Defense of the Doctoral Dissertation

Department of Mathematics

"Evolution of the radius of spatial analyticity for the dispersion modified Degasperis-Procesi equation"

University of Notre Dame
College of Science

Brian Reyes Velez

Thursday, March 21, 2024
Time: 12:00 PM
Location: 258 Hurley Bldg.

Examination Committee:
Alex Himonas, Advisor
Mei-Chi Shaw
Richard Hind
Jiahong Wu

Abstract:

The local well-posedness of the Cauchy problem for the dispersion modified **b**-equation with data in Sobolev spaces $H^s(\mathbb{R})$ and analytic Gevrey spaces $G^{\delta,s}(\mathbb{R})$ is proved for any $s > 1/4$. However, for $= 3$, which is the modified Degasperis-Procesi equation, a sharper result is established. In this case, the equation behaves as a nonlocal perturbation of the Kordeweg-de Vries (KdV) equation and well-posedness is shown for $s > -3/4$. Furthermore, for $= 3$ this equation possesses a twisted-L^2 conservation law. This yields an almost conservation law in the analytic Gevrey spaces $G^{\delta,0}$. Using this almost conservation law global solutions are established and a lower bound, given by $c/t^{\frac{4}{3}+}$, for their radius of spatial analyticity is proved. Key ingredients in the proof of this result are the Paley-Wiener Theorem and bilinear estimates for the nonlinearity of the modified Degasperis-Procesi equation.