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The Quaternion Matrix-Valued Young's Inequality

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Abstract: In this paper, we prove Young's inequality in quaternion matrices: for any $n \times n$ quaternion matrices A and B, any $p, q \in (1, \infty)$ with $\frac{1}{p} + \frac{1}{q} = 1$, there exists $n \times n$ unitary quaternion matrix U such that $U|AB^*|U^* \leq \frac{1}{p}|A|^p + \frac{1}{q}|B|^q$.

Furthermore, there exists unitary quaternion matrix U such that the equality holds if and only if $|B| = |A|^{p-1}$.