
Beyond Rationality in Algebraic CFT: mathematical structures and models

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Project abstract:

Conformal Field Theory (CFT) in low dimensions is one of the most active branches of modern physics, it is amenable to rigorous "axiomatic" formulations, hence it is naturally connected to various areas of mathematical research. For example, to CFTs one can associate braided tensor categories (describing superselection sectors, defects, topological field theories) and subfactors, i.e., inclusions of von Neumann algebras with trivial center (describing extensions, duality properties and exotic charge localizations). All these areas are independently pairwise correlated, e.g., subfactors with CFTs, subfactors with tensor categories, and they have their own history and an extremely profound literature. The aim of my research project is to analyze models of CFT, together with the associated mathematical objects, which are not necessarily "rational", i.e., which may admit infinitely many superselection sectors ("particle" excitations of the vacuum). Examples of non-rational CFTs (which are the majority among all CFTs) come from Virasoro minimal models with central charge bigger than one (there are continuously many), and global gauge theories with respect to a compact non-finite group of internal symmetries. Non-rationality of a CFT also implies that the "size" of the associated categories and subfactors have to be infinite, namely one is led to consider categories with infinite spectrum and subfactors with infinite Jones index. These mathematical objects are natural generalizations of their "finite" counterparts (modular and fusion categories, finite index subfactors), they are physically motivated, but they attracted the attention of researchers only in recent times. This research project aims to study structural properties of non-rational CFTs using modern machinery (e.g., generalized Q- systems, ind-categories, planar algebras), to study infinite braided tensor categories and infinite index subfactors arising from them, and exploit their interplay.

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Summary

No data in the form of computer simulations, databases, experimental or empirical records will be created/accessed to/collected/shared during this project, nor datasets will underly the published material, as far as I can foresee at the moment and referring to my previous experience.

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Making Data Findable

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Making Data Openly Accessible

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Making Data Interoperable

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Increase Data Re-Use

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Allocation of Resources and Data Security

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