

TRANSVERSALITY OF STABLE AND NEHARI MANIFOLDS
FOR A SEMILINEAR HEAT EQUATION

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We consider the Cauchy-Dirichlet problem associated to the nonlinear heat equation $\partial_t u - \Delta u = |u|^\alpha u$ in a bounded regular domain $\Omega \subset \mathbb{R}^n$, where $0 < \alpha < 4/(N - 2)^+$. It is well known that for this subcritical case negative initial energy is a sufficient condition for finite time blowup of the solution. We show that this is no longer true when the energy functional is replaced with the Nehari functional, thus answering negatively a question left open by Gazzola and Weth (2005). Our proof proceeds by showing that the local stable manifold of any non-zero steady state solution intersects the Nehari manifold transversally. As a consequence, given any steady state Ψ there exist solutions with initial Nehari energy either negative or positive which converges to Ψ . This is a joint work with Philippe Souplet, Noriko Mizoguchi and Fred Weissler.