

# Abstract

This thesis focuses on the study of singular solutions of nonlinear diffusion equations, specifically the fast diffusion and porous medium equations. It consists of three papers and two additional chapters that provide context, summarize results, and clarify the current state of the topic. Chapter 1 formulates and describes the problem and provides an overview of the literature on singular solutions of nonlinear diffusion equations. This chapter also summarizes the research on asymptotically radially symmetric solutions with a moving singularity. Chapter 2 provides a summary of the papers included in this thesis. Building on work on asymptotically radially symmetric solutions in space dimensions higher than two, we study the existence of such solutions in two space dimensions. We also explore a different type of singularity that we call an anisotropic singularity and discuss the existence of solutions with such a singularity, as well as open problems and possibilities for further analysis. Finally, we extend the knowledge of the properties of asymptotically radially symmetric solutions in space dimensions higher than two, focusing on their uniqueness and the equation they satisfy in the sense of distributions. This equation involves a moving Dirac source term, which is also found in parabolic systems used in various biological applications.

**Keywords:** nonlinear diffusion, porous medium equation, fast diffusion, singular solution, moving singularity