One-dimensional periodic fractional Schrödinger equations with exponential critical growth

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January 10, 2022

Abstract

In the present paper, we study the existence of nontrivial solutions of the following one-dimensional fractional Schr\"{o}dinger equation $$ (-\Delta)^{1/2}u+V(x)u=f(x,u), \ \ x\in \R, $$ where $(-\Delta)^{1/2}$ stands for the $1/2$-Laplacian, $V(x)\in \mathcal{C}(\R, (0,+\infty))$, and $f(x,u):\R\times\R\to \R$ is a continuous function with an exponential critical growth. Comparing with the existing works in the field of exponential-critical-growth fractional Schr\"{o}dinger equations, we encounter some new challenges due to the weaker assumptions on the reaction term f. By using some sharp energy estimates, we present a detailed analysis of the energy level, which allows us to establish the existence of nontrivial solutions for a wider class of nonlinear terms. Furthermore, we use the non-Nehari manifold method to establish the existence of Nehari-type ground state solutions of the one-dimensional fractional Schr\"{o}dinger equations.

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