

# The Method of Polynomial Chaos with Applications

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## **Abstract**

In mathematical modeling, especially in models of population growth, epidemics and other biological processes, there is a dependency on parameters that are either measured directly or determined by curve fitting. Some of these parameters can have variability depending on experimental error, on differences in the actual population used and on many other factors. To deal with this variability, in this talk we consider that those parameters are random variables with given distributions and that there may be a correlation between some of them. We also consider that the unknown variables are stochastic processes. The method of polynomial chaos is a way to deal with random differential equations. We apply the method to some simple bacterial growth models and will solve the resulting equations numerically. We also present a variant of the method known as non-intrusive polynomial chaos that is easier to program and more efficient. We apply it to a model of virus propagation.