Nested Principal Component Analysis Inference on non-Euclidean Spaces

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Principal component analysis (PCA) is a popular device for dimension reduction and their asymptotics are well known allowing for inferential statistics. In particular, principal components through the mean span the data with decreasing residual variance, as the dimension increases, or, equivalently maximize projected variance, as the dimensions decrease, and these spans are nested in a backward and forward fashion all due to Pythagoras Theorem. For non-Euclidean data with no Pythagorian variance decomposition available, it is not obvious what should take the place of PCA and how asymptotic results generalize. For spaces with high symmetry, for instance for spheres, backward nested sphere analysis has been successfully introduced. For spaces with less symmetry, recently, nested barycentric subspaces have been proposed. We show how to arrive at asymptotic results for sequences of random nested subspaces.

This is joint work with Benjamin Eltzner (Univ. of Gttingen).