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Weighted averages of ℓ^p sequences: New generalizations of Hardy's inequality

The classical Hardy inequality states that $\sum_{n=1}^{\infty} \left(\frac{a_1+\dots+a_n}{n}\right)^p \leq \left(\frac{p}{p-1}\right)^p \sum_{n=1}^{\infty} a_n^p$, where $(a_n)_{n \geq 1}$ is a given sequence of nonnegative real number. The objective of this talk is to present three new Hardy-type inequalities in which the arithmetic mean over a sequence of nonnegative real numbers is replaced by some weighted arithmetic mean over some nested subsets of the given sequence of numbers. One of these inequalities stems from a calculation in a recent paper on semi-infinite matrices of Bouthat and Mashreghi.