## Mathematics and CS Seminar

# Hecke operators over local fields and an analytic approach to the geometric Langlands correspondence

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I will review an analytic approach to the geometric Langlands correspondence, following my work with E. Frenkel and D. Kazhdan,arXiv:1908.09677, arXiv:2103.01509, arXiv:2106.05243. This approach was developed by us in the last couple of years and involves ideas from previous and ongoing works of a number of mathematicians and mathematical physicists, Kontsevich, Langlands, Teschner, and Gaiotto-Witten. One of the goals of this approach is to understand single-valued real analytic eigenfunctions of the quantum Hitchin integrable system. The main method of studying these functions is realizing them as the eigenbasis for certain compact normal commuting integral operators the Hilbert space of L2 half-densities on the (complex points of) the moduli space Bun_G of principal G-bundles on a smooth projective curve X, possibly with parabolic points. These operators actually make sense over any local field, and over non-archimedian fields are a replacement for the quantum Hitchin system. We conjecture them to be compact and prove this conjecture in the genus zero case (with parabolic points) for G=PGL(2). I will first discuss the simplest non-trivial example of Hecke operators over local fields, namely G=PGL(2) and genus 0 curve with 4 parabolic points. In this case the moduli space of semistable bundles Bun_G^{ss} is P^1, and the situation is relatively well understood; over C it is the theory of single-valued eigenfunctions of the Lame operator with coupling parameter -1/2 (previously studied by Beukers and later in a more functional-analytic sense in our work with Frenkel and Kazhdan). I will consider the corresponding spectral theory and then explain its generalization to N>4 points and conjecturally to higher genus curves.

**Thursday, November 11, 2021 02:00pm - 04:00pm**
https://mathseminars.org/seminar/AGNTISTA

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