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**Marta Lewicka\*** (lewicka@pitt.edu). *Expansions of averaging operators and applications.*

The following approach of finding solutions to a partial differential equation  $Lu=0$ , proved to be quite versatile and allow to deal with several elliptic and parabolic nonlinear operators  $L$ :

(i) find an asymptotic expansion of suitable averaging operator on  $u$ , in which the appropriate order coefficient matches  $Lu$ ;

(ii) study the related mean value equation by removing higher order error terms in the expansion;

(iii) interpret the mean value equation as the dynamic programming principle of a two-player game incorporating deterministic and stochastic components;

(iv) pass to the limit in the radius of sampling/averaging, in order to recover solutions to  $Lu=0$  from the values of the game process.

In my talk, I will explain this approach in the following contexts:  $p$ -Laplacian; non-local geometric  $p$ -Laplacian; Robin boundary conditions; and weighted Laplace-Beltrami operator on a manifold. In each case, finding the appropriate averaging principle is the key starting point in order to develop (i)-(iv). (Received August 22, 2020)