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**A NONSMOOTH EXTENSION OF THE BREZZI-RAPPAZ-RAVIART
APPROXIMATION THEOREM VIA METRIC REGULARITY
TECHNIQUES AND APPLICATIONS TO NONLINEAR PDES**

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In this talk, based on a current collaboration with J. Berry and O. Ley (INSA Rennes), we discuss a general result allowing to obtain existence and a priori error estimates for approximations to nonlinear equations. This result is motivated by nonlinear partial differential equations and is a generalization a theorem of Brezzi, Rappaz and Raviart. In this context, our extension lies in the fact that the Nemytskii operator induced by the nonlinearity need not be differentiable. This is achieved by making use of the theory of metrically regular mappings. We also study a generalized differential for the Nemytskii operator. Finally we provide an application of our theorem to viscous Hamilton-Jacobi equations and second order mean field games.

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