Harmonic analysis has been used as a powerful set of tools in partial differential equations, mathematical physics, engineering, and pure mathematics. Due to a recent breakthrough in fast numerical algorithms based on local trigonometric transforms, we present here the “Best-Basis” paradigm for maximizing class separation. Important features for classification, such as edges, spikes, or transients, are characterized by local information in the time (space) domain and the frequency (wave number) domain. Local feature extraction is then possible because the Best Basis “fills the gap” between the standard Euclidian basis and the Fourier basis. We discuss smooth projections (Coifman and Meyer) on $L^2(R)$ to generate a versatile collection of orthonormal bases which are exploited to extract important features to achieve robust discrimination. We demonstrate the usefulness of these features for the classification of objects in Synthetic Aperture Sonar (SAS) images. The robustness of this approach is that it does not rely on geometric shape information of imaged objects.

Bio

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