The Bangladesh Times

COMPUTERS THAT THINK LIKE PE

Organised like brain cells, neural networks learn on their own to make judgments the way human beings do. And now one can set up a neural net on one's personal computer which will cost only 99 dollars.

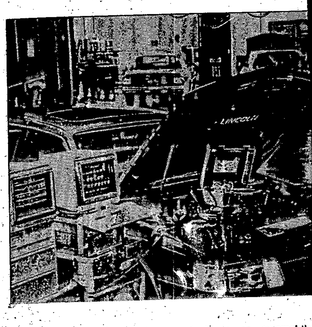
BRIAN REILLY

ALMOST EVERYBODY has heard by now about artificial intelligence: computers that will be able to do things that dullard humans can already do instantly, such as spot a face in a crowd, understand speech, or look out the window and guess whether it will rain — tasks that depend on recognizing patterns. Various (Artificial Intelligence) AI machines have been soaking up millions from big spenders like Japan and the U.S. Defense Department. But did you know that you can take another route to AI with a piece of software as cheap as $99 that will run on your PC?

This vastly different approach is called neural net technology, since it vaguely mimics the brain's complex network of neurons, the cells that transmit and store the nervous system's messages. Neural nets do have their hitches. Like people, they arrive at acceptably accurate decisions in mysterious ways. They can't tell you how they solve a problem and it's unclear how big a task they can take on. So far no one really understand either their limitations or their ultimate usefulness. Another difficulty: Neurocomputers have barely reached the fledging stage, so most applications must be simulated on ordinary digital computers. That's what that $99 software lets you do.

Fortunately researchers with impressive credentials are being drawn to the field. In 1986 Federico Faggin and Carver Mead, whose work revolutionized the design of semiconductor chips a decade ago, started a company called Synaptics in San Jose, California, to devise a completely new type of chip of neural computers. Even they caution that neural nets are in their infancy. "This will be an art for a long time before it becomes a science," says Faggin.

If it succeds, neural net research could lead to a generation of machines thousands of times faster than today's computers, capable of interpreting speech, vision and data in ways that are impossible now. Neurocomputers even seem to be able to spot patterns that people can't. Because they can identify those patterns without special programming, they may turn out to be an improvement over so-called expert systems, a rival branch of artificial intelligence that requires elaborate rules yet can rarely deal with unfamiliar information. If a neural net is faced with the problem of figuring out whether dog ownership has any effect on a person's creditworthiness, it eventually teaches itself the answer. An expert system can't do that: the programmer has to tell it whether owning a dog is significant.



It takes hours to detect a fault in an automobile computer can do it in a minute.

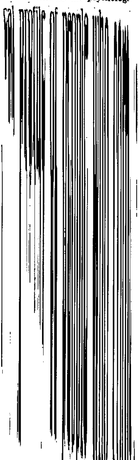
Automakers, oil drillers, chemical producers, and financial service companies have had mixed but generally promising results with neurocomputing. In the mid-1980s, for instance, occasional noisy blower motors turned up among those that Siemens, the West German electrical equipment maker, was producing for Ford car heaters in Europe. To identify the defective ones, the company did the obvious: Workers turned on the motors and listened, but that was so tedious that performance dropped off quickly. Siemens tried to programmie a traditional to recognize the offending mix of sounds, but couldn't get it right. A year and a half ago the company tested a neural net device developed at the Siemens research lab in Princeton, New Jersey. "It turned out to be correct more than 90 per cent of the time," says project leader Wolfgang Peik. Siemens now checks all blower motors with neutral nets.

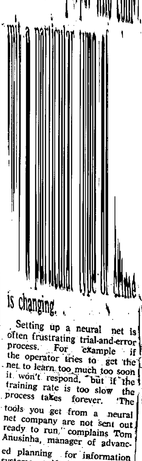
In the past three years hundreds of tiny neural net companies have sprung up. Few are profitable, and so far the lot of them resemble a fantasy more than an industry. Even two well-regarded companies, both publicly traded, have had financial woes. Nestor Inc. of Providence was co-founded in 1973 by Leon Cooper a Nobel Prize winner in physics. Nestor has never made a profit last year it lost $2 million on revenues of $500,000.

The new technology has one big fan in the oil field. Before Arco 'fractures' a field, injecting fluid into well holes at high pressure to crack rock formations and improve the flow of oil, the company first develops huge computer models of it. Those models help engineers interpret data from sensors in the ground that tell them how the fracture is proceeding. Some models take hours to run, however, which makes them almost useless. If a problem develops while fracturing is under way, Richard Stoisits, Arco's principal production engineer, used data stored in a maintrame computer to train a neural net on the characteristics of the Prudhoe Bay field. 'It can retrieve the answer almost instantly,' says Stoisits. He says this 'spectacular technology' how identifies some patterns better than he can: 'It's almost magic.'

Scientists Faggin and Mead with a chip that acts like an eye.

A chorus of small success stories can be heard from dozens of other companies and organizations. Ford Motor reports that neural nets can be trained to spot faulty paint finishes. Better than a human inspector? 'Better than a tired one,' says Shaun Devlin, manager of vehicle electronics at Ford's research facility in Dearborn, Michigan. He's hopeful that neural nets will help diagnose engine problems as well. A major law enforcement agency is using a neural net to see whether the psychologi-





is changing.

Setting up a neural net is often frustrating trial-and-error process. For example if the operator tries to get the net to learn too much too soon it won't respond, but if the training rate is too slow the process takes forever. The tools you get from a neural net company are not sent out ready to run,' complains Tom Anusinha, manager of advanced planning for information systems at Navistar. 'You call up the company and tell them you want to know how to adjust the learning rate. No one can tell you how. It becomes very time consuming.'

Before anyone makes big

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