This talk presents an account of joint work with Aleksey Ber, Jinghao Huang and Karim-bergen Kudaybergenov, whose large part can be found in the paper, *Notes on derivations of Murray–von Neumann algebras*, *Journal of Functional Analysis*, 279 (2020), no. 5, 108589, 26 pp (by A. Ber, K. Kudaybergenov, F. Sukochev).

Recall, that a fat Cantor set $E$ in $[0, 1]$, is nowhere dense (in particular it contains no intervals), yet has positive Lebesgue measure. Further, it is well-known that its characteristic function $\chi_E$ is approximately differentiable but nowhere differentiable function. Firstly, we explain the description of the algebra of all approximately differentiable functions on $(0, 1)$ (which is probably well known to the experts) and then introduce the algebra of all approximately differentiable operators affiliated with the hyperfinite $II_1$ factor (introduced by von Neumann in 1930’s). To this end, I shall briefly explain major results/notions concerning derivations on algebras of unbounded operators.

Next, I shall explain that the classical differential operator $\partial : D(0, 1) \mapsto S(0, 1)$ acting from the algebra of all differentiable functions on $(0, 1)$ into the algebra of all Lebesgue measurable functions allows an extension to the differential operator on the algebra $S(0, 1)$. However, any such extension cannot be translation-invariant, which is in the strong contrast with the properties of $\partial$.

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