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The Decomposition of Deformation: new metrics to enhance shape analysis in medical imaging.

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**Highlights**

- Shape analysis in Medical Image requires an appropriate decomposition of deformation.
- Spherical (purely homothetic), Deviatoric (affine non-homothetic) and Non Affine components must be defined to be reciprocally orthogonal.
- This can be done in different ways depending on the metric used for size definition: Centroid Size and m-Volume are the most used measures.
- We propose three different strategies, "Classic", "GPp", "TPSs", in order to decompose deformations in series of shapes.
- We applied this to 3D Speckle Tracking Echocardiography data including healthy Control subjects and patients affected by Hypertrophic Cardiomyopathy; pathology is best recognized using the non Euclidean TPS metric.

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