WEBINAR ON PDE AND RELATED AREAS

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Hölder regularity for nonlocal double phase equations

Giampiero Palatucci

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We present some regularity estimates for viscosity solutions to a class of possible degenerate and singular integro-differential equations whose leading operator switches between two different types of fractional elliptic phases, according to the zero set of a modulating coefficient $a = a(\cdot,\cdot)$. The model case is driven by the following nonlocal double phase operator,

$$\int \frac{|u(x)-u(y)|^{p-2}(u(x)-u(y))}{|x-y|^{n+sp}}\,\mathrm{d}y + \int a(x,y)\,\frac{|u(x)-u(y)|^{q-2}(u(x)-u(y))}{|x-y|^{n+tq}}\,\mathrm{d}y,$$

where $q \geq p$ and $a(\cdot,\cdot) \geqq 0$. Our results do also apply for inhomogeneous equations, for very general classes of measurable kernels. By simply assuming the boundedness of the modulating coefficient, we are able to prove that the solutions are Hölder continuous, whereas similar sharp results for the classical local case do require a to be Hölder continuous. To our knowledge, this is the first (regularity) result for nonlocal double phase problems.

References

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Giampiero Palatucci
Università di Parma
giampiero.palatucci@unipr.it