Recap

- Neural network model terms:
  - Neuron
    - Weight
- Learning rule
- Dynamic rule

Learning rule

- Tells us how to encode memories in the network

$$w(i,j) = \sum_{k=1}^{L} a_k(i) a_k(j)$$

Learning multiple memories (example)

$$w(i,j) = \sum_{k=1}^{L} a(i)a(j)$$

$$\mathbf{a}_1 = \begin{pmatrix} +1 \\ -1 \\ -1 \\ +1 \\ +1 \end{pmatrix} \quad \mathbf{a}_2 = \begin{pmatrix} -1 \\ +1 \\ -1 \\ -1 \\ +1 \end{pmatrix} \quad \mathbf{a}_3 = \begin{pmatrix} +1 \\ +1 \\ +1 \\ -1 \\ -1 \end{pmatrix}$$

Dynamic rule

- Tells us how to recover memories given a partial cue (pattern complete)

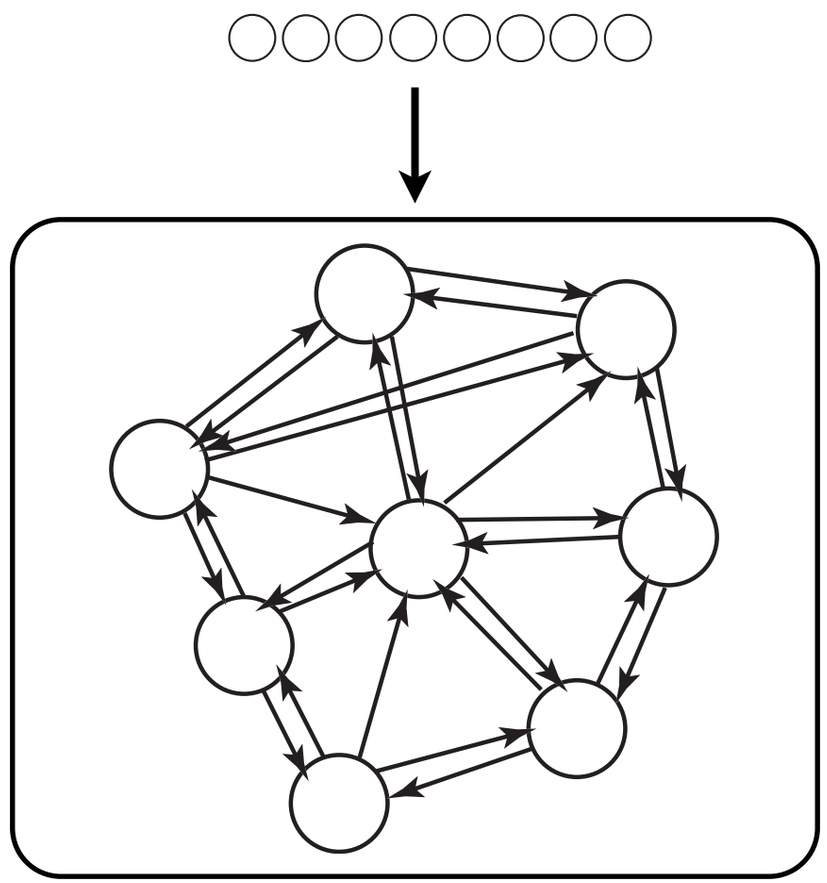
$$a(i) = sgn\left(\sum_{j=1}^{N} w(i,j)a(j)\right)$$

Dynamic rule

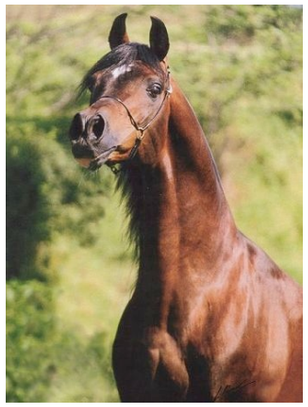
- Asynchronous: update 1 neuron at a time and then use that new value in future updates
- Synchronous: update all neurons simultaneously by using the original (not updated) values in the calculations

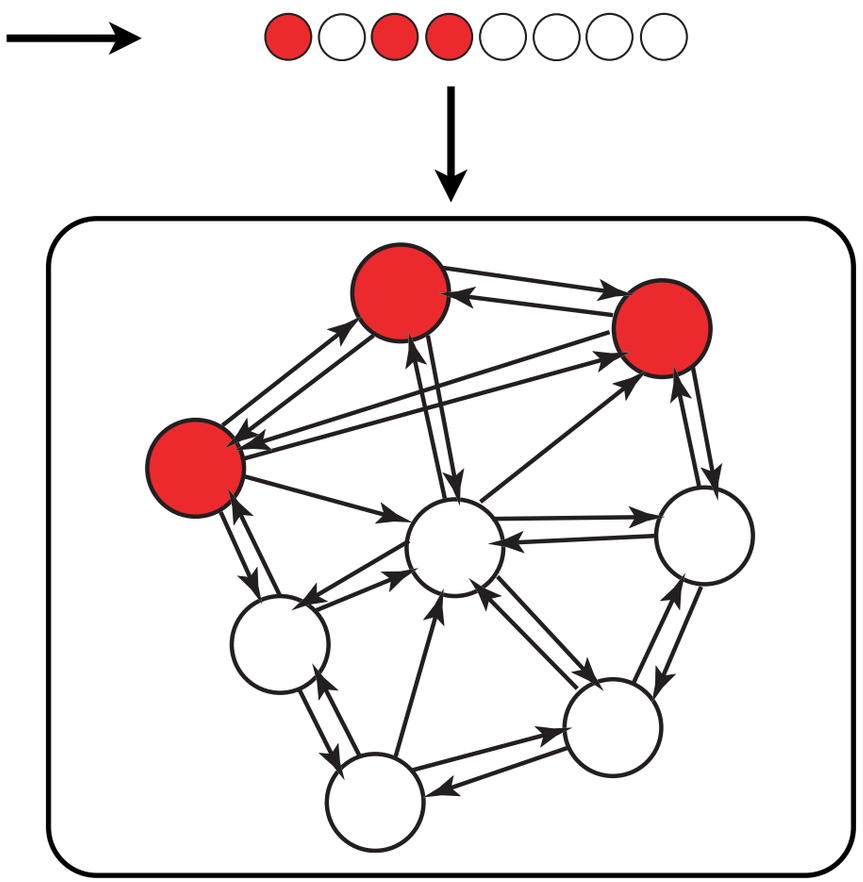
$$a(i) = sgn\left(\sum_{j=1}^{N} w(i,j)a(j)\right)$$

An intuitive walkthrough

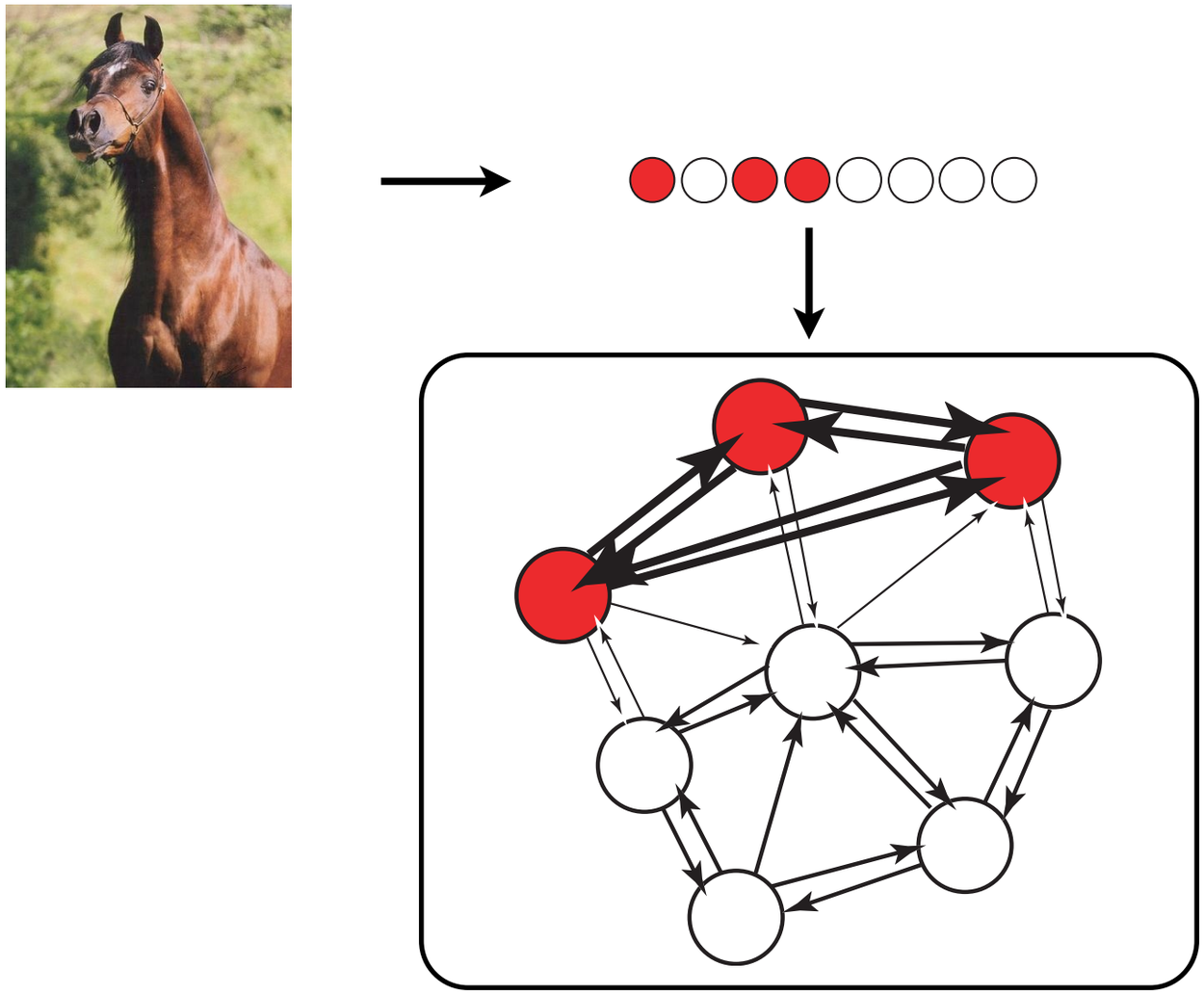


An intuitive walkthrough



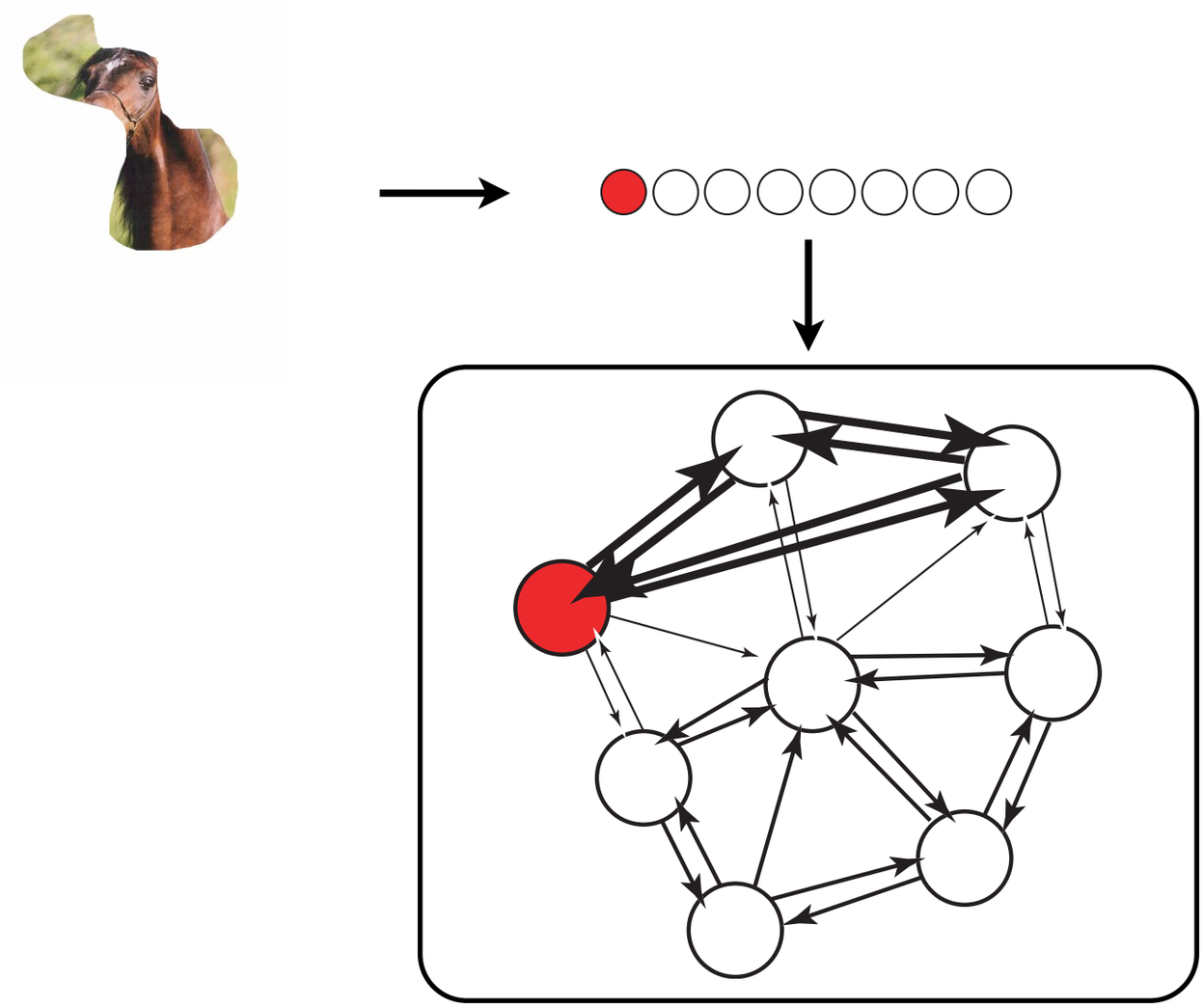


An intuitive walkthrough

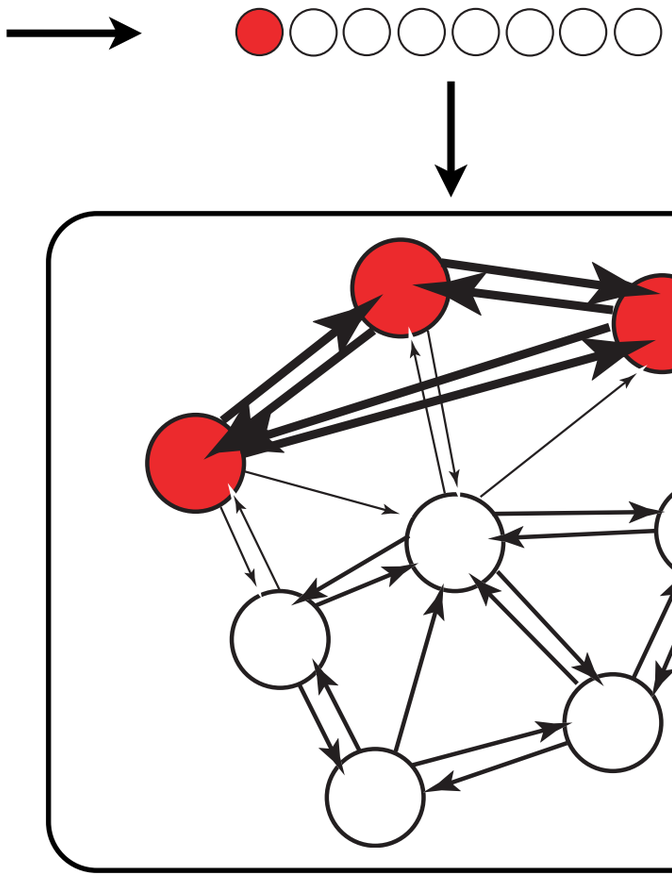


The “learn” operation

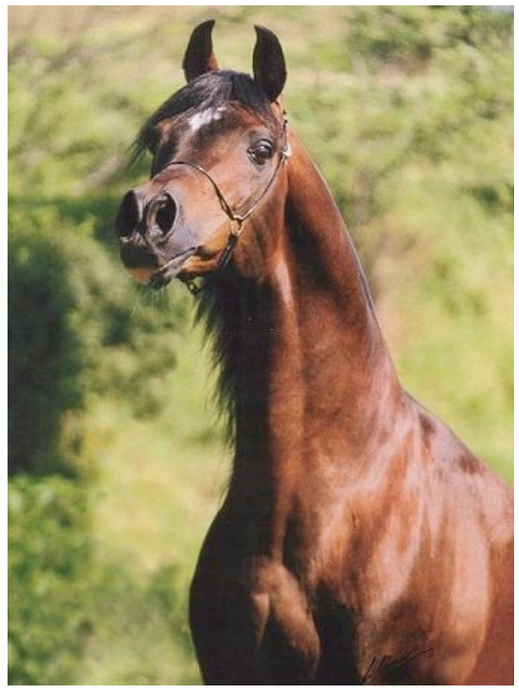
An intuitive walkthrough



An intuitive walkthrough

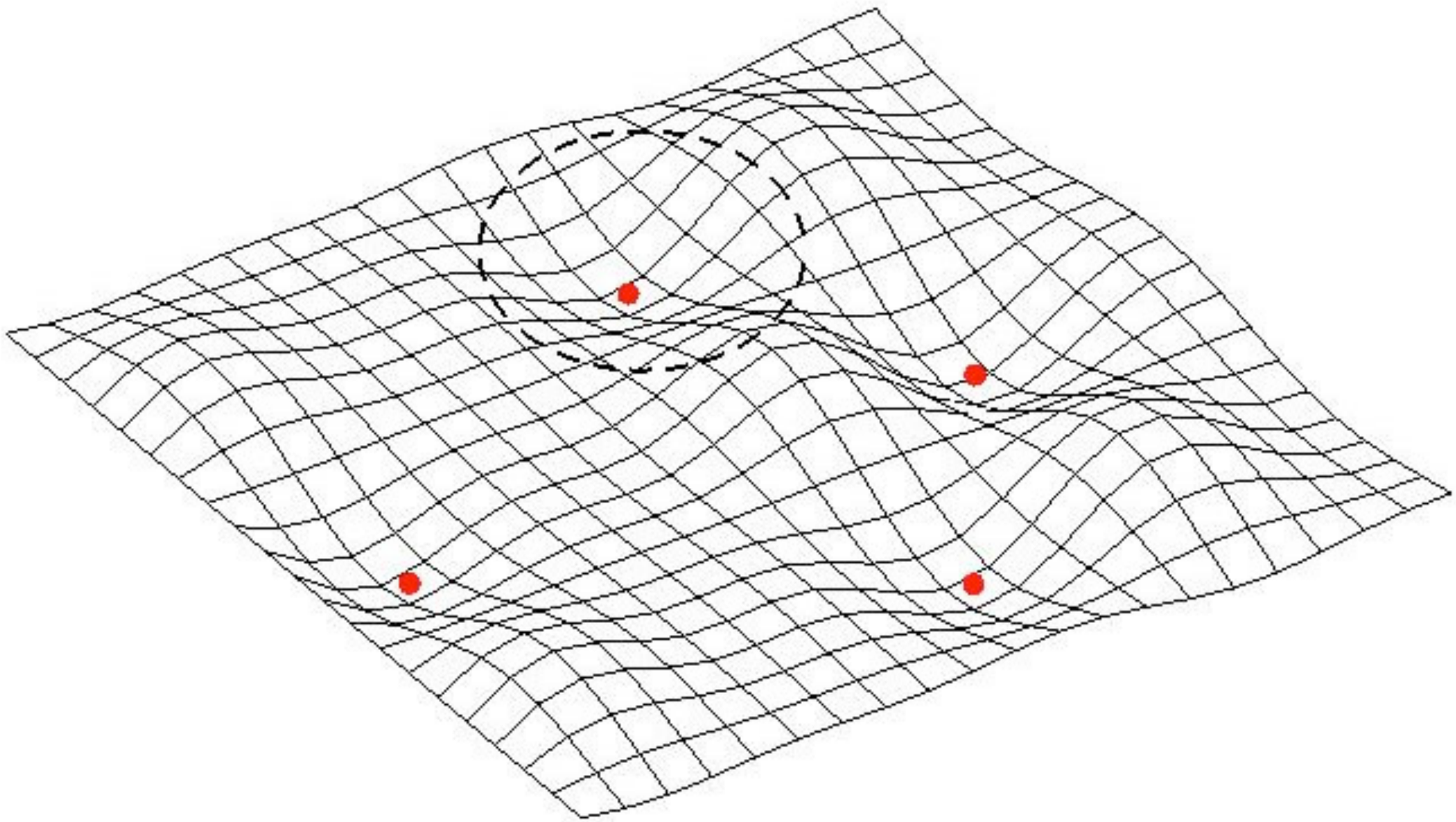


POW!



The “retrieve” operation...
AKA pattern completion!

Further intuitions



Further intuitions