

Abstract

This thesis provides representation theorems for classes of nonstationary covariance functions on spheres across time. Isotropy on spheres comes out naturally in virtue of the addition theorem, and we show how to escape from this assumption, in order to obtain kernels that can be non-isotropic. The same criterion is used in order to escape from stationarity in the temporal component.

Due to the analogy between the covariance functions and the positive definite kernels, we use the terminology given by these to introduce the representations in a general form, then we apply spectral theory to define a class of positive definite kernels on $(\mathbb{S}^n \times T)^2$, where T denotes the set where the time variable ranges. The characterization of the kernels is achieved through a set of conditions imposed to a sequence of time functions derived from each representation. Finally, our findings are illustrated through a simulation study.

Keywords and Phrases: Positive definite kernel, Spherical harmonics, Gegenbauer polynomials, Spectral representation, Space-Time random fields.