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Ubiquity of melonic limits in tensor models

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Analogously to matrix models, which provide a combinatorial approach to two-dimensional quantum gravity, tensor models appear to be well-suited to investigations of random geometry in higher dimensions. Indeed, certain generating functions of discrete (pseudo)manifolds, of arbitrary but fixed dimension, can be expressed in terms of (formal) tensor integrals. This being said, obtaining genuinely new universality classes of random geometry from the currently understood scaling limits of tensor models has proven challenging. Among them, the so-called melonic limit is known to produce a branched-polymer phase at criticality, leading to a random geometry of local dimension 4/3 which is unsuitable for quantum gravity. But not all is lost since the combinatorial simplicity of this type of limit has made it a valuable tool to design solvable strongly coupled quantum (field) theories, and via a 2d version of the AdS/CFT correspondence, to investigate quantum gravity itself (albeit from a different perspective). This state of affair raises the question of how ubiquitous melonic limits actually are in tensor models, which will be the focus of this talk. After summarizing the types of tensor representations and invariant interactions that are already known to support melonic limits, I will discuss further conjectures and open problems.

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