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# MULTIPLICITY OF NONNEGATIVE SOLUTIONS FOR A CLASS OF FRACTIONAL P-LAPLACIAN SYSTEM IN $\mathbb{R}^N$

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**Abstract.** Here, we deal with the existence and multiplicity of nonnegative solutions for a class of fractional p-laplacian system in $\mathbb{R}^N$. Using the variational methods and extracting Palais-Smale sequences in the Nehari manifold, we prove that there exists $\lambda^*$ such that for $\lambda \in (0, \lambda^*)$ the given problem has at least two distinct positive solutions.

**Keywords.** critical point, nonlinear elliptic equations, Fractional partial dierential equations, lack of compactness, Nehari manifold.

**AMS (MOS) subject classification:** 35B38, 35J60, 35R11.

## 1 Introduction

The class of fractional elliptic partial differential problems arise in many different contexts, such as optimization, finance, wather wavs, continuum mechanics, conservation laws and other sciences. Also, recently many authors are interested in the existence and multiplicity of this problems, see for instance [4, 7, 8, 9] and the references cited therein. So in this paper we consider the following fractional p-laplacian elliptic system:

$$\begin{cases} (-\Delta)_p^s u + m(x)|u|^{p-2}u = \lambda f_u(x,u,v) + \Re_u(x,u,v), \\ (-\Delta)_p^s v + m(x)|v|^{p-2}v = \lambda f_v(x,u,v) + \Re_v(x,u,v), \end{cases} \tag{1}$$

where $x \in \mathbb{R}^N$, $m(x) \in C(\mathbb{R}^N)$ is a positive function and $(-\Delta)_p^s$ is the fractional p-laplacian operator which is defined by

$$(-\Delta)_p^s u(x) := 2 \lim_{\epsilon \to 0} \int_{\mathbb{R}^N \setminus B_\epsilon(x)} \frac{|u(y) - u(x)|^{p-2}\big(u(y) - u(x)\big)}{|x - y|^{N+ps}} dy. \tag{2}$$

Also, $\Re(x,u,v) = \frac{1}{r} g(x,u,v) + h(x,u,v)$ where $g$ and $h$ are $C^1-$positively homogenous functions of degrees $r$ and 1 respectively such that $1 < r < p$ and $g(x,0,0) = h(x,0,0) = 0$.