Equivariant Eilenberg-Watts theorem for locally compact (quantum) groups

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Abstract

Let A and B be two von Neumann algebras. We write $\mathrm{Corr}(A, B)$ for the category of A-B-correspondences, whose objects consist of Hilbert spaces endowed with an appropriate A-B-bimodule structure. As a special case, $\mathrm{Rep}(A) = \mathrm{Corr}(A, \mathbb{C})$ is the category of all normal, unital $*$-representations of A on Hilbert spaces. In the seventies, M. Rieffel proved that there is a categorical equivalence

$$\mathrm{Corr}(A, B) \simeq \mathrm{Fun}(\mathrm{Rep}(B), \mathrm{Rep}(A)),$$

where the latter is the category of all normal $*$-functors $\mathrm{Rep}(B) \to \mathrm{Rep}(A)$. This is a von Neumann algebra version of the celebrated Eilenberg-Watts theorem. In this talk, we upgrade the von Neumann algebras A and B with actions $A \curvearrowleft \mathbb{G}$ and $B \curvearrowleft \mathbb{G}$ of a locally compact (quantum) group $\mathbb{G}$, and we provide versions of the von Neumann algebraic Eilenberg-Watts theorem in the presence of these actions. In this framework, the category $\mathrm{Rep}(\mathbb{G})$ of unitary $\mathbb{G}$-representations plays an important role.