Noise-Enhanced Associative Memories

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Patterns of length $N$

Learning

- No Structure
  - $O(N)$
    - Hopefield' 82
    - McEliece' 87

- Correlation
  - Poly($N$)
    - Berrou' 11

- Subspace
  - Exp($N$)
    - Salavati' 12
Noise Tolerance

External Noise

Linear fraction of corrupted elements can be corrected

Karbasi’ 13

Internal Noise

What Happens?

Amit’ 94
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.