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Tensor decomposition via the analysis of Artinian algebras

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Tensor decomposition is a challenging problem from a computational and numerical point of view. This can be explained by the complex and still unrevealed geometry hidden behind the scene.
We will explore this complex geometry via the lens of algebra, investigating how Artinian algebras can be naturally associated to general (additive) decompositions of tensors. We will review algebraic geometric approaches, which reduces tensor decomposition to direct eigenvalue and eigenvector computations when the rank is small.
When the rank is higher, the geometry is much more complex. We will see how the tensor decomposition problem can be transformed into a simultaneous diagonalization problem of extended tensors or extensor. We will connect the varieties of extensors with the punctual Hilbert scheme, via families of commuting matrices and illustrate the concepts and the computational approach on some examples.

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