Algorithmic Treatment of Nonlinear Data

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One of the characteristic features of our modern age is the deluge of data we are confronted with. In addition to the mere masses, we are witnessing more and more modern sensing devices where measurements are of a nonstandard form with data points constrained to nonlinear geometries. With applications ranging from topics in human biomechanics, over image processing, kinematics and robotics to computer graphics, nonlinear geometric data represents a fact of life in modern computational science and therefore it is of eminent interest to develop computational and theoretical tools capable of processing it in an efficient manner. Unfortunately, due to the nonlinear structure inherent in geometric data, classical linear methods known from signal processing, such as wavelet transforms, finite elements, etc., cannot be used in a meaningful way. This calls for genuinely new constructions which respect the underlying geometric structure while satisfying the same desirable properties of well-known linear methods. In my talk I will discuss several such constructions.