Summary: We consider the nonlinear elliptic equation \( \Delta u + V(x)u + f(x, u(x)) = 0 \) on \( D \setminus \{0\} \), where \( D \) is a bounded domain containing 0 in \( \mathbb{R}^n \), \( n \geq 2 \), and \( V \) and \( f \) are Borel measurable functions. Under general conditions on the functions \( V \) and \( f \), we prove the existence of positive singular solutions globally comparable to the Dirichlet Green’s function of the Laplacian with pole at the origin. Our result applies to various types of semilinear equations, in particular to \( \Delta u + W(x)u^p = 0 \) for all real exponent \( p \) which was extensively studied for the range \( p > 1 \). Moreover for this equation with sign-unchanging function \( W \) our condition is the optimal one.

MSC:
35J60 Nonlinear elliptic equations
35B40 Asymptotic behavior of solutions to PDEs

Keywords:
nonlinear elliptic equation; Dirichlet boundary condition; positive solution; singular solution; Kato class; asymptotic behavior

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References:

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