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Kempner Colloquium

Recent developments in universal quantum computation

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Classical computers function with bits that are 0 and 1. Instead quantum computers function with states that are complex linear combinations of quantum bits $|0>$ and $|1>$. In this talk we will give an overview of how to make quantum gates, that is how to mathematically and physically realize the unitary transformations that make a state evolve to another state.
Our approach is based on the pioneering work of Michael Freedman, Chetan Nayak and Sankar Das Sarma among others in topological quantum computation. An important physical operation consists of braiding quasi-particles which are named anyons.
Making a braid on anyons consists of interchanging their positions. The mathematical theory which we use behind the physics of braiding anyons is the Kauffman-Jones version of SU(2) Chern-Simons theory at level 4. We will introduce this theory and show how to make some of the quantum gates that make quantum computation universal, that is, it is possible with these very few gates to obtain good approximations to any desired gate.

Tuesday October 7, 2014
12:10 PM - 12:50 PM
MATH 350