A point process is a probability model for occurrences at random instants of time. The occurrences may be road accidents, telephone calls, genetic mutations, subatomic particle transitions, airline arrivals and departures, failure times of light bulbs, computer interrupts, recurrences of cancer and so on. Point processes may also be used to describe the locations of occurrences in two-dimensional or three-dimensional space (such as the spatial locations of trees in a forest, birds' nests, diamond deposits) and to describe both the spatial location and time of occurrence (for events such as earthquakes, mobile phone calls, disease outbreaks). Point processes are an important part of the tool kit of modern probability theory. Spatial statistics is the analysis of data recorded at different spatial locations, for example, temperature reports from different cities; maps of the locations of meteorite impacts or geological faults; and satellite images or demographic maps. Point process methods are a powerful tool in spatial statistics.

This unit presents the basic foundations of point process theory and applies them to the statistical analysis of observations in time, space, and space-time. One third of the lecture material presents practical techniques for data analysis using the statistical package R. Topics include motivating examples of applications; definition and representation of point processes in time; examples—simulation in R; theory—distributions, stationarity, conditional intensity, moments; operations on point processes; likelihood, model-fitting; spatial point patterns; exploratory data analysis of point patterns using the library spatstat; spatial point processes; examples—simulation; conditional intensity; and modelling spatial patterns using spatstat.

For more info see: http://handbooks.uwa.edu.au/units/stat/stat7443