



## EFFECTIVE METHODS IN GEODESIC SPACES

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This talk reports on recent applications of proof mining in nonlinear ergodic theory. The program of proof mining is concerned with the extraction, using methods from logic, of hidden finitary and combinatorial content, such as algorithms and effective bounds, from proofs that make use of highly infinitary principles. This research direction can be related to Terence Tao proposal of “hard analysis”, based on finitary arguments, instead of the infinitary ones from “soft analysis”.

We apply methods of proof mining to study the asymptotic behavior of nonlinear generalizations of the ergodic averages, known under the name of Halpern iterations. We obtain effective and highly uniform rates of metastability (in the sense of Tao) on nonlinear generalizations of the classical von Neumann mean ergodic theorem, due to Saejung for CAT(0) spaces and Shioji-Takahashi for Banach spaces with a uniformly Gateaux differentiable norm. These results are obtained by developing a method to eliminate the use of Banach limits from Saejung’s and Shioji-Takahashi convergence proofs.