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Random surfaces and Liouville quantum gravity

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ABSTRACT

What is the most natural way of choosing a random surface (2d Riemannian manifold), say with the topology of the sphere? The answer is far from obvious since the space of all Riemannian metric tensors on the sphere is infinite-dimensional. On the other hand, this question has connections to topics in theoretical physics such as string theory, Yang-Mills theory, conformal field theory, statistical mechanics, and quantum gravity. I will give an introduction to the theory of Liouville quantum gravity (LQG), which allows us to make rigorous sense of random surfaces. I will also touch on some recent developments concerning the supercritical (strongly coupled) phase of LQG and analogs of LQG in higher dimensions. I will assume no background knowledge beyond introductory graduate-level courses in probability and analysis.