basque center for applied mathematics

Scientific Seminar

Tuesday, February 12nd, 16:00-17:00

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NONLOCAL (AND LOCAL) NONLINEAR DIFFUSION EQUATIONS. BACKGROUND, ANALYSIS, AND NUMERICAL APPROXIMATION

Diffusion is the act of spreading out—the movement from areas of high concentration to areas of low concentration. From basic physical principles, we will derive the linear heat equation and the nonlinear porous medium equation. Both are natural and important from an applied point of view, and they have thus been studied for decades. We will also discuss different ways of diffusing, that is, local versus nonlocal diffusion.

With this background settled, we are going to explain the mathematical properties expected from such equations. The analysis include well-posedness, equicontinuity, and equitightness. The numerical approximations will then converge to the solutions of the equations studied under minimal assumptions including assumptions that lead to very irregular solutions. In other words, the schemes we introduce are robust in the sense that they converge under very unfavorable conditions. Numerical simulations will also be presented.

The material is based on joint work with F. del Teso (BCAM, Bilbao) and E. R. Jakobsen (NTNU, Trondheim), and also books by J. L. Vázquez (UAM and UCM, Madrid).

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