ACMS Graduate and Postdoc Seminar

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Wednesday, September 17, 2025
154 Hurley Hall
3:30 PM – 4:30 PM

The Lightning Method for the Heat Equation

This talk will describe a rapid, accurate and easy to implement numerical solution of the planar heat equation based on the lightning method, a recent development in the numerical solution of linear PDEs which expresses solutions using sums of polynomials and rational functions, or more generally as sums of fundamental solutions. This method has demonstrated an ability to accurately represent solutions of PDEs with solution singularities, in particular those due to corners. The method solves elliptic PDEs by forming series solutions whose coefficients are determined by least squared solution of an overdetermined linear system at a collocation grid. Our approach utilizes the Laplace transform to obtain a modified Helmholtz equation, solve it via the lightning method, and then numerically invert the Laplace transform to yield a solution to the heat problem. We validate our method by calculating the full time-dependent fluxes of our solution, and comparing this quantity with other numerical and asymptotic methodologies. Our validation shows the method is robust across a wide range of time ranges and geometric conditions.