

# Department of Applied and Computational Mathematics and Statistics Colloquium

**James Collins**


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will give a lecture entitled:

*Adjoint-based a posteriori Error Estimation for the Lax-Wendroff method*

## Abstract

Adjoint-based a posteriori error estimation is a useful tool for accurately determining the error in an approximate solution to a differential equation. Also called a goal oriented error estimation, this technique estimates the error in a particular quantity of interest of the solution, allowing one to focus only on the relevant aspects of the solution. Beyond determining the accuracy of an approximate solution, error estimation is also useful for performing adaptively to reduce the error. In this talk, I discuss these error estimation techniques applied to the Lax-Wendroff method. This method is part of a class of explicit finite difference schemes for solving conservation laws. This class of methods have many desirable properties for solving conservation laws, due mostly to their simplicity and small computational cost. However, since adjoint-based error estimation is typically applied to finite element approximations, it is difficult to perform for this class of methods. I will begin by giving an introduction to adjoint-based a posteriori error estimation, then construct a finite element method that is equivalent in a particular sense to the Lax-Wendroff method, which allows us to obtain an adjoint-based a posteriori error representation formula for a Lax-Wendroff approximation. Along the way, we also obtain similar error representation formulas for explicit time-stepping schemes for nonlinear ODEs, such as Runge-Kutta and Adams-Bashforth. Finally, we show results of the error estimator for nonlinear ODEs and Burgers equation.



**Monday, April 15, 2013  
4:00 p.m. to 5:00 p.m.  
127 Hayes-Healy Center**

Colloquium Tea

3:30 p.m. to 4:00 p.m. 154 Hurley Hall