Group 15 - LAB 3

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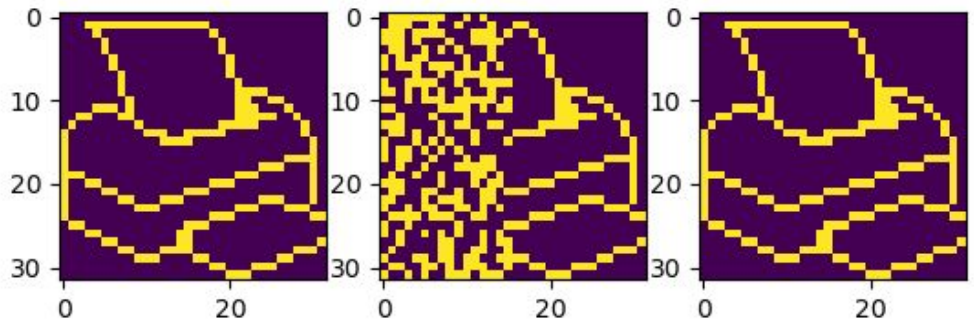
3.1
Convergence and attractors

Simple 8bit data

- The three input patterns are stable
- 2 / 3 slightly noisy patterns converged correctly
- No heavily noisy patterns converged correctly
- 11 attractors in total

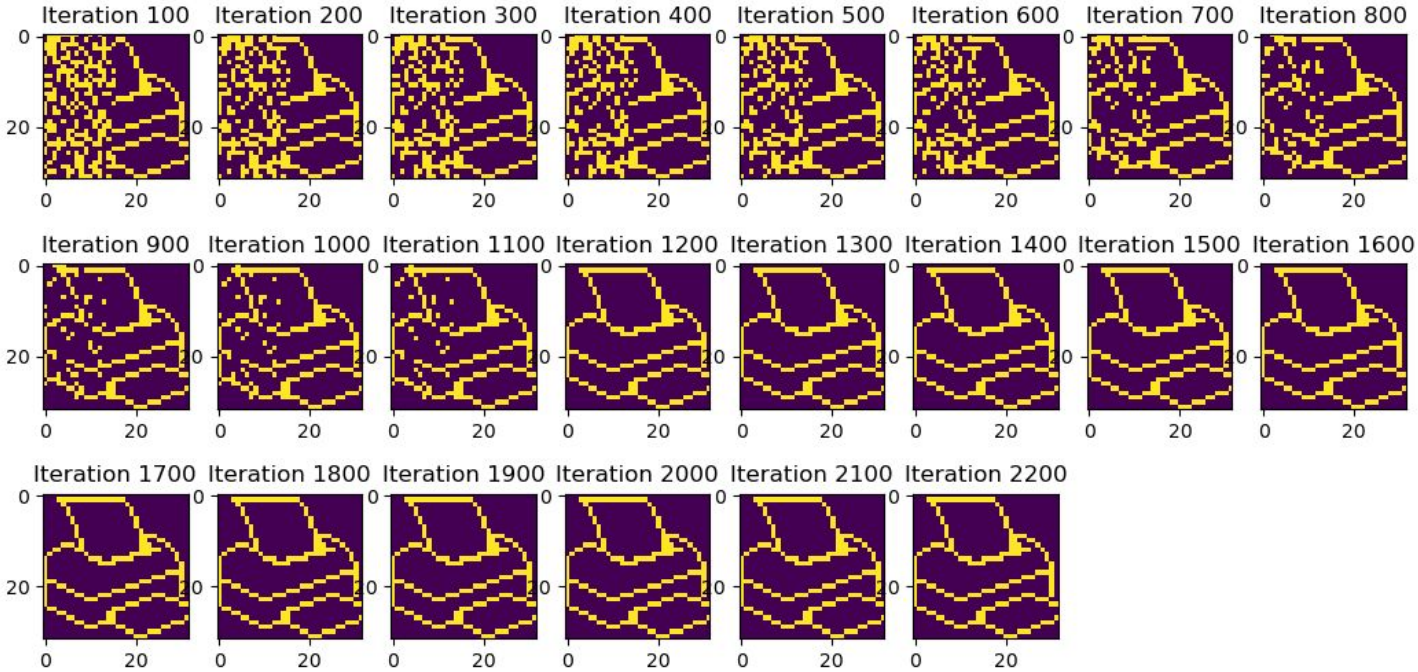
3.2
Sequential Update

Recovery with distorted pattern



Memory Input Output

Recovery with distorted pattern, sequential updates

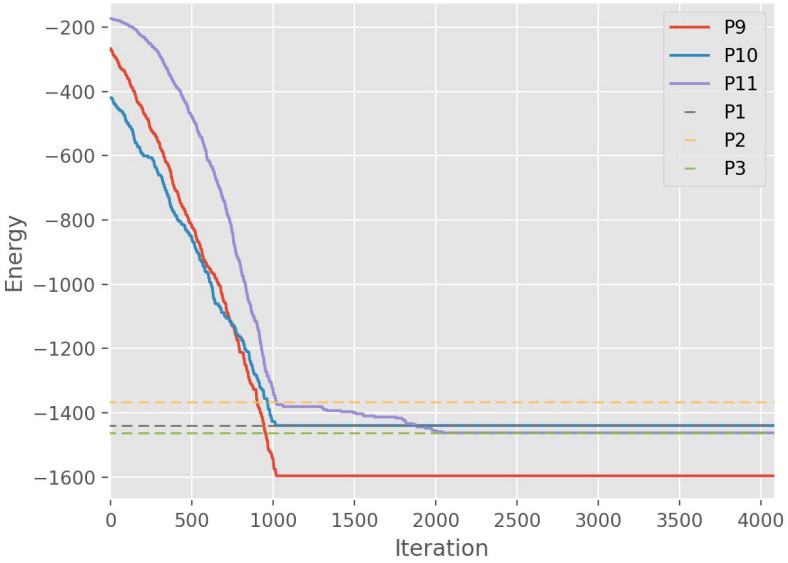


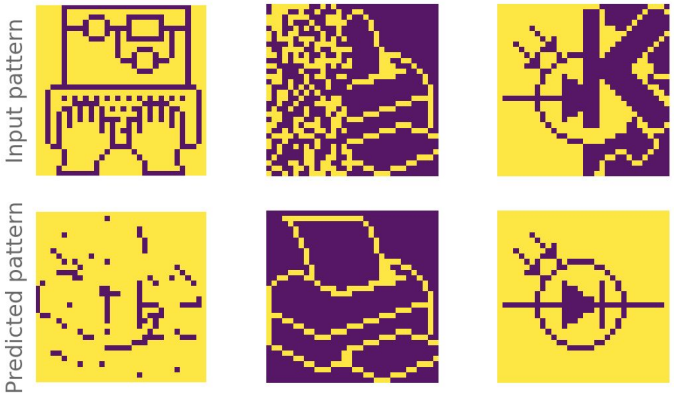
3.3
Energy

A reference of all the predictions

When trained only on the first three patterns the network appears to have four attractors

Energies for different images





Attractor energies

E_{P1} = -1439.4
E_{P2} = -1365.6
E_{P3} = -1462.3

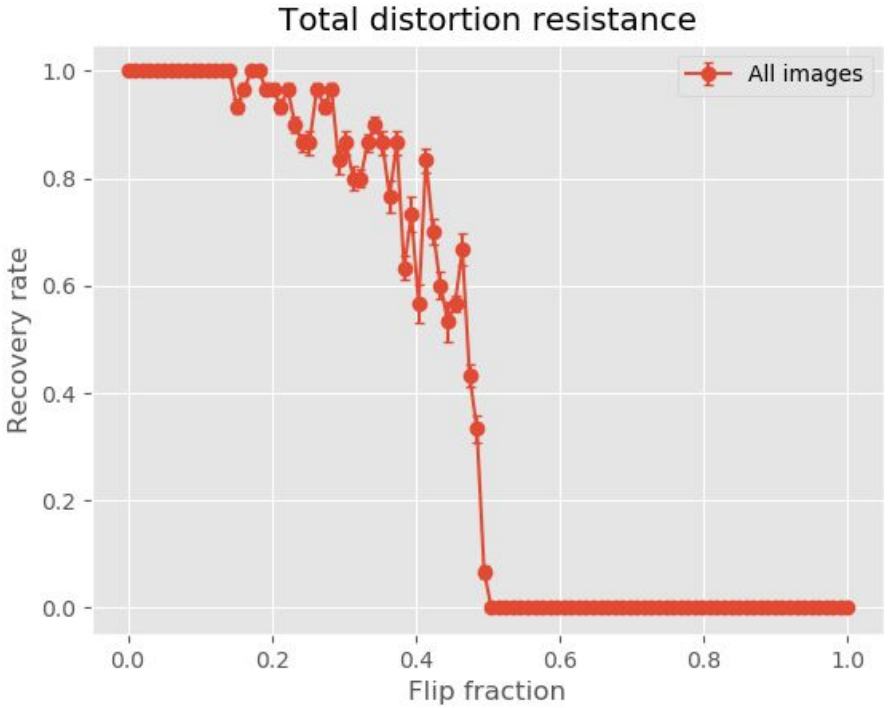
The last two distorted patterns converge to the correct attractor while P9 converges to a different attractor of the system.

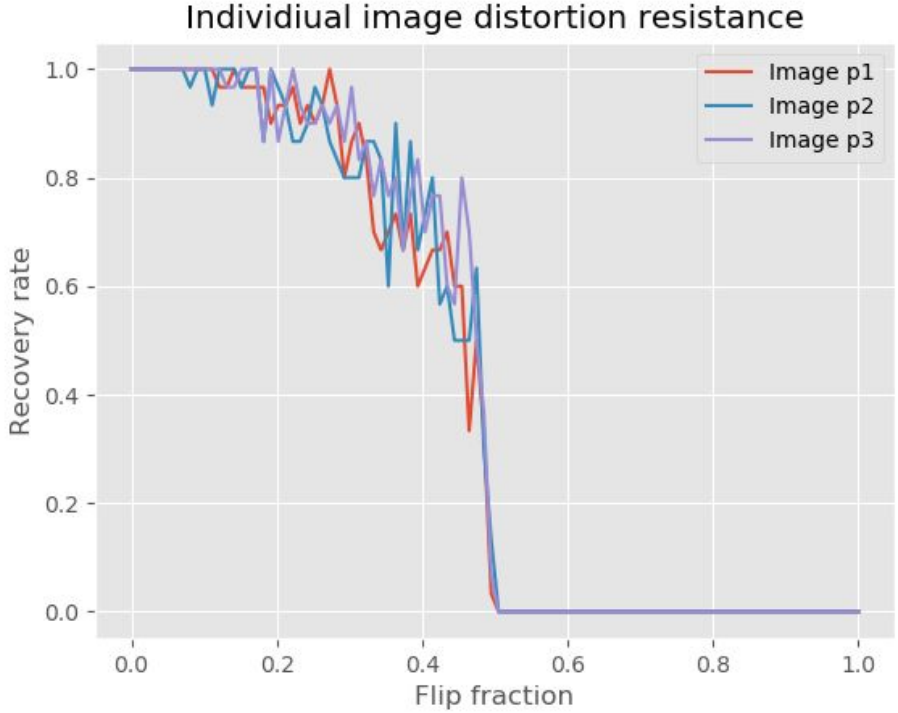
Random weights

Higher energy level and when weight matrix is non-symmetric it is not possible to define a Lyapunov function of the system

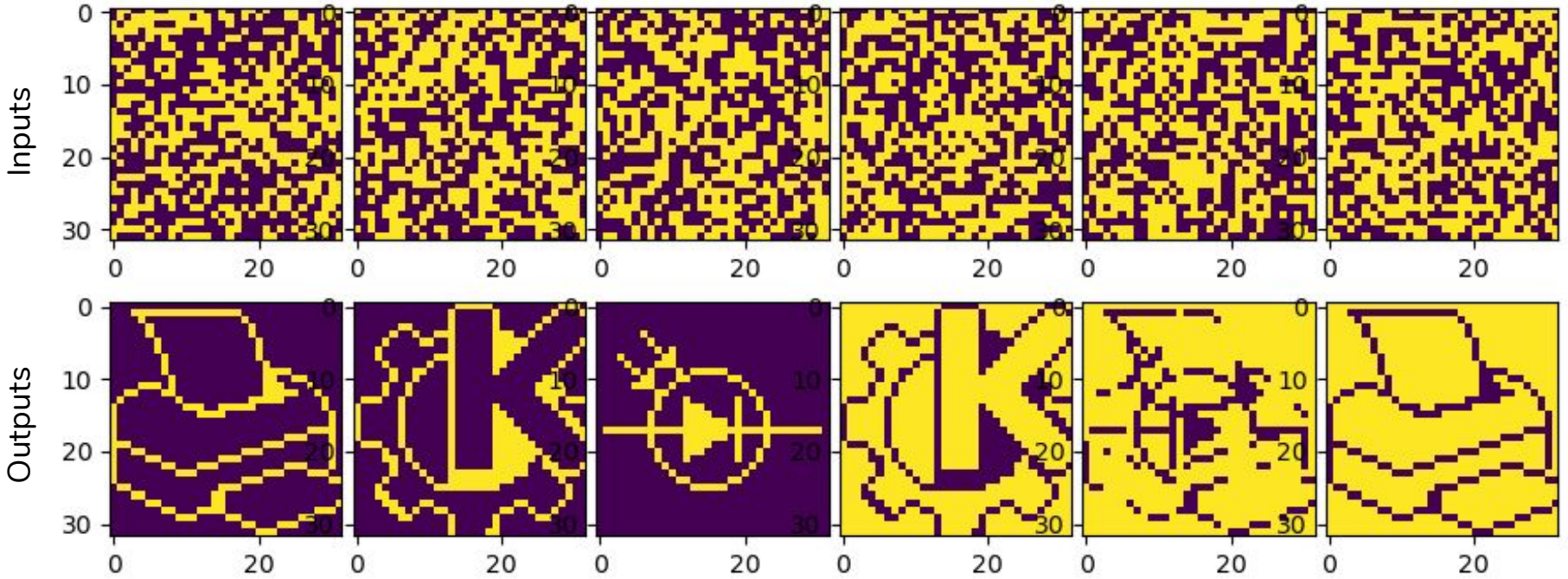
3.4
Distortion Resistance

Distortion resistance analysis
Average over 100 trials



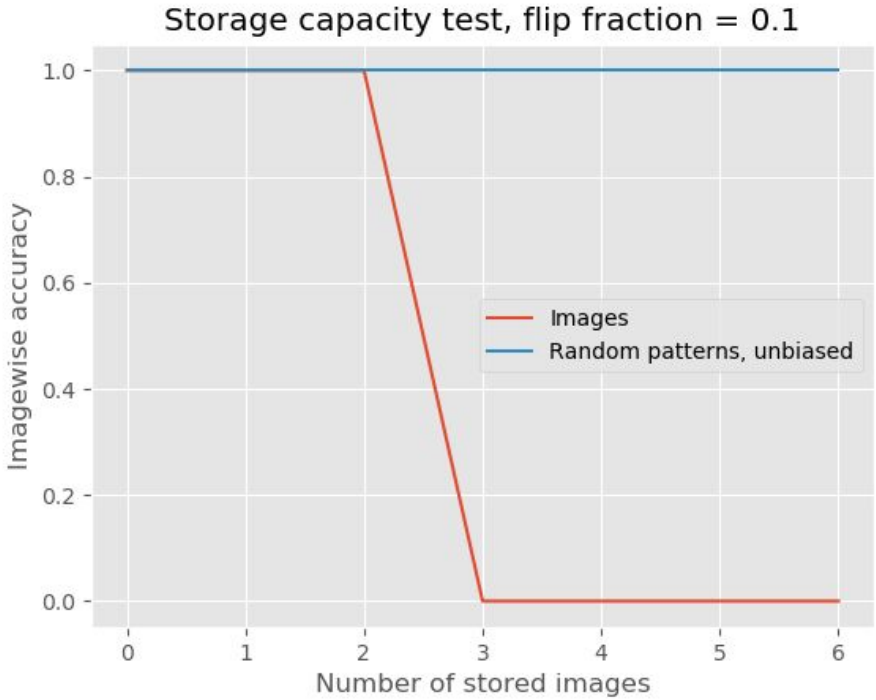


A few attractors

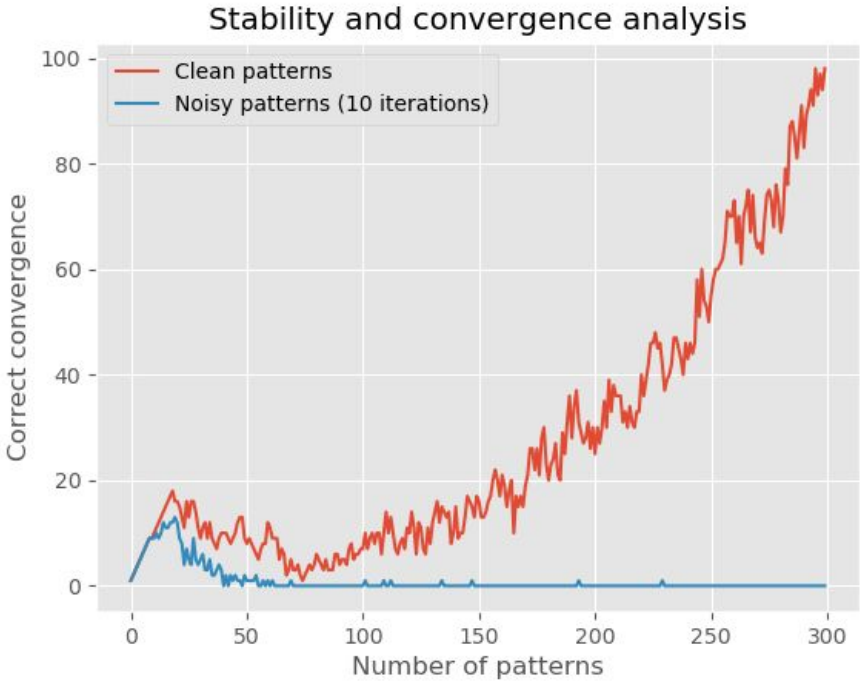


3.5
Capacity

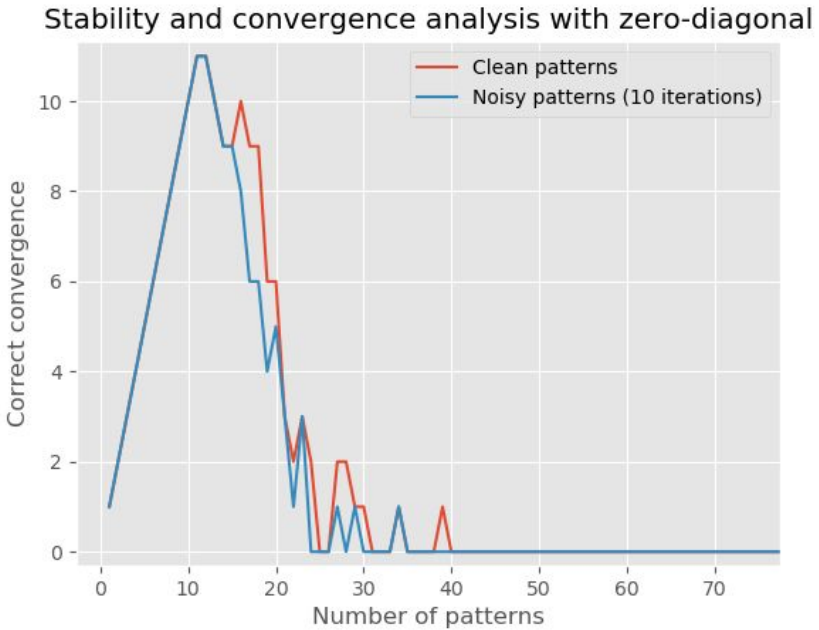
Storage capacity

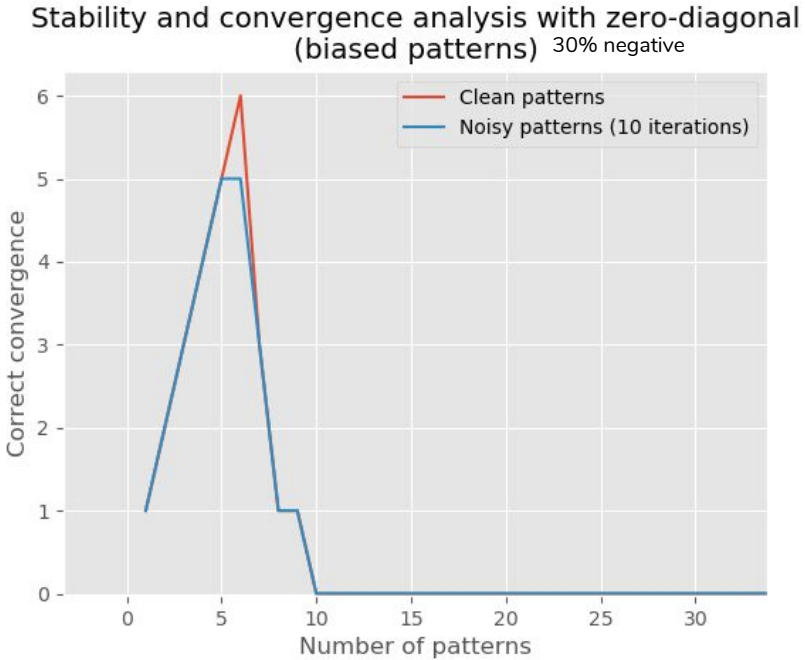


Storage capacity with random, unbiased samples



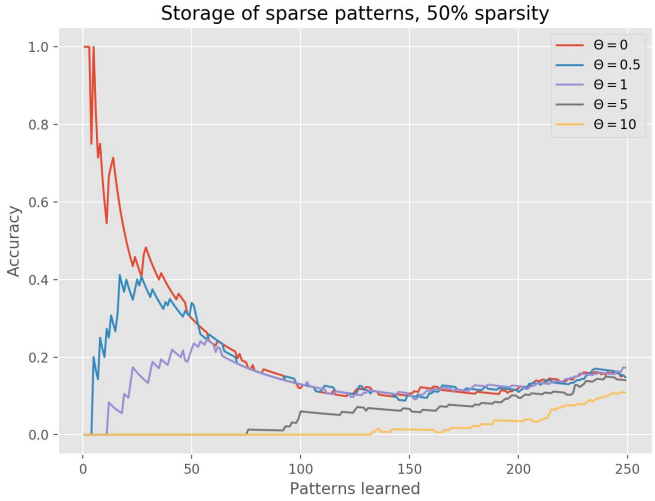
Storage capacity with zero diagonal

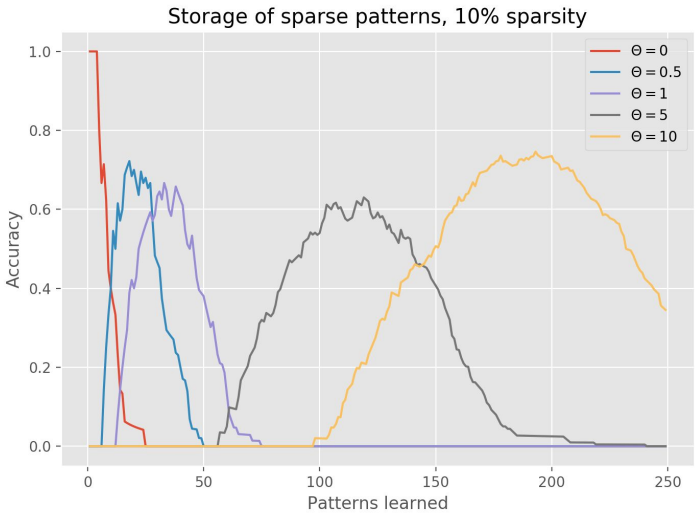




3.6
Sparse Patterns

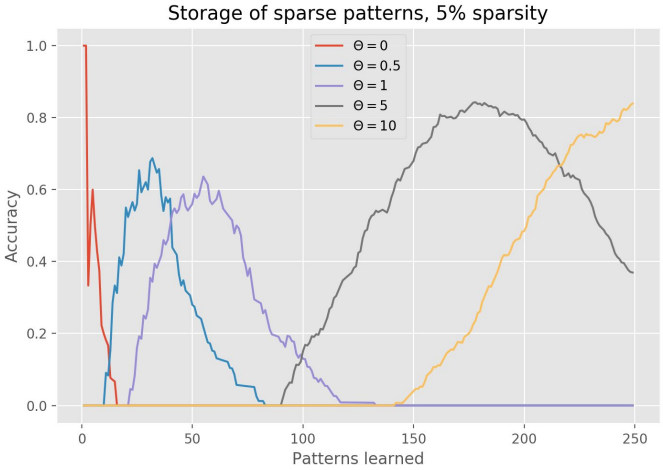
The bias-sparsity effect

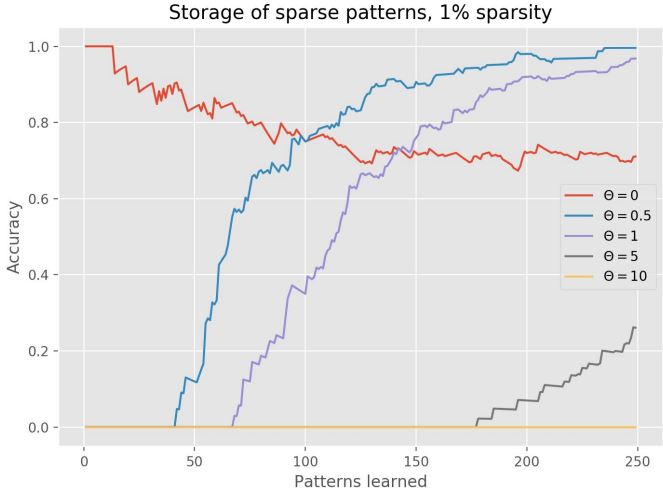




The higher the bias the more patterns are required to achieve higher accuracy. Thus, performance is degraded

The bias-sparsity effect





The lower the sparsity the less the performance is degraded.