

1 Multivariate Interpolation on Non-Rectilinear Grids

This section presents alternative interpolation methods for non-rectilinear grids. First, I present the relatively simpler case of fast warped interpolation on a curvilinear grid, which improves upon the interpolation in [White \(2015\)](#). Then, I present a machine learning approach to interpolation on unstructured grids based on Gaussian process regression as presented in [Scheidegger and Bilonis \(2019\)](#).

1.1 The curvilinear case

Discuss fast warped interpolation.

1.2 Machine Learning for Unstructured Grid Interpolation

Unstructured interpolation arises in many dynamic programming applications when using the endogenous grid method because the first order conditions might be highly non-linear and non-monotonic, or because boundary constraints induce kinks in the policy and value functions. In these cases, the grid points generated by the EGM step are not evenly spaced, leading to the need for curvilinear interpolation. We saw above an approach to curvilinear interpolation based on [White \(2015\)](#) that is incapable of interpolation on structured grids. A similar approach was presented in [Ludwig and Schön \(2018\)](#) which used Delaunay interpolation. However, this approach is not well suited for our purposes because triangulation can be computationally expensive and slow, often offsetting the efficiency gains from the Endogenous Grid Method.

As an alternative to these methods, I introduce the use of Gaussian process regression (GPR) along with the Endogenous Grid Method. GPR is computationally efficient, and tools exist to easily parallelize and take advantage of hardware such as GPU's.

1.2.1 *Gaussian Process Regression*

A Gaussian process is a random process whose every subset of random variables is jointly Gaussian or has a multivariate normal distribution.