

Numenta: Continuous online
sequence learning with
unsupervised neural
network model

Numenta

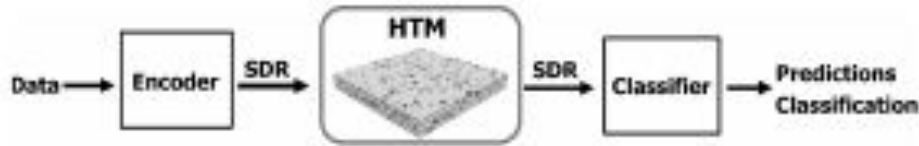
- *On Intelligence* published in 2004 [1]
- Wiki: machine intelligence company that has developed a cohesive theory, core software, technology and applications based on the principles of the neocortex
- Jeff Hawkins lecture: <https://youtu.be/uOA392B82qs>

[1] https://www.goodreads.com/book/show/27539.On_Intelligence

Numenta	
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Type	Privately held
Industry	Analytics, Artificial Intelligence, Neuroscience
Founded	February 4, 2005
Founder	Jeff Hawkins, Donna Dubinsky, Dileep George
Headquarters	Redwood City, California, U.S.
Area served	Worldwide
Key people	Donna Dubinsky (CEO), Jeff Hawkins (Co-founder),
Number of employees	11-50 [1]
Website	numenta.com numenta.org

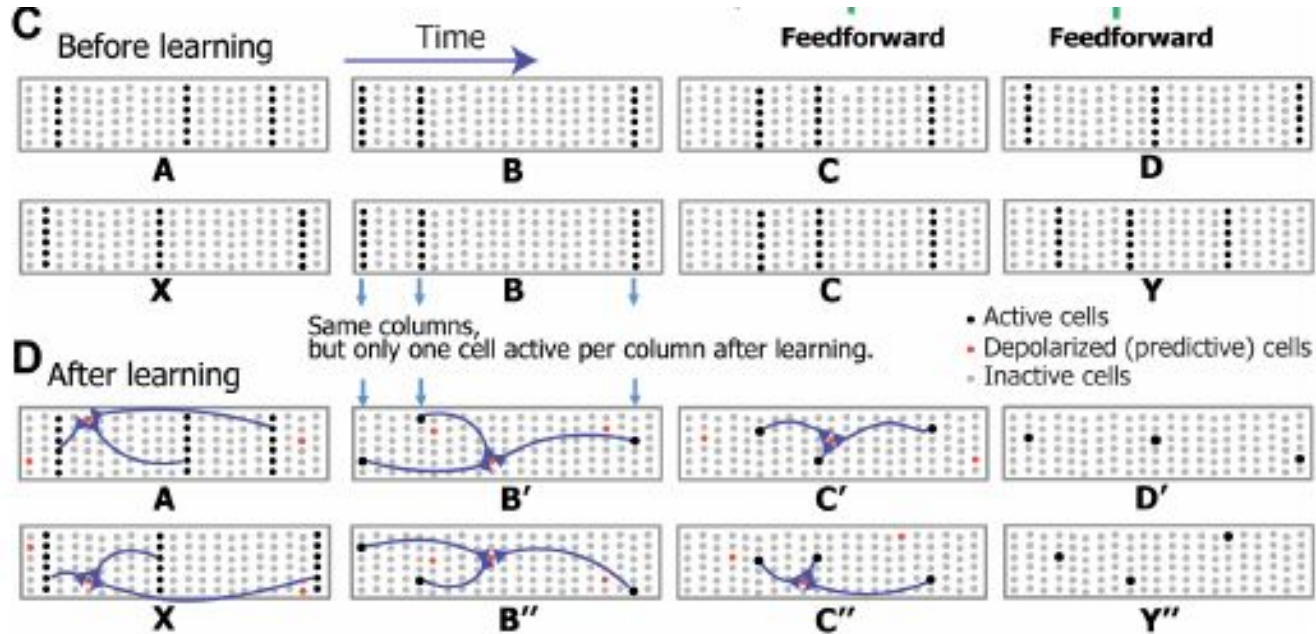
Hierarchical Temporal Memory (HTM)

- Online, unsupervised
- Learns sequences, predicts outcomes
- HTM is based on knowledge of neocortex
- Possible uses: one-shot learning?
- SDR - binary representations of the input (example: sensor data)



Hierarchical Temporal Memory (HTM)

- HTM learns transition of patterns
- Uses spatial pooling



Hebbian Learning

- When an input neuron fires, if it frequently leads to the firing of the output neuron, the synapse is strengthened
- Here, η is a learning rate coefficient, and x are the outputs of the i th and j th elements.

$$w_{ij}[n + 1] = w_{ij}[n] + \eta x_i[n] x_j[n]$$

Results for sequential data

- Very good performance with artificial data
- Comparable results of LSTM and HTM for *taxi* data

