POSITIVE AND SIGN CHANGING SOLUTIONS TO A NONLINEAR CHOQUARD EQUATION

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Abstract. We consider the generalized Choquard equation

$$-\Delta u + W(x)u = \left(\frac{1}{|x|^{\alpha}} * |u|^{p}\right)|u|^{p-2}u, \quad u \in H_0^1(\Omega),$$

where Ω is an exterior domain in $\mathbb{R}^N$, $N \geq 3$, $\alpha \in (0, N)$, $p \in \left[2, \frac{2N-\alpha}{N-2}\right)$, and $W \in C^0(\mathbb{R}^N)$ is a scalar potential with $\inf_{\mathbb{R}^N} W > 0$ and $W(x) \to W_\infty > 0$ as $|x| \to \infty$.

The special case

$$-\Delta u + u = \left(\frac{1}{|x|} * |u|^2\right)u, \quad u \in H^1(\mathbb{R}^3),$$

is commonly referred to as the stationary Choquard equation. It has many interesting applications in quantum physics. In some contexts, it is also called the nonlinear Schrödinger-Newton equation.

We shall present some results concerning the existence of a positive solution and multiple sign changing solutions to this problem, recently obtained in collaboration with M. Clapp.

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