cessing natural language. The key stages of processing included syntactic analysis (structure), semantic analysis (meaning), and pragmatic analysis (using world knowledge and information about the context). An important system at that time was SHRDLU, developed in 1972 by Terry Winograd (1946–). This system simulated a robot that manipulated blocks on a table top. It could handle instructions such as "Pick up a big red block" and answer questions such as "Which cube is on the table?" SHRDLU could handle language only in this very limited domain, but it did attempt to combine knowledge of syntax, semantics, and pragmatics.

Attempts to scale up the kind of approach used in SHRDLU have met with only limited success. It is too difficult to capture and represent all the knowledge that we need to understand arbitrary natural language. In the late 1980s and 1990s, with the advent of bigger, faster machines, researchers have therefore turned to statistical methods, based on analyzing huge numbers of online texts. To illustrate this approach, consider the following sentence: "John likes flying planes." One problem in determining what this means is deciding whether *plane* refers to a woodworking tool, an airplane, or a tree. In the classic approach to NLP we would need to have represented somewhere the fact that airplanes fly but trees generally do not. But using statistical methods we just analyze many texts, find all the sentences that mention planes, and find out how often the word *flying* occurs in each one and how that varies according to which type of plane is mentioned. This requires that someone has annotated the texts to indicate what meaning of the word is intended in each case, but after that the process can be automated. We might find that in (say) 95 percent of cases where *plane* occurs in the same sentence as *flying*, it means an airplane.

These statistical techniques, based on analyzing large corpora (rather than hand-authoring rules and knowledge) have proved successful for a range of practical NLP tasks. Speech recognition is based almost entirely on statistical models. Other tasks, such as determining the right *part of speech* (noun, verb, etc.) of words, or determining the correct word sense (as in the plane example), can also be done efficiently and effectively using simple probabilistic models. NLP is still some way

off from full, robust, general language understanding, but we now know how to do some useful language-related tasks well. While statistical models may be used, these are based on our evolved understanding of the structures and processes involved in making sense of language. These techniques are now being exploited in (for example) speech interfaces, and to help us find and make sense of the vast quantities of natural language texts now available on the **World Wide Web**. The vision of talking to computers in everyday language may still be in the distant future, but our understanding of language processing has matured to enable a wide variety of practical NLP applications.

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—*Alison Cawsey*

NEC Corporation

NEC Corporation is a leading manufacturer in the world of communications equipment, **semiconductors**, and computer technology. The company was founded in Tokyo in 1899 as the Nippon Electric Company and was originally a joint venture with a U.S. partner. Only nine years later, NEC founded its first international office in Korea. One hundred years after its foundation (i.e., in 1999) NEC had total yearly sales of U.S.$40 billion, 155,000 employees worldwide, and 125 manufacturing plants in 21 countries.

The largest Japanese computer technology companies today are Matsushita, **Toshiba**, NEC, **Fujitsu**, and Mitsubishi, in that order. All of them produce a wide range of computer products, from **liquid-crystal displays**, to **laptops**, semiconductors, and even **supercom-**

puters. Almost one-fourth of NEC's revenue comes from the sale of computer chips, making NEC the second largest producer of semiconductors (**Intel** is first).

The emergence of NEC as a major computer company was partially the result of the Japanese government's strategy of subsidizing strategic industrial sectors in the 1960s. Companies such as NEC, Fujitsu, and **Hitachi** could sell computers in Japan regardless of **IBM**'s world dominance. In the 1970s, the Japanese also subsidized chip design and production, with the result that Japanese producers displaced American traditional semiconductor companies in the 1980s. American companies could maintain an edge in the market only for **microprocessors**. The close relation of the NEC executives with the Japanese government, however, led to a major scandal in the 1990s, when it was discovered that NEC had profited illegally from government contracts.

One sector in which NEC has been very successful is the production and marketing of supercomputers. NEC's machines are of the type called *vector processors* and are specially suited for scientific computations. In the 1990s, almost all major U.S. supercomputer companies went bankrupt. NEC, however, flourished in Japan and started selling more machines in the United States and Europe. This led to conflicts with the U.S. Commerce Department, which accused NEC of using unfair tactics in pricing.

In an effort to get a foothold in the U.S. personal computer market, NEC bought Packard-Bell, at one time the largest producer and distributor of **personal computers** in the United States. However, the manufacturing plant in Sacramento was closed in 1999 and the brand name disappeared.

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—*Raúl Rojas*

Netiquette

Every culture has its own rules or guidelines for good conduct. On the **Internet**, those rules are called *netiquette*—that is, network etiquette. Rules of netiquette are not rules of law. They are enforced only by the threat of social disapproval. Like nonvirtual etiquette, netiquette is based on self-restraint. It says, essentially, that the mere fact that the Internet gives you the ability to do something does not necessarily make it a good idea.

Netiquette has developed along with the Internet. One of the first published netiquette guides, Chuq von Rospach's "A Primer on How to Work with the Usenet Community," was written in 1984 in response to an influx of new users. It, like many other netiquette guides, was published on the Internet rather than in printed book form, and is still updated periodically.

Advice given by different netiquette guides may vary, and what constitutes good netiquette varies among the many subcultures of the Internet; and, of course, netiquette issues change with time and technology. In 1994, a huge netiquette controversy grew up around the emergence of **spam**—mass, unsolicited commercial postings to newsgroups and **electronic mail** addresses. Spammers experienced every form of electronic retaliation imaginable, from *flames* (angry e-mail harangues) to *mail-bombing* (sending reams of data to an e-mail address, thus overloading the culprit's server and forcing it to shut down). But spam has proved unstoppable. In 2000, spamming, although still generally disliked, is a fact of life. Because netiquette proved inadequate to the task of preventing spam, several groups are pursuing legislative remedies to make spam illegal.

In the year 2000, new netiquette issues have been created by the popularity of *instant messages*, real-time messages that pop up on the computer screens of friends and family members. Unlike e-mail, which can be read at the recipient's convenience, instant messages demand one's attention immediately. The technology has created some new netiquette dilemmas: How does one refuse an instant message that comes at a bad time, or discourage friends and family members from sending instant messages to the workplace without offending them? This was not an issue in 1994, because instant messaging technology didn't exist. It is likely that new netiquette issues will arise with new Internet technology in years to come. Still, despite changes in culture and technology, respect and consideration for