

GRADUATE STUDENT SEMINAR

Guest Speaker: Philippe Mathieu

University of Notre Dame

Date: Wednesday, March 23, 2022

Time: 3:30 PM

Location: 117 Hayes-Healy Hall

Zoom URL: notredame.zoom.us/j/93888654312



Lecture Title:

Extensions of the Abelian Turaev-Viro construction and U(1) BF theory to any finite dimensional smooth oriented closed manifold

Abstract

In 1992, V. Turaev and O. Viro defined an invariant of smooth oriented closed 3-manifolds consisting of labelling the edges of a triangulation of the manifold with representations of $\mathcal{U}_q(\mathfrak{sl}_2(\mathbb{C}))$ (q being a root of unity), associating a (quantum) $6j$ -symbol to each tetrahedron of the triangulation, taking the product of the $6j$ -symbols over all the tetrahedra of the manifold, then summing over all the admissible labelling representations. It is commonly admitted that this construction is a regularization of a path integral occurring in quantum gravity, the so-called “Ponzano-Regge model”, which is a kind of SU(2) BF gauge theory. A naive question is: Is it possible to define an abelian version of this invariant? If yes, is there a relation with an abelian BF gauge theory? These questions were answered positively in 2016, and the corresponding Turaev-Viro invariant is built from $\mathbb{Z}/k\mathbb{Z}$ labelling representations (the equivalent of $6j$ -symbols being “modulo k ” Kronecker symbols) while the associated gauge theory is a particular U(1) BF theory (with coupling constant k). This U(1) BF theory can be straightforwardly extended to any finite dimensional closed oriented manifold, and so can be the Turaev-Viro construction built from $\mathbb{Z}/k\mathbb{Z}$ labelling representations. A natural question is thus: Are these extensions still related? I will answer this question during the talk.