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Janet Hung: A 2D-CFT Factory: Critical Lattice Models from Competing Anyon Condensation in SymTO/SymTFT

Thursday, July 17, 2025 10:00 AM (1 hour)

In this talk, we introduce a CFT factory" : a novel algorithm of methodically generating 2D lattice models that would flow to 2D conformal fixed points in the infrared. These 2D models are realised by giving critical boundary conditions to 3D topological orders (symTOs/symTFTs) described by string-net models, often called the strange correlators. We engineer these critical boundary conditions by introducing a commensurate amount of non-commuting anyon condensates. The non-invertible symmetries preserved at the critical point can be controlled by studying a novelrefined condensation tree". Our structured method generates an infinite family of critical lattice models, including the A-series minimal models, and uncovers previously unknown critical points. Notably, we find at least three novel critical points (c ≈1.3, 1.8, and 2.5 respectively) preserving the Haagerup symmetries, in addition to recovering previously reported ones. The condensation tree, together with a generalised Kramers-Wannier duality, predicts precisely large swathes of phase boundaries, fixes almost completely the global phase diagram, and sieves out second order phase transitions. This is not only illustrated in well-known examples (such as the 8-vertex model related to the A5 category) but also further verified with precision numerics, using our improved (non-invertible) symmetry-preserving tensor-network RG, in novel examples involving the Haagerup symmetries. We show that critical couplings can be precisely encoded in the categorical data (Frobenius algebras and quantum dimensions in unitary fusion categories), thus establishing a powerful,
systematic route to discovering and potentially classifying new conformal field theories.