Effective computations on Grassmann, Flag, and Stiefel varieties with applications

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Consider a sequence of images of a fixed object collected under a continuous variation of state (varying illumination, frequency, pose, etc). In pixel space, the collection of images can be intuitively viewed as lying on a manifold. Noise, quantization, and background clutter significantly degrade this model. What one actually sees is a data cloud clustered near the manifold. The Grassmann, flag, and Stiefel varieties have proven to be effective settings for extracting information about the underlying manifold and for comparing the appearance of different objects imaged under the same variations of state. In this setting one is led to consider problems such as "how can you average a collection of subspaces?" and "what if the subspaces are of differing dimensions?" and "what point on a given Schubert variety lies closest to a given point on a Grassmann manifold?". In this talk, we will give an overview of some of the theory and computational techniques that have allowed for solutions to these and related problems.

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