

SIGNAL PROCESSING ON THE SPHERE

3-0-2-0-11

Harmonic analysis on the line: Fourier series and transforms (discrete and continuous), orthogonality (discrete and continuous), sampling theorem (uniform sampling), aliasing, convolution, window functions, autocovariance/autocorrelation functions, power spectral densities, computational aspects, periodogram estimation, FFT, Least Squares Spectral Analysis. Global harmonic analysis on the sphere: Orthogonal base functions on the sphere, Associated Legendre functions, Spherical harmonics, convolution, sampling theorems (uniform), aliasing, filtering, autocovariance/autocorrelation functions, power spectral density, computational aspects. Localized analysis on the sphere: Space localizing basis functions (Radial basis functions, spherical splines, Band-limited spline functions), computational aspects. Slepian functions: Uncertainty principle of signal processing, uncertainty principle on the sphere, Slepian functions, Shannon number, periodogram estimation, computational aspects. Empirical Orthogonal Functions: Spatio-temporal datasets, eigenvalue decomposition, significance testing of modes, signal reconstruction, data compression, computational aspects.