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About the maximal rank of 3-tensors over the real and the complex number field

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Abstract Tensor data are becoming important recently in various application fields. In this paper, we consider the maximal rank problem of 3-tensors and extend Atkinson and Stephens' and Atkinson and Lloyd's results over the real number field. We also prove the assertion of Atkinson and Stephens: $\max.\mathrm{rank}_{\mathbb{R}}(m, n, p) \leq m + \lfloor p/2 \rfloor n$, $\max.\mathrm{rank}_{\mathbb{R}}(n, n, p) \leq (p+1)n/2$ if p is even, $\max.\mathrm{rank}_{\mathbb{F}}(n, n, 3) \leq 2n-1$ if $\mathbb{F} = \mathbb{C}$ or n is odd, and $\max.\mathrm{rank}_{\mathbb{F}}(m, n, 3) \leq m+n-1$ if $m < n$ where $\mathbb{F}$ stands for $\mathbb{R}$ or $\mathbb{C}$.

Keywords Tensor · Maximal rank