STAT-814 Spatial Statistics (3 Credit Hours)

1. Objectives

This course aims to introduce students to the statistical methods and models for spatial data, including the applications to climate data.

2. Course Contents

Processes in space and time. Statistical models and methods for spatially varying phenomena, that is, where the geographical position of measurements matters. Homogeneous/nonhomogeneous processes. Geostatistical interpolation methods; semivariogram; kriging (spatial prediction); estimation problems. Spatial point processes; simulation; spatial sampling strategies. Applications to ozone, climate data, etc. Spatial models for grid data and inference in these (MRFs, pseudo-MLE, Monte Carlo MLE, Bayesian methods). Extreme value methods- crossing limits for air pollution, changes in climate extremes. Time series with long-range dependency. Trends in climate data. Related applications/computations with R.

3. Recommended Books

i. Andrew F., Mathematical Geosciences, Springer (2011).
ii. Christopher K. W. and Noel C., Statistics for Spatio-Temporal Data, Wiley (2013).
iii. Diggle P.J. Model-Based Geostatistics, Springer (2006).
iv. Le N.D. and Zidek J.V., Statistical Analysis of Environmental Space-Time Processes, Springer (2006).

4. Outcomes

On successful completion of this course, students will be able to use, construct and interpret the spatial models including the kriging. The students will be able to fit and model the climate data and will be able to make an inference.