

Nonparametric Regression for Spherical Data

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We consider data of the form (x_i, y_i) in which both x and y lie on the circle or sphere, and we seek to model a relationship in which y can be predicted from x . Examples of such data are modelling of tectonic plate movement, and development of an electromagnetic motion-tracking system which can be used to track orientation and position of a sensor moving in three-dimensional space. Motivated by the fact that there exist a limited number of parametric models for spherical-spherical regression, and that all of them implement strong assumptions, we develop a general and simple approach to this regression problem by introducing nonparametric smoothing for data lying on a sphere of arbitrary dimension. Distinct from other models, our approach is not rotational in nature, which means that the prediction and response domains do not need to have the same dimensionality. The methods are illustrated using real data on wind directions taken from various sites on the earth's surface.

Key Words: Spherical-Linear Regression, Circular-circular regression, spherical kernels, Local Polynomial Fitting