

Ben Jeuris

"The Karcher mean: Solving a particular matrix equation through matrix manifold optimization"

Abstract:

In this talk we will discuss several implementations of the Karcher mean, which is a specific instance of the matrix geometric mean. This geometric mean is readily defined when working with scalars, but for matrices, we immediately run into problems due to non-commutativity. This causes the matrix geometric mean to lack a unique, general definition. However, the Karcher mean is thought to be an interesting instance of the geometric mean because it displays nice analogies with the arithmetic mean and exhibits interesting features. This Karcher mean can be described both as the minimizer to an optimization problem and as the solution to a particular matrix equation. To solve the matrix equation, we approach it from the perspective of optimization theory on matrix manifolds. We do this by implementing a wide variety of optimization techniques (SD, CG, Trust Region, BFGS), analysing their behaviour and comparing it with the ALM, BMP and CHEAP mean algorithms.

This contribution is joint work with Raf Vandebril (K.U.Leuven, Belgium) and Bart Vandereycken (ETH-Zürich, Switzerland).