Intrafaculty Colloquium: Mathematics and Physics

UNI FREIBURG

Tobias Osborne
(Leibniz Universität Hannover)

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The Renormalisation Group via Statistical Inference

In physics one attempts to infer the rules governing a system given only the results of imperfect measurements. Hence, microscopic theories may be effectively indistinguishable experimentally. We develop an operationally motivated procedure to identify the corresponding equivalence classes of theories. Here it is argued that the renormalisation group arises from the inherent ambiguities in constructing the classes: one encounters flow parameters as, e.g., a regulator, a scale, or a measure of precision, which specify representatives of the equivalence classes. This provides a unifying framework and identifies the role played by information in renormalisation. Our methods also provide a way to extend renormalisation techniques to effective models which are not based on the usual quantum-field formalism, and elucidates the distinctions between various type of RG.

☏: 0761 / 203 67351 ✉: david.gross@physik.uni-freiburg.de