

# Abstracts Geilo Winter School

Simen Tennøe

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## **1 Introduction to polynomial chaos expansions**

Polynomial chaos expansion is a method for determining the evolution of uncertainties in a system with probabilistic uncertainties in its parameters. This lecture intends to give an introduction to the general concepts necessary to understand the field of polynomial chaos expansion, such as probability distributions and how to find the orthogonal polynomials. It also introduces the fundamental ideas behind polynomial chaos, along with examples on how to use chaospy, a python package developed specifically to do polynomial chaos expansion.

## **2 Execution of polynomial chaos expansion**

One important set of methods to get the coefficients of the polynomial chaos expansion are collocation methods. These are methods that require the residue of the governing equations to be zero at specific points in the computations. We will take a closer look at two subclasses of this set of methods, the pseudospectral approach and a interpolation approach utilizing sparse grids. After this lecture you will be able to do a polynomial chaos expansion using chaospy on simpler problems.

## **3 Advanced topics in polynomial chaos**

This lecture covers more advanced topics, such as what happens when you no longer have independent variables. Another topic is if the uncertain parameters have a non-Gaussian distribution, which is solved by using a Rosenblatt transformation on the parameters. We will end with a walkthrough of the Galerkin method, another often used method for finding the coefficients of a generalized polynomial chaos expansion, again using chaospy.