Appendix VII: The Birth of Deep Learning: Rosenblatt’s Perceptron

The original Rosenblatt paper [45] outlining the concept of the “perceptron” aimed to develop a theory to explain: 1. How sensory information is detected by biological organisms, 2. how that information is subsequently processed and stored and 3. how mental comprehension or organismal behaviour (which he termed “preference for a particular response”) was driven by the first two processes.

He outlined a mathematical framework for these mechanisms, at the hand of the following constructs:

1. **S-points:** sensory units which can possess any of a number of response curves based on the signal strength of incoming information

2. **A-units:** association cells located in an “association area” , which in some of his models was preceded by a “projection area”

3. S-points are connected in specific ways to A-units and forward their stimulus response to them, in the form of an inhibitory or an excitatory impulse

4. : A threshold value assigned to each A-unit dictates whether it will fire, based on the algebraic sum of excitatory and inhibitory signals received, from either S-points or preceding A-units

5. The connections between S-points and A-units, and between A-units themselves is random, and not all elements of such a network are connected to each other

6. Response units, , receive a large number of inputs from the set, called its source-set, and have feedback mechanisms to A-units in its source set. [45]

He put forth various models for response curve summation and how these networks would learn [45], but while the mathematical constructs he proposed were oversimplifications of the complexity of biological brains, they were found to be extremely useful in training computers to emulate their capabilities.