Anyons as equivalence classes of representations of observables

It is well known that the algebraic properties of anyons are described by modular tensor categories (MTC). In this talk I will consider quantum systems in the limit of infinitely many sites, and argue that anyonic excitations of such systems are described by equivalence classes of certain representations of the observable algebra. A careful study of these representations allow the recovery of all relevant properties of the anyons, e.g. braiding and fusion rules. In this way the MTC can be obtained from first principles.

A natural question is then if, given any such quantum system, anyonic excitations are possible or not. Or slightly better, could one distinguish different 'topological phases'? One could try to answer this question by finding quantities that can distinguish different anyon models. One such quantity is the so-called topological entanglement entropy (TEE). I will report on work in progress (with Tobias Osborne) on an alternative, purely algebraic quantity, the Jones-Kosaki-Longo index, that can be defined in the thermodynamic limit setting. As I will argue, this index is related to TEE.