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Probabilistic Conformal Field Theory

Monday, May 12, 2025 4:30 PM (1 hour)

Conformal Field Theories (CFT) are believed to describe the universal behaviour of physical systems at a second order phase transition point. They also play a central role in Quantum Field Theories of fundamental physics by describing their properties in the limits of small and large length scales. In two dimensions they are believed to have a rich mathematical structure uncovered by the physicists Belavin, Polyakov and Zamolodchicov in 1983 with deep impacts in representation theory and geometry. However their rigorous mathematical foundations have remained a matter of debate. The lectures aim to explain a probabilistic approach to CFT based on their path integral formulation and how this can be connected to Graeme Segal's geometric approach to conformal bootstrap, an axiomatic approach to CFT. We discuss in particular two prominent CFTs, the Liouville CFT that plays a central role in Liouville Quantum Gravity and the theory of random surfaces and the Wess-Zumino-Witten models that have rich representation theoretical content.

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