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In recent years, stochastic models have become extremely important for the understanding (analysis, prediction, control) of complex processes in many diverse areas such as engineering, physics, economics, biology, geoscience and environmental processes. My research concerns different aspects of asymptotic behaviour of stochastic processes.

Stability and Limit Theorems for different stochastic processes

Some of my research is related to the stability problems. The uncertain and/or random factors occur and only some deterministic characteristics such as domain of possible values are known about the controllable or uncontrollable factors. The problem is how to identify the domain of such values of these factors where the system under consideration is stable, that is, where the system doesn't blow up.

Large deviations

Some of my papers are devoted to problems of classical large deviations. Within stochastic modelling, of particular importance is the large deviations theory which is concerned with evaluating probabilities of rare events, such as the event that the system exhibits abnormal or atypical behaviour. Consequences of such events can be far-reaching and even catastrophic. One example is in the failure of an information distribution medical network. Another example is the extreme behaviour of an environmental process. Applications of large deviations theory to other branches of science are indeed wide-spread and include communications theory, information theory, spatial processes, statistical mechanics, and risk-sensitive control, among many others.

Heavy-tailed and subexponential distributions.

Heavy-tailed distributions (probability measures) play a major role in the analysis of many stochastic systems. For example, they are frequently necessary to accurately model inputs to computer and communications networks, they are an essential component of the description of many risk processes, they occur naturally in models of epidemiological spread, and there is much statistical evidence for their appropriateness in physics, geoscience and economics. Important examples are Pareto distributions (and other essentially power-law distributions), lognormal distributions, and Weibull distributions (with shape parameter less than 1). My particular interests in this area are related to quantitative and qualitative analysis of different models in network theory and risk analysis. For example, I studied how big queues occur in multi-server system under the first-come-first-served policy.