Morrey spaces on domains: different approaches and growth envelopes

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Abstract

We deal with Morrey spaces on bounded domains Ω obtained by different approaches. In particular, we consider three settings $\mathcal{M}_{u,p}(\Omega)$, $\mathbb{M}_{u,p}(\Omega)$, and $\mathfrak{M}_{u,p}(\Omega)$, where $0 < p \leq u < \infty$, commonly used in the literature, and study their connections and diversities. Moreover, we determine the growth envelopes $\mathfrak{E}_{\mathsf{G}}(\mathcal{M}_{u,p}(\Omega))$ as well as $\mathfrak{E}_{\mathsf{G}}(\mathfrak{M}_{u,p}(\Omega))$, and obtain some applications in terms of optimal embeddings. Surprisingly, it turns out that the interplay between p and u in the sense of whether $\frac{n}{u} \geq \frac{1}{p}$ or $\frac{n}{u} < \frac{1}{p}$ plays a decisive role when it comes to the behaviour of these spaces.