

An Orlicz space approach to exponential elliptic problems in higher dimensions

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We consider semilinear elliptic problems of the form

$$-\Delta u + \lambda u = f(x, u), \quad u \in H_0^1(A),$$

where $A \subset \mathbb{R}^N$, $N \geq 3$, is either a bounded or unbounded annulus, and $\lambda \geq 0$. We study a broad class of nonlinearities f with superlinear growth at infinity, including exponential- and power-type ones. Under suitable assumptions, we establish the existence of a positive nonradial solution via techniques in the spirit of Szulkin's nonsmooth critical point theory, applied within a convex cone in Orlicz spaces. Notably, the Trudinger-Moser inequality fails in the whole Sobolev space $H_0^1(A)$. This is a joint work with A. Boscaggin, F. Colasuonno, and F. Sani.