World Wide NeuRise

Talks by rising stars of neuroscience

Mice identify subgoals locations through an action-driven mapping process

Philip Shamash - Branco lab
(Sainsbury Wellcome Centre)

Mammals instinctively explore and form mental maps of their spatial environments. Models of cognitive mapping in neuroscience mostly depict map-learning as a process of random or biased diffusion. In practice, however, animals explore spaces using structured, purposeful, sensory-guided actions. We have used threat-evoked escape behavior in mice to probe the relationship between ethological exploratory behavior and abstract spatial cognition. First, we show that in arenas with obstacles and a shelter, mice spontaneously learn efficient multi-step escape routes by memorizing allocentric subgoal locations. Using closed-loop neural manipulations to interrupt running movements during exploration, we next found that blocking runs targeting an obstacle edge abolished subgoal learning. We conclude that mice use an action-driven learning process to identify subgoals, and these subgoals are then integrated into an allocentric map-like representation. We suggest a conceptual framework for spatial learning that is compatible with the successor representation from reinforcement learning and sensorimotor enactivism from cognitive science.

Event link:
https://www.crowdcast.io/e/wwneurise/