Noise-Enhanced Associative Memories

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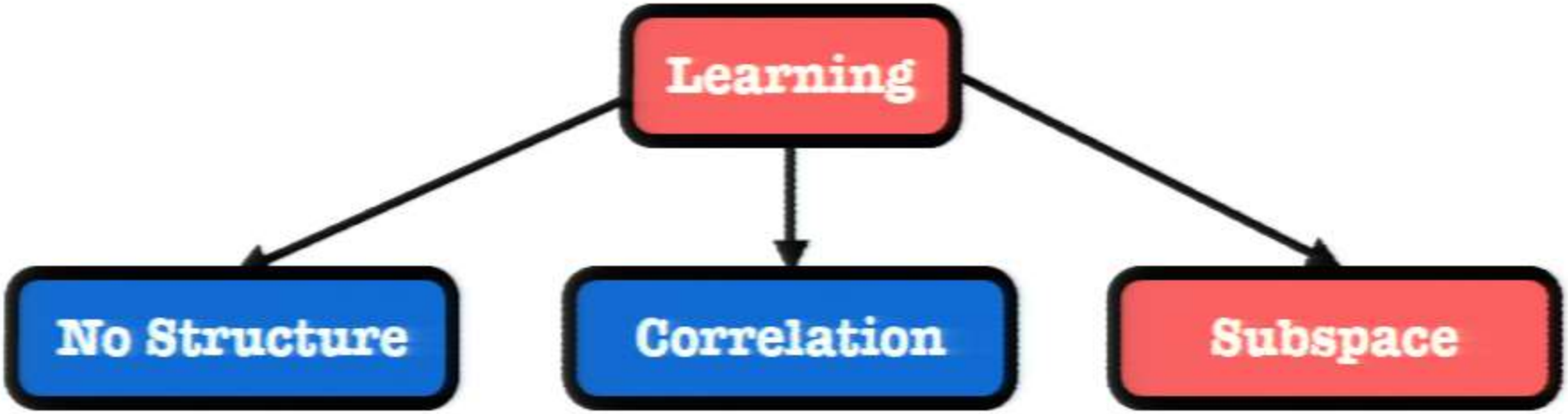
Neural Associative Memory

Patterns of length N



O(N)

Hopefield' 82
McEliece' 87

Poly(N)

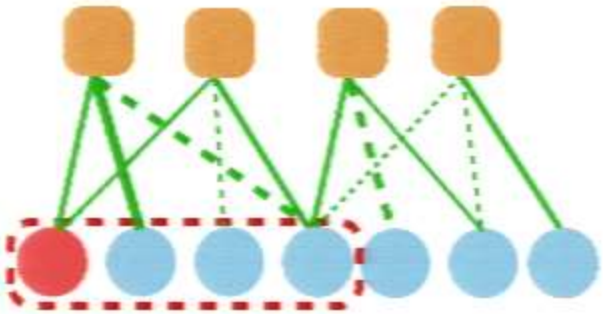
Berrou' 11

Exp(N)

Salavati' 12

Noise Tolerance

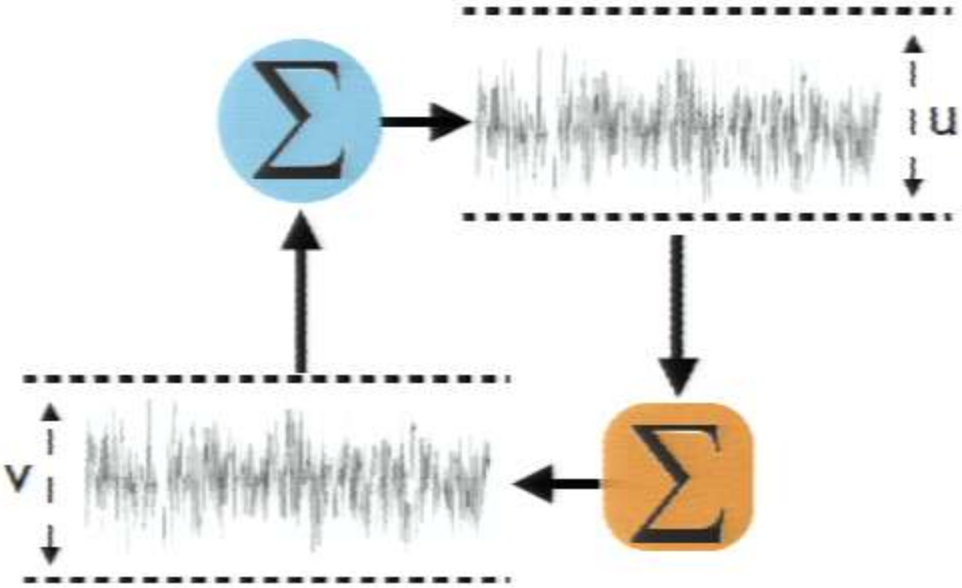
External Noise



Linear fraction of corrupted elements can be corrected

Karbasi' 13

Internal Noise

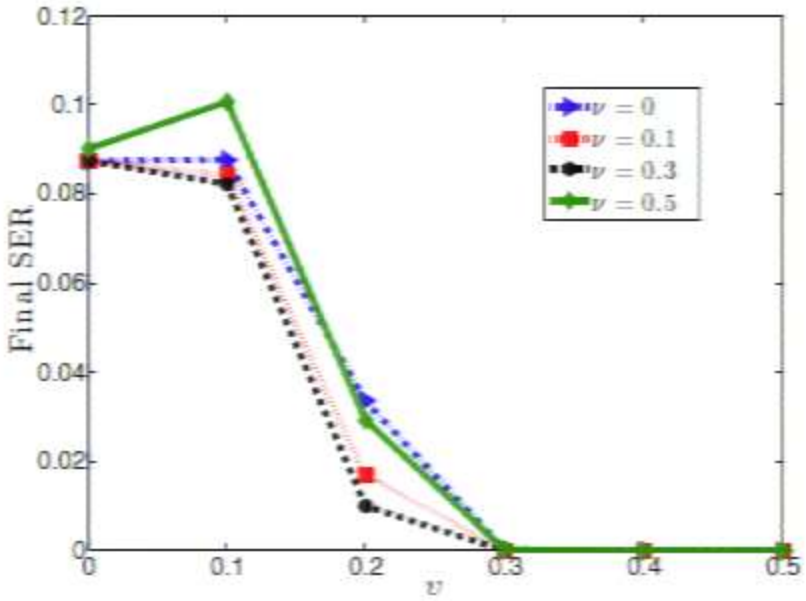


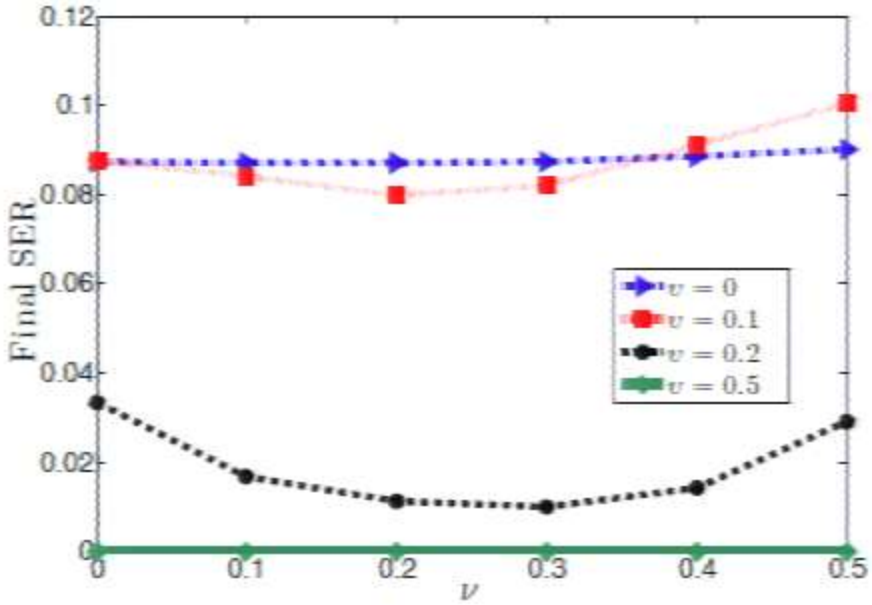
What Happens?

Amit' 94

Surprising Effect

There are positive error levels (u*,v*) below which noise **improves** the recall performance.





(u*,v*): fixed points of a density evolution recursion

Internal noise below (u*,v*) does not degrade retrieval capacity