

 **KEYWORDS**

algorithms, artificial intelligence, avatar, cognition, cognitive apparatus, computational linguistics, correlate, Daily Double, Deep Blue, factoids, game strategy, key words, latency, level of confidence, machine logic, processors, sentient being, supercomputer

Watson paused. The closest thing it had to a face, a glowing orb on a flat-panel screen, turned, from forest green to a dark shade of blue. Filaments of yellow and red streamed steadily across it, like the paths of jets circumnavigating the globe. This pattern represented a state of quiet anticipation as the supercomputer awaited the next clue. It was a September morning in 2010 at IBM Research, in the hills north of New York City, and the computer, known as Watson, was annihilating two humans, both champion players, in practice rounds of *Jeopardy!* Within months, it would be playing the game on national television in a million-dollar man vs. machine match against two of *Jeopardy!*'s all-time greats.

As Todd Crain, an actor and the host of these test games, started to read the next clue, the filaments on Watson's display began to jig and tremble. Watson was thinking—or coming as close to it as a computer could. The \$1,600 clue, in the category The Eyes Have It, read; “This facial ware made Israel's Moshe Dayan instantly recognizable worldwide.”

The three players—two human and one electronic—could read the words as soon as they appeared on the big *Jeopardy* board. But they had to wait for Crain to read the entire clue before buzzing. That was the rule. As the host pronounced the last word, a light would signal that contestants could buzz. The first to hit the button could win \$1,600 with the right answer—or lose the same amount with a wrong one. (In these test matches, they played with funny money.)

This pause for reading gave Watson three or four seconds to hunt down the answer. The first step was to figure out what the clue meant. One of its programs promptly picked apart the grammar of the sentence, identifying the verbs, objects, and key words. In another section, research focused on Moshe Dayan. Was this

a person? A place in Israel? Perhaps a holy site? Names like John and Maria would signal a person. But Moshe was more puzzling.

During these seconds, Watson's cognitive apparatus—2,208 computer processors working in concert—mounted a massive research operation through thousands of documents around Moshe Dayan and his signature facial ware. After a second or so, different programs, or algorithms, began to suggest hundreds of possible answers. To us, many of them would look like wild guesses. Some were phrases that Dayan had uttered, others were references to his military campaigns and facts about Israel. Still others cited various articles of his clothing. At this point, the computer launched its second stage of analysis, figuring out which response, if any, merited its confidence. It proceeded to check and recheck facts, making sure that Moshe Dayan was indeed a person, an Israeli, and that the answer referred to something he wore on his face.

A person looking at Watson's frantic and repetitive labors might conclude that the player was unsure of itself, laughably short on common sense, and scandalously wasteful of computing resources. This was all true. Watson barked up every tree from every conceivable angle. The pattern on its screen during this process, circles, exploding into little stars, provided only a hint of the industrial-scale computing at work. In a room behind the podium, visible through a horizontal window, Watson's computers churned, and the fans cooling them roared. This time, its three seconds of exertion paid off. Watson came up with a response, sending a signal to a mechanical device on the podium. It was the size of a large aspirin bottle with a clear plastic covering. Inside was a *Jeopardy* buzzer. About one one-hundredth of a second later, a metal finger inside this contraption shot downward, pressing the button.