THE CHOQUARD LOGARITHMIC EQUATION INVOLVING A NONLINEARITY WITH EXPONENTIAL GROWTH

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Abstract. In the present work, we are concerned with the Choquard Logarithmic equation
\[-\Delta u + au + \lambda (\ln |\cdot| * |u|^2)u = f(u)\textrm{ in } \mathbb{R}^2,\]
for \(\alpha > 0, \lambda > 0\) and a nonlinearity \(f\) with exponential critical growth. We prove the existence of a nontrivial solution at the mountain pass level and a nontrivial ground state solution. Also, we provide these results under a symmetric setting, taking into account subgroups of \(O(2)\).

1. Introduction

In this paper, we are interested in studying standing wave solutions for the following Schrödinger–Poisson system:

\[
\begin{aligned}
    i\psi_t - \Delta \psi + \tilde{V}(x)\psi + \gamma \omega \psi &= 0 \quad \text{in } \mathbb{R}^N \times \mathbb{R}, \\
    \Delta \omega &= |\psi|^2 \quad \text{in } \mathbb{R}^N,
\end{aligned}
\]

where \(\psi: \mathbb{R}^N \times \mathbb{R} \to \mathbb{C}\) is the time-dependent wave function, \(\tilde{V}: \mathbb{R}^N \to \mathbb{R}\) is a real external potential and \(\gamma > 0\) is a parameter. The function \(\omega\) represents...