



C R RAO ADVANCED INSTITUTE OF MATHEMATICS, STATISTICS AND COMPUTER SCIENCE

Prof. C R Rao Road, University of Hyderabad Campus, Gachibowli, Hyderabad

**Seminar
on**

**Spectral and Frequency domain methods for the analysis of
Spatio-Temporal Data- An application to Spatio-Temporal
(Prediction) Kriging**

by

Professor Tata Subba Rao
University of Manchester

Abstract

In recent years it has become necessary to develop statistical methods for analysing data coming from diverse areas such as Environment, Marine Biology, agriculture ,finance etc etc. The data which comes from these areas are functions of location and also of time. It is assumed that the underlying processes ,say $\{Z(s,t)\}$, where s is a spatial coordinate , t is a temporal coordinate (usually assumed to belong to set of integers) is stationary in space and time. Given the data at several locations and l time series data at all these locations ,one of the objects is to estimate the data at a known location over the entire length and also at a future time ,where there is no data available. This prediction is usually called Kriging in geominig literature. Though several methods are available to deal with Kriging when only spatial data is available , not many methods are available when one observes spatio-temporal data. One of the challenging problems in this context is the inversion of very large dimensional matrices ,another problem is ordering the data (see recent book by Cressie and wikle,2011). Besides these ,another problem is to define a spatio-temporal covariance function which is positive definite (or equivalently spatio-temporal spectrum which is strictly positive). Several authors, in recent years , have made many interesting contributions to fill this gap. Some on these methods are adhoc. In this presentation , we will present a systematic ,novel approach (based on Discrete Fourier transforms) and propose a new class of models for defining a spatio-temporal spectral density function (under isotropy assumption) . We also show how the prediction problem can be solved using the Frequency Domain approach. The methods derived have several possible applications , in environmental sciences, geophysics and signal processing (in array detection and monitoring).

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**Venue: Classroom-1, First Floor, Ramanujan Building,
C R Rao AIMSCS**

Brief Bio-Sketch



Tata Subba Rao

Professor of Statistics (Emeritus)
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Manchester, M13 9PL, U.K.

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Education:

1988	University of Manchester, UK.	D.Sc.
1962 – 1966	Gauhati University, India .	Ph.D.
1960 – 1962	Karnatak University, India .	M.A.
1958 – 1960	Andhra University, India.	B.A.

Research Interest:

Non-stationary and non-linear time series analysis, higher order spectral analysis, theory of random fields, time series methods for analysis of environmental variables (detection of climatic changes etc), multivariate nonlinear models

Memberships

1. Elected to the Fellowship of the Royal Statistical Society (1968).
2. Elected member of the International Statistical Institute, Hague, Netherlands, 1981.

Books Published and Edited

- An introduction to Bilinear models and bispectra design of stationary time series (1984), Springer-Verlag, New York (jointly with M. M. Gabr).
- Developments in Time Series Analysis, Chapman-Hall (1994).
- Applications of Time Series Analysis in Astronomy and Meteorology (1997), Chapman Hall, (jointly with M. B. Priestley, O. Lessi).
- Time Series Analysis: Methods and applications (2012). Handbook of Statistics .Vol 30. Elsevier Publishers.Ed by T.Subba Rao,S.Subba Rao and C.R.Rao