



SEMINÁRIO DE EQUAÇÕES DIFERENCIAIS

Variational problems involving nonlocal fractional operators

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Resumo: In some recent works written jointly with Prof. Raffaella Servadei (University of Calabria) and Prof. Enrico Valdinoci (WIAS-Berlin), we have studied problems modeled by

$$(0.1) \quad \begin{cases} (-\Delta)^s u = f(x, u) & \text{in } \Omega, \\ u = 0 & \text{in } \mathbb{R}^n \setminus \Omega, \end{cases}$$

where $s \in (0, 1)$ is fixed, $\Omega \subset \mathbb{R}^n$ is an open and bounded set, $(-\Delta)^s$ is the fractional Laplace operator which (up to normalization factors) may be defined as

$$-(-\Delta)^s u(x) = \int_{\mathbb{R}^n} \frac{u(x+y) + u(x-y) - 2u(x)}{|y|^{n+2s}} dy, \quad x \in \mathbb{R}^n,$$

while the nonlinear term f satisfies suitable regularity and growth conditions. In problem (0.1) the Dirichlet datum is given in $\mathbb{R}^n \setminus \Omega$ and not simply on $\partial\Omega$, consistently with the nonlocal character of the operator $(-\Delta)^s$.

Aim of this talk will be to present results which extend the validity of some existence theorems known in the classical case of the Laplacian to the nonlocal framework. The proof of these existence results for problem (0.1) and for other problems which will be introduced in this talk are mainly based on variational and topological arguments.