Consequences of a broad, smoothly varying STDP curve on the optimal coupling function and phase response curves.

(a) Memories are stored by a STDP rule that is broader and more smoothly varying than most experimentally described forms of STDP (but see C.D. Meliza, N. Caporale & Y. Dan. Spike timing-dependent plasticity of visually evoked synaptic responses, Soc. Neurosci. Abstr. 57.10, 2004). Nevertheless, main characteristics of STDP are still reflected: a synapse is strengthened if the presynaptic neuron fires before the postsynaptic neuron, and is weakened if the order of firings is reversed, and time differences beyond an ideal value result in decreasing synaptic weight change. The parameters used for this STDP curve were $s=0$, $A=0.25$, and $T_\theta=125$ ms (see Methods and Supplementary Note). $t_{pre}$, $t_{post}$, times of pre- and postsynaptic firing.

(b) Optimal coupling function for retrieving memories stored by STDP shown in a. $\Phi_{pre}$, $\Phi_{post}$, firing phases of pre- and postsynaptic cells relative to a local field potential oscillation. (For further explanation see Figure 1c of the main paper.)

(c) Optimal phase response curves derived from the optimal coupling function (shown in b). Different curves correspond to linearly increasing synaptic weights ($w_{ij}$) (0.025, red; 0.05, yellow; 0.075, green; 0.01, blue), $k_x = 0.6$ in all cases. (For further details and explanations, see Supplementary Note online, and Figure 1d of the main paper.)