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The Infinitesimal Distribution of Commutators and Anti-commutators

Given a unitarily invariant random matrix X_N and a fixed finite rank matrix F_N, it is known from the work of Sklyakhtenko (2018) and Collins, Hasabe, and Sakuma (2018) that X_N and F_N are asymptotically infinitesimally free. In joint work with Pei-Lun Tseng (NYU Abu Dhabi), we consider the commutator $i(X_N F_N - F_N X_N)$ and the anti-commutator $X_N F_N + F_N X_N$ and present a simple formula for their asymptotic infinitesimal distributions.