# Superconvergence Extraction: Interpolation Versus Filtering

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 **Abstract:**

There has been much work in the area of superconvergent error analysis for finite element and discontinuous Galerkin (DG) methods.  The property of superconvergence leads to the question of how to exploit this information in a useful manner, mainly through superconvergence extraction.  There are many methods used for superconvergence extraction such as projection, interpolation, patch recovery and B-spline convolution filters.  In this talk, we discuss the importance of overcoming the mathematical barriers in making superconvergence extraction techniques useful for applications.  Specifically, we focus on the comparison of interpolation versus Smoothness-Increasing Accuracy-Conserving (SIAC) filters, with an emphasis on the latter technique.  SIAC filters are designed to take advantage of the superconvergence property in finite element and discontinuous Galerkin methods in order to improve both smoothness and the convergence rate of the approximation.  Specifically, for linear hyperbolic equations it can improve the order of accuracy of a DG approximation from k+1 to 2k+1, where k is the highest degree polynomial used in the approximation.  We specifically discuss derivative recovery, boundaries and unstructured grids.