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**ABSTRACT**

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**Category Algebras and States on Categories**

**Abstract:**

In the present talk we introduce a new approach to build a new bridge between category theory and noncommutative probability, in terms of states as linear functional defined on category algebras [1]. We clarify that category algebras can be considered to be generalized matrix algebras and that the notions of state on category as linear functional defined on category algebra turns out to be a conceptual generalization of probability measures on sets as discrete categories. Moreover, by establishing a generalization of famous GNS construction, we obtain a representation of category algebras of  ${}^{\dagger}$ -categories on certain generalized Hilbert spaces which we call semi-Hilbert modules over rigs. The concepts and results in the present paper will be useful for the various studies including quantum field theory [2].

[1] Saigo, H. Category Algebras and States on Categories. Symmetry 2021, 13, 1172. <https://doi.org/10.3390/sym13071172>

[2] Saigo, H. Quantum Fields as Category Algebras. Symmetry 2021, 13, 1727. <https://doi.org/10.3390/sym13091727>