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Belief and Reality in Quantum-Like Model: Lessons from a Rat in a Maze

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We present a simple toy model of a rat moving in a maze [1, 2], where the rat's motion is governed by a quantum-inspired rule. At each time step, the rat samples its next position from a probability distribution that evolves according to a fixed Hamiltonian. This gives rise to the objective probability —the distribution that actually drives the rat's movement.
Meanwhile, an observer outside the maze does not know the rat's objective probability distribution. Instead, the observer updates their subjective probability —a belief about where the rat might be —based on indirect information (the rat's actual positions over time) and prior knowledge (initial position and evolution rule).
This setup clearly illustrates the difference between objective and subjective probabilities, a distinction that plays a central role in quantum foundations (e.g., in QBism [3] and related interpretations). Our model demonstrates how the same physical system can give rise to two distinct yet meaningful probability distributions: one tied to the system's internal behavior, and one tied to the observer's knowledge. Their difference can be called mismodelling.
Although the presented setup is simple, its main contribution is interpretational and connects to areas where real-world systems must be tracked or inferred based on uncertain or partial data.

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