

Xiaochang Li, **Divination Engines: Natural Language Processing, Artificial Intelligence, and the Making of Algorithmic Culture**, Chicago, IL: University of Chicago Press, 2026, 320 pp., \$27.50 (hardcover).

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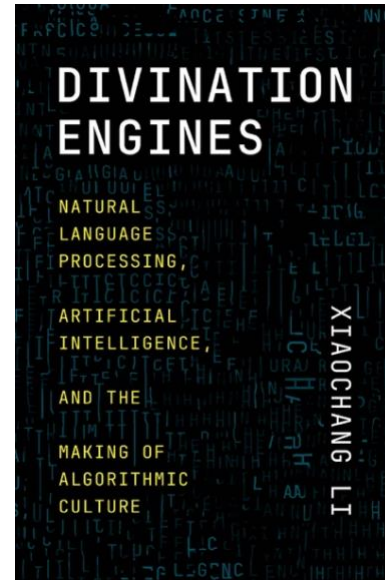
At a time when artificial intelligence and large language models are occasioning questions about the structure and meaning of language itself, *Divination Engines: Natural Language Processing, Artificial Intelligence, and the Making of Algorithmic Culture* traces these questions back to myriad, sometimes surprising sources in the history of computation. The book chronicles the “strange and enduring pursuit to endow machines with the faculty of language” (p. 6). In the middle of the twentieth century, there was a dream that humans would be able to speak directly to computers—a gendered dream, since operating computers was viewed as clerical work and men typically did not type at the time. In the subsequent decades, creating computers that could understand human language transformed into the datafication of language, which paved the way for the algorithmic culture mentioned in the book’s subtitle.

As such, the history recounted here offers one answer to the question of how our era became so data driven.

Author and assistant professor of communication at Stanford, Xiaochang Li locates the origin of an “ever-deepening data orthodoxy” in the intertwined histories of speech processing (how computers process the acoustic signal of spoken language) and natural language processing (NLP; how computers interpret the meaning of human language), the two distinct fields with different methodological and epistemological commitments that would only become conflated later (p. 143).

Li begins the story of how language became data within the field of speech processing, which, given its origins in telephony, was primarily shaped by acoustics and communication engineering. The history of speech processing is littered with various machines detailed in the second chapter, such as the oscilloscope and the cathode ray spectroscope. These devices could interface with one’s voice, and the chapter explores the shift from visual representations of the acoustic features of speech sounds to representing the essential elements of speech as quantitative data. In 1952, Bell Labs—at the time a subsidiary of AT&T—released Audrey, the first working speech recognition system that identified spoken digits by converting speech spectrographic data into numerical patterns and matching them against stored templates representing prototypical examples of each vocabulary word.

In the next decade, shifting research priorities would begin to push speech recognition out of acoustics and telecommunications and into the domain of computer science. This shift was driven in part by influential figures like J. R. Pierce, who served on the President’s Science Advisory Committee and directed



Bell Laboratories' Communication Sciences Research Division. Pierce argued that acoustic classification in speech recognition research was inadequate and insisted upon endowing computers with linguistic knowledge. Such a critique opened the door for artificial intelligence research within the domain of speech recognition, as linguistic knowledge entailed creating computers capable of reasoning.

By 1971, the U.S. Department of Defense funded the DARPA Speech Understanding Research (SUR) project, which was "carried out under the broad mandate of artificial intelligence research" (p. 74). Through the SUR program, knowledge-based approaches—using explicit rules to represent linguistic knowledge like morphology, syntax, and semantics—rose to prominence, supplanting earlier template-matching systems like Audrey. Around the same time but in relative isolation, IBM launched its Continuous Speech Recognition (CSR) group, which pioneered the statistical approach that eventually abandoned linguistic knowledge in favor of what Li calls "brute-force" pattern recognition over speech and text datasets (p. 14). The implications of the statistical approach would play out in the decades to come, as it redefined speech as mere data to be modeled without understanding its actual meaning.

In a breakthrough for the statistical approach, the CSR group's use of the hidden Markov model (HMM) would formalize the idea that knowledge of speech's underlying nature was irrelevant to the task of recognizing and modeling it, since the model could predict outcomes from statistical inferences over prior states of language without needing to describe the underlying processes that produced those states. The HMM represented a significant transformation compared with the acoustic research of two decades prior. Yet this approach was accompanied by its own problems: In the 1970s, computer-readable text needed to train such models was scarce compared with today's relative abundance of digital text data.

As a consequence, instead of algorithmic practices following the rise of massive datasets, IBM's data-intensive techniques, "compelled by a commercial imperative to create market demand for more powerful computers, were adopted before there was the data to implement them and helped to drive the demand for data at scale" (p. 109). The statistical approach to language would usher in a thirst for data that has only grown more insatiable today, an inheritance still visible in artificial intelligence development. Readers of Karen Hao's (2025) *Empire of AI: Dreams and Nightmares in Sam Altman's OpenAI* might find generative parallels in Li's treatment of IBM and how its preexisting commercial interests made the aforementioned brute-force approach to modeling speech "not only technologically feasible but thinkable and desirable in the first place" (p. 86).

Knowledge-based and statistical approaches remained somewhat separate until the 1980s. At the time, knowledge-based approaches were still closely aligned with NLP, while the statistical approach dominated speech recognition. Two key changes would popularize and encourage the adoption of the statistical approach within NLP. First, defense-sponsored initiatives brought speech processing and computational linguistics back into contact, like DARPA's joint Speech and Natural Language Workshop, which ran from 1989 to 1994 and "canonized" the use of data-driven techniques for "all spoken and language work" (pp. 147–149).

The second change was IBM's venture into machine translation with the Candide project, translating from French (which none of the researchers even spoke!) to English. The use of statistical techniques for

translating languages proved to be far more controversial in the research community than its use in speech recognition, as it defied the expectation that the translation should not have worked. The previous success of the statistical approach within speech recognition had the “alibi of acoustics,” where the absence of linguistic knowledge was explained by the fact that acoustic signal processing was an engineering problem rather than a matter of language comprehension (p. 156). The fact that machine translation worked at all “granted data-intensive statistical methods a foothold into the province of [language’s] meaning,” and in so doing, it “destabilized the status of language within the very task domain on which the discipline of computational linguistics had originated” (pp. 147, 156). The parallels between this moment in the text and the present are particularly salient, given the concerns and arguments about the status of language following the advent of large language models, an observation not lost upon Li, who writes “IBM’s speech recognition work, with its approach that purported to spurn linguistics, thus established a road map for the algorithmic conquest of language” (p. 142). Readers compelled by this issue might find the adjudication of linguistic theory and artificial intelligence in Leif Weatherby’s (2025) *Language Machines: Cultural AI and the End of Remainder Humanism* a valuable accompaniment to Li’s historical treatment.

The legacy of the two changes mentioned above was that the statistical techniques that were once separate and “outside the scientific scope of computational linguistics” would come to saturate the field within a decade (p. 167). This change was institutionalized through the introduction of a standardized framework for evaluating research within NLP known as the Common Task Method, which was originally designed for DARPA’s programs but soon became widespread in the research community. The Common Task Method pushed the “data fundamentalism” inherent in the statistical approaches into NLP, as “the particular advantage of statistical NLP was not so much that it simply resulted in the most effective systems but that it resulted in the type of systems that could be tested most effectively” (p. 184). Such an alliance risked confusing the metric of progress for progress itself.

Bringing NLP into the domain of statistical methods coincided with the rise of the World Wide Web and the challenges of digitization that accompanied it. In the 1990s, the web brought together disparate areas of research, including NLP, to “help navigate vast and ever-expanding quantities of digital information online” (p. 192). The aforementioned algorithmic conquest of language perhaps began in earnest during the rise of the web, when digital text became more plentiful. Researchers using the statistical approach to language modeling would soon jump from detecting patterns in textual data to generating projections about the world itself—thus marking the arrival of the titular divination engines. The technique of text data mining was turned outward to the wider world: detecting patterns and making inferences from any kind of data, not solely language. While artificial neural networks have since overtaken the statistical approaches to language modeling, this book uncovers the origins of data fundamentalism and its reverberations across the computational present we have since inherited.

References

Hao, K. (2025). *Empire of AI: Dreams and nightmares in Sam Altman’s OpenAI*. New York, NY: Penguin Press.

Weatherby, L. (2025). *Language machines: Cultural AI and the end of remainder humanism*. Minneapolis: University of Minnesota Press.