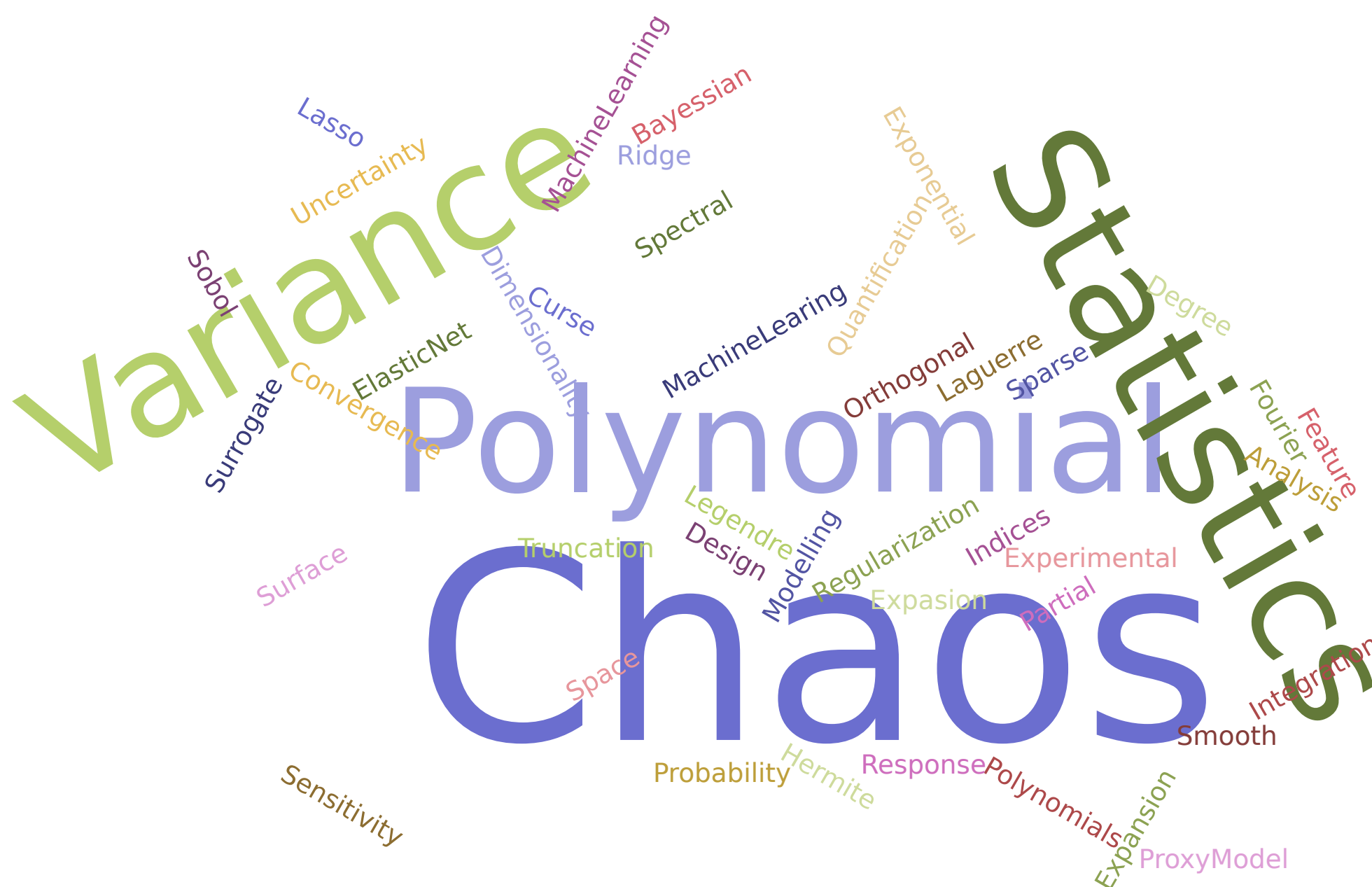# Polynomial Chaos Expansion and Machine Learning: Benefits, Challenges, Applications

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## Abstract

Polynomial Chaos Expansion (PCE) is a Machine-Learning technique that approximates a given function as a series of orthogonal polynomials.

The main feature of PCE is a strong connection between family of orthogonal polynomials and statistics of input features. The benefits of such a connection are twofold. First of all, the quality of PCE response surface can be improved if orthogonal polynomials are selected in agreement with probability distribution of input data. Secondly, utilization of PCE-based response surfaces simplifies Sensitivity Analysis and Uncertainty Quantification, because a variety of sensitivity indices can be computed analytically without Monte-Carlo simulations.

In the present talk the fundamentals of PCE are covered. Advantages and challenges of data approximation with PCE are explained. Additionally, potential areas of applications such as optimization of data acquisition are covered.

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