# When Do Neural Networks Learn Sequential Solutions in Short-Term Memory Tasks?

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**Presentation Abstract Summary** Sequential and attractor-based models are two prominent solutions to short-term memory tasks. In attractor-based models, memories are represented in persistent or nearly persistent activity patterns across a population of neurons, whereas in sequential models, memories are represented dynamically by a sequential pattern of activity across the population. Experimental evidence for both types of models in the brain have been reported previously. However, it is not clear under what conditions these two qualitatively different types of solutions emerge in neural circuits. In this contribution, we address this question by training recurrent neural networks on a variety of short-term memory tasks through error-based supervised learning. We show that simple neural circuits, fixed delay durations and complex tasks favor sequential solutions, whereas more complex neural circuits with multiplicative interactions, variable delay durations and simpler tasks favor attractor-like solutions. Our results clarify some seemingly contradictory experimental results on the existence of sequential vs. attractor-like memory mechanisms in the brain.

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### Keywords

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