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ITERATED REARRANGEMENTS  
AND GAGLIARDO-SOBOLEV TYPE INEQUALITIES

We consider Lorentz type spaces  $\mathcal{L}_\sigma^{p,r}$  defined in terms of iterated rearrangements of functions of several variables ( $\sigma$  is a permutation of  $\{1, \dots, n\}$ ). Further, we study Fournier-Gagliardo mixed norm spaces  $\mathcal{V}(\mathbb{R}^n)$  closely related to Sobolev spaces  $W_1^1(\mathbb{R}^n)$ . We prove estimate of  $\|f\|_{\mathcal{L}_\sigma^{n',1}}$  via  $\|f\|_{\mathcal{V}}$  with the sharp constant. In particular, this gives a refinement of the known Sobolev type inequalities for the space  $W_1^1(\mathbb{R}^n)$ .