Where can Signal Processing and Machine Learning Algorithms help Automate Diagnostic Procedures in Medical Imaging?

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Ultrasound images produce speckle artifacts directly related to microscopic scattering centers in tissue. As tissue displaces and deforms, speckle associated with these scatterers moves in real-time images. Tracking speckle motion can produce high resolution images of tissue displacements and deformations. Recent work on ultrasound speckle tracking has focused on quantifying deformation defects in the heart related to specific pathologies. For example, changes in average deformations in the left ventricle as assessed by ultrasound speckle tracking can monitor cardiotoxicity resulting from therapies used to treat cancer. Although such non-invasive monitoring is very promising, there is great variability in results depending on the specific tracking methods and the skill of the clinician interpreting the results. Here we report on automated methods to reduce tracking variance and greatly improve the reliability of deformation measures based on ultrasound speckle tracking. Such techniques may be applicable to other medical imaging tests and ultimately help automate diagnostic procedures based on image interpretation.