

ranging intellect. Early in his tenure at IBM he and a friend tried, in their spare time, to teach a machine to write fiction by itself. They trained it for various literary themes, from love to betrayal, and they named it Brutus, for Julius Caesar's traitorous comrade. Ferrucci was comfortable talking about everything from the details of computational linguistics to the evolution of life on earth and the nature of human thought. This made him an ideal ambassador for a *Jeopardy* machine. After all, his project would raise a broad range of issues, and fears, about the role of brainy machines in society. "Would they compete for jobs? Could they establish their own agendas, like the infamous computer HAL, in *2001: A Space Odyssey*, and take control? What was the future of knowledge and intelligence, and how would brains and machines divvy up the cognitive work? Ferrucci was always ready with an opinion. At the same time, he could address the strategic questions—how these machines would fit into hundreds of businesses, and why the project he was working on, as he saw it, went far beyond Google.

The Google question was his starting point; until people understood that his machine was not just a souped-up search engine, the project made little sense. For certain types of questions, Ferrucci said, a search engine could come up with answers. These were simple sentences with concrete results, what he and his team called factoids. For example: "What is the tallest mountain in Africa?" A search engine would pick out the three key words from that sentence and in a fraction of a second suggest Kenya's 19,340-foot-high Kilimanjaro. This worked, Ferrucci said, for about 30 percent of *Jeopardy* questions. But performance at that low level would condemn Watson to defeat at the hands of human amateurs.

A *Jeopardy* machine would have to master far thornier questions. Just as important, it would have to judge its level of confidence in an answer. Google's algorithms delivered users to the statistically most likely outposts of the Web and left it to the readers to find the answers. "A search engine doesn't know that it understood the question and that the content is right," Ferrucci said. But a *Jeopardy* machine would have to find answers

and then decide for itself if they were worth betting on. Without this judgment, the machine would never know when to buzz. It would require complex analysis to develop this "confidence."

Was it worth it? Didn't it make sense for machines to hunt through mountains of data and for people to rely on their exquisitely engineered brains to handle the final judgments? This seemed like a reasonable division of labor. After all, processing language and spotting answers come easily to humans and are so hard for machines.

But what if machines could take the next step? What if they could go beyond locating bits and pieces of information and help us to understand it? "I think there are 1.4 million books on sale online," Ferrucci said one afternoon. He was sharing a bottle of his own wine, a Shiraz blend that he'd cooked up in the winery attached to his kitchen in the northern suburbs of New York. He was in an expansive mood, which led him to carry out energetic dialogues with himself, asking questions and answering them emphatically. "You can probably fit all the books that are on sale on about two terabytes that you can buy at OfficeMax for a couple hundred dollars. You get every book. Every. Single. Book. Now what do you do? You can't read them all! What I want the computer to do," he went on, "is to read them for me and tell me what they're about, and answer my questions about them. I want this for *all* information. I want machines to read, understand, summarize, describe the themes, and do the analysis so that I can take advantage of all the knowledge that's out there. "We humans need help. I know I do!"

Before building a *Jeopardy* machine, Ferrucci and his team had to carry this vision one step further: They had to make a case that a market existed outside the rarefied world of *Jeopardy* for advanced question-answering technology. IBM's biggest division, after all, was Global Services, which included one of the world's largest consultancies. It sold technical and strategic advice to corporations all over the world. Could the consultants bundle this technology into their offerings? Would this type of machine soon be popping up in offices and answering customers' questions on the phone?