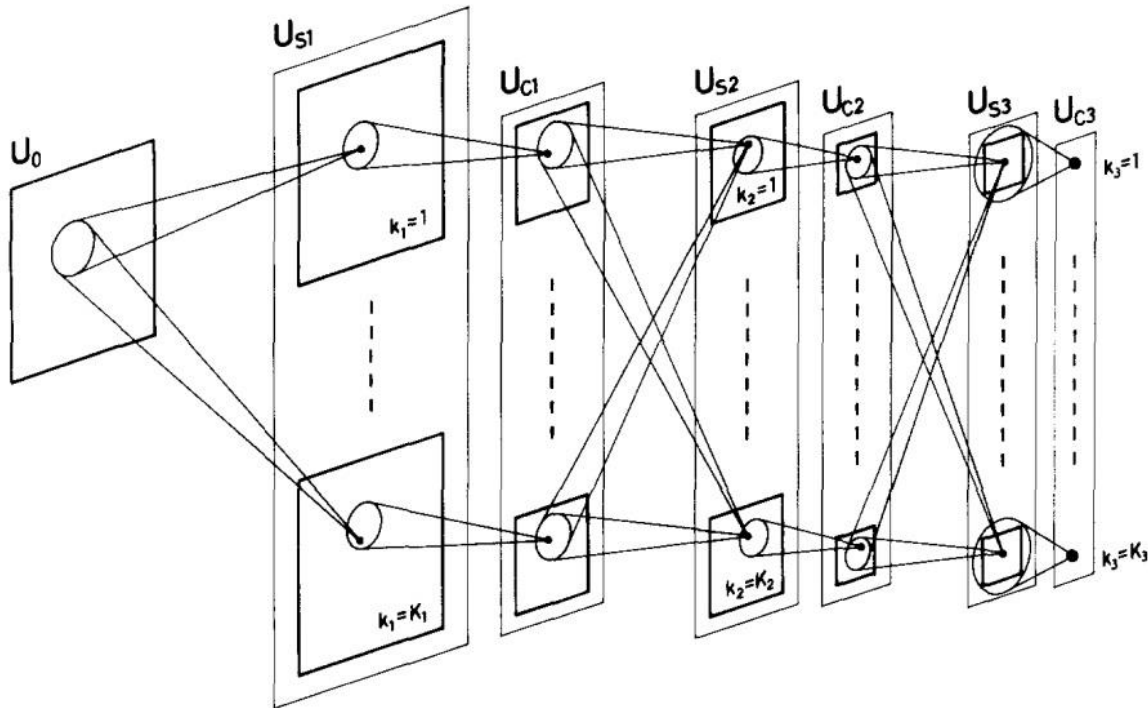


Neocognitron: A Self-organizing Neural Network Model for a Mechanism of Pattern Recognition Unaffected by Shift in Position

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The paper demonstrates an approach for pattern recognition based on geometrical similarities among the stimulus where position shifting or small distortion in shape does not affect the process, called Neocognitron. It uses unsupervised learning and has a multilayered structure. The deepest layer has response only respect to the shape of the pattern, thus it overcomes the difficulties of Cognitron.



U_0 is the input layer, three components rather than U_0 is required to complete the structure of the network:

Layer: Tetragonal area denoted by the thin lines are called layers, each layer consists a certain number of modules.

Plane: Tetragonal area denoted by heavy lines are called planes. Each cell in S-Layer is connected parallelly with the corresponding cell in C-Layer. <this subgroup are called plane.

Module: The no of cells present in each layer is called modules and denoted by U_{CL} or U_{SL} . Where L denotes L th module.

The output of a S-Plane is given by $u_{sl}(k_i, n)$ and for C-Plane it is $u_{cl}(k_i, n)$.

Where, K_i denotes the K_i th S-Plane and n denotes (n_x, n_y) , the 2D coordinates locating the cell.

The value is given by:

$$u_{S_l}(k_l, \mathbf{n}) = r_l \cdot \varphi \left[\frac{1 + \sum_{k_{l-1}=1}^{K_{l-1}} \sum_{\mathbf{v} \in S_l} a_l(k_{l-1}, \mathbf{v}, k_l) \cdot u_{C_{l-1}}(k_{l-1}, \mathbf{n} + \mathbf{v})}{1 + \frac{2r_l}{1+r_l} \cdot b_l(k_l) \cdot v_{C_{l-1}}(\mathbf{n})} - 1 \right]$$

where

$$\varphi[x] = \begin{cases} x & x \geq 0 \\ 0 & x < 0. \end{cases}$$