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Sharp regularity estimates for fully nonlinear parabolic equations

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In this talk we will prove sharp regularity estimates for viscosity solutions of parabolic equations as follows

$$\frac{\partial u}{\partial t} - F(x,t,Du,D^2u) = f(x,t) \text{ in } \mathcal{Q}_1 = \mathcal{B}_1 \times (-1,0],$$

where F is a second order fully nonlinear operator, its coefficients are merely mensurable with small enough oscillation, and $f \in L^{p,q}(\mathcal{Q}_1)$, i.e., an anisotropic Lebesgue space with exponents $p,q \in [1,\infty)$ such that $0 < \frac{n}{p} + \frac{2}{q} < 1$. Under such assumptions, we will establish local $C^{1+\zeta,\frac{1+\zeta}{2}}$ regularity estimates for such models, where the sharp value of $\zeta \in (0,1)$ is explicitly found in terms of structural and universal parameters of the problem, i.e., ellipticity constants of the operator, dimension and integrability of the source term.

The mathematical insights for proving such a sharp $C^{1+\zeta,\frac{1+\zeta}{2}}$ regularity are based on a refined compactness method, as well as a systematic iterative approximation procedure arising from [1]. Such estimates can be found in the manuscript [2] and are an extension to obtained ones in [1] and [3].

This is joint work with Eduardo V. Teixeira (University of Central Florida - USA).

References

[1] M.G. Crandall; M. Kokan and A. Swiech, *L^p-theory for fully nonlinear uniformly parabolic equations*, Comm. Partial Differential Equations 25, no. 11 (2000), 1997–2053.

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[3] E. V. Teixeira, *Universal moduli of continuity for solutions to fully nonlinear elliptic equations*. Arch. Rational Mech. Anal. 211, no 3, 911–927 (2014).

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