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On harvesting physical predictions from asymptotically safe quantum field theories

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Asymptotic safety is a powerful mechanism for obtaining a consistent and predictive quantum field theory beyond the realm of perturbation theory. It hinges on an interacting fixed point of the Wilsonian renormalization group flow, which controls the microscopic dynamics. Connecting the fixed point to observations requires constructing the set of effective actions compatible with this microscopic dynamics. Technically, this information is stored in the UV-critical surface of the fixed point. In this talk, I will describe a novel approach for extracting this information based on analytical and pseudo-spectral methods. I will illustrate the methods at the level of the two-dimensional Ising model, where we find non-trivial predictions for the effective action. The developed techniques apply to any asymptotically safe quantum field theory. Furthermore, they also constitute an important step towards setting up a well-founded swampland program within the gravitational asymptotic safety program. The talk is based on arXiv:2403.08541.

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