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Scattering Operator and Spectral Clustering for Ultrasound Images: Application on Deep Venous Thrombi

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Abstract : Deep Venous Thrombosis (DVT) occurs when a thrombus is formed within a deep vein (most often in the legs). This disease can be deadly if a part or the whole thrombus reaches the lung and causes a Pulmonary Embolism (PE). This disorder, often asymptomatic, has multifactorial causes: immobilization, surgery, pregnancy, age, cancers, and genetic variations. Our project aims to relate the thrombus epidemiology (origins, patient predispositions, PE) to its structure using ultrasound images. Ultrasonography and elastography were collected using Toshiba Aplio 500 at Brest Hospital. This manuscript compares two classification approaches: spectral clustering and scattering operator. The former is based on the graph and matrix theories while the latter cascades wavelet convolutions with nonlinear modulus and averaging operators.

Keywords : deep venous thrombosis, ultrasonography, elastography, scattering operator, wavelet, spectral clustering
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