



THE HISTORY OF NEURAL NETWORKS

THE HISTORY AND INTRIGUE OF NEURAL NETWORKS

This a story of greed, avarice, and murder. The setting is academia. The motives are ego and money. The time is the late 1950s. There were winners and losers; victims and the innocent. The story begins with the emergence of the digital computer in the mid-50s. The place: the Massachusetts Institute of Technology.

Digital computers, emerging from the early work of Turing, Von Neuman, to the practical implementations of Newell and Simon, had become the next exciting academic career path filled with opportunities for theory, practice, reputations, tenure and all of the other trappings generally associated with a new discipline. But there was one other ingredient that made this even more exciting: Money...

ARPA (Advanced Research Projects Agency) and ORN (Office of Naval Research) had lots of it. The new icons were young. They had the instincts of street fighters. The world of possibilities seemed infinite. The feasibility of the thinking computer was the subject de jour, after all; the checkers champion of the world was already a computer. Speech synthesis had happened and speech recognition seemed just around the corner. The stakes were very high for reputations, money, tenure, money, and recognition money. There were millions of dollars that the military was willing and anxious to spend to foster the development of the capabilities of computers. The feathers of the intellectual roosters were being preened with visions of breakthroughs in the field of computer science and artificial intelligence.

The brain had been the subject of psychologists for years. Now suddenly it was snatched from their intellectual protection and thrust into the spotlight of the world of computers. After all, wasn't a computer a simulation of the human brain?

The new computer scientists with all of the arrogance that goes with innocent intellect were convinced that they could develop the rules by which humans thought, program those rules into a computer, and model the intelligence of the brain. The appeal to ARPA and ONR was irresistible and funding came first in drops and then with a cornucopia of opportunity. The term artificial intelligence crept into the vocabulary of the scientific community. It was trumpeted, oversold, over-promised and generally shouted from the rooftops, but it had a listening checkbook that was willing to believe.

Among the young Turks in Artificial Intelligence was Marvin Minsky who, in 1959 with John McCarthy, founded the MIT Artificial Intelligence Project. McCarthy who was more concerned with the logical and mathematical foundations for reasoning left in 1963 to found the AI laboratory in Stanford. Minsky, at the prestigious MIT, was a strong proponent in the belief that he could define the process of how humans reason using pattern recognition and analogy. He had a very aggressive stance on the subject.

Into this environment came Frank Rosenblatt a psychologist working at the Cornell Aeronautical Lab. He invented a class of networks call Perceptrons and wrote extensively, and perhaps too enthusiastically, about their potentials. To be fair, however, the MIT, AI project matched his enthusiasm with their publications. Frank's approach was different. He said, "we can't possibly understand the structure of thought. It is too complex." He proposed the first of the practical Neural Networks, patterning his concept to mimic the architecture and operational elements of the human brain. His approach was actually quite simple: provide a series of teaching sessions to a network that is designed to understand patterns, and it will learn the implicit and complicated rules of pattern recognition logic. This was then extended to encompass a broader scope of reasoning.

Rosenblatt's project was competition for Marvin Minsky as he had proposed exactly the opposite. Minsky's thesis stated it was possible to understand the reasoning rules.

Rosenblatt's idea was more than competition; it was a crisis! The military was beginning to listen to Rosenblatt. Funding was beginning to trickle in and Minsky's approach had a legitimate challenger.

The attack was swift and certainly unusual. The Perceptron was in its early stages and had limitations. Marvin Minsky teamed up with Semour Papert and did not debate, did not write a paper, but wrote a crushing book published in 1969 called Perceptrons, which proved that a large class of problems termed "interesting problems" could never be solved by Perceptron Networks. The analysis dealt only with the narrow Perceptron architecture, not the concept of Neural Networks. This book basically terminated Frank Rosenblatt's career in Artificial Intelligence and stopped virtually all further research on Neural Networks through the late 1970s and early 80s while Minsky and Papert's rule-based artificial intelligence was funded and consequently flourished. The academic murder was complete.

The halls of academia are long, well lit and narrow. The corridors that connect them are twisted, dark and hazardous. The psychologist had treaded in dangerous waters and lost. Research on Neural Networks was only done quietly, without much fanfare and only by a very few.

In 1986, a year after Marvin Minsky published his book *The Society of Mind*, the summation of his career in rule-based reasoning, several publications converged to bring Neural Networks out of the shadows and into academic favor and practical applications.

The work of Minsky will persist, but Neural Networks will be the embryo of the development of the "thinking machine". It will evolve, it will change, but it will be remembered as the basis.



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