Convergence of lacunary ergodic Cesàro averages and weighted inequalities

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Let $T$ be a positive linear operator with positive inverse. We consider the ergodic Cesàro-$\alpha$ averages

$$A_{n,\alpha}f = \frac{1}{A_n} \sum_{k=0}^{n} A_{n-k}^{\alpha-1} T^{k} f, \quad 0 < \alpha \leq 1,$$

and the ergodic Cesàro-$\alpha$ maximal operator associated to $T$. For Lebesgue spaces $L^p(\nu)$, the good range for the convergence of the Cesàro-$\alpha$ averages and the boundedness of the maximal operator is $1/\alpha < p < +\infty$. In this lecture we shall recall previous results about convergence of ergodic averages and we shall present some of the results in [?] about the convergence of the lacunary sequence $A_{2^k,\alpha}f$ and the boundedness of its associated ergodic maximal operator. We get positive results in the range $1 \leq p < \frac{1}{1-\alpha}$. We use transference arguments which leads to us to study in depth weighted inequalities of the lacunary Cesàro-$\alpha$ maximal operator in the setting of the integers and in the setting of the real line.

Keywords: Cesàro-$\alpha$ ergodic averages, lacunary ergodic averages, ergodic maximal operator, positive operator, nonsingular transformation, weighted inequalities

Mathematics Subject Classification 2010: 47A35, 37A40, 42B25

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