

Chapter 8 is about feedback systems, in general. Hillis first defines the components of such systems (goal, error, feedback), and explains their basic mechanism. They use the example of an autopilot system in an airplane to this end. We build up from here with proportional control and nested feedback systems that can “learn” the correct parameters for the next lower-level system. This all leads to neural networks, which Hillis describes using the basic model of a perceptron. Hillis concludes by briefly describing self-organizing neural networks, which don’t require training, but rather find patterns in the input data on their own.

Chapter 9 is about evolved programs and computers—what Hillis calls “thinking machines”. They begin by describing how the human brain works, to the best of their knowledge, and how its construction might compare with that of a computer system. They argue that the two are fundamentally different, since a brain is not created in a structured, strictly hierarchical, engineering process. Instead, it’s shaped by the process of evolution through random mutation (there are other forms of evolution, but Hillis probably isn’t an evolutionary biologist). They combine this with the earlier ideas about AI and thinking machines in the next section, describing a process of creating programs through simulated evolution.

These were probably my favorite chapters of the book, as I feel like I actually learned quite a bit. Despite taking a course on it (and getting an A), I really don’t know much about machine learning. The way Hillis explained and motivated it from the bottom up was illuminating for me, especially the part about perceptrons. I actually feel like I have some understanding of what the neurons in a neural network are really doing. I’d really like to learn more about the block-recognizing program by Patrick Winston, since it honestly seems impossible that something like that could work without a neural network. I was also not entirely convinced by Hillis’s description of the image-unscrambling network. I don’t understand how the system will converge, since there doesn’t seem to be any feedback about what a “correct” image will look like.

The last chapter was really cool; I love the comparison of the brain to a computer system! It makes sense to me that if we’re to create a system simulating the human brain, that behavior will have to be an emergent property of a complicated system created through a process similar to biological evolution. I especially like the idea that we don’t necessarily have to understand how that system works. This is something that honestly blew me away when

Hillis described generating sorting algorithms through simulated evolution. The fact that they can be proven correct, can be faster than engineered algorithms, and yet can't be understood, is absolutely incredible to me. To the point where I really don't understand how I haven't heard of this before. There must be more applications for this sort of technique, right?