MATHEMATICAL RESOLUTION OF THE LIOUVILLE CONFORMAL FIELD THEORY

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Conformal field theory is a field theory with conformal symmetries. This theory was developed in the eighties in relation to statistical physics and to string theory. It inspired a lot of interesting mathematical questions, going from vertex operator algebras and representation theory to the theory of random geometries. In this talk, I will explain several aspects of conformal field theory (CFT) in dimension 2, and we will review recent results we obtained in a particular case called Liouville CFT with Kupiainen, Rhodes, Vargas and Baverez. For this model, involving random Riemann surfaces, we are able to perform a mathematically rigorous proof of the conformal bootstrap that allows us to obtain formulas for all correlation functions and all surfaces in terms of conformal blocks and 3-point correlation functions. This work is based on the use of probability, scattering theory, and an explicit representation of the Virasoro algebra involving the theory of Gaussian multiplicative chaos. I will aim for the talk to be accessible to non-specialists.