work we trained several machine learning algorithms for scatter correction with list-mode data from a Monte Carlo simulation of a PEM prototype being built in our lab. The features for this binary classification problem were energy and position of detection, where energy had the higher feature importance in agreement with traditional methods. The best results were found with a Random Forest of 38 estimators and a maximum depth of 7, which reduced the scatter fraction of a study of 1 million events from 11% to 4% in 2 seconds.

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Session Classification : Machine learning in medicine

Track Classification : Machine Learning in Medicine