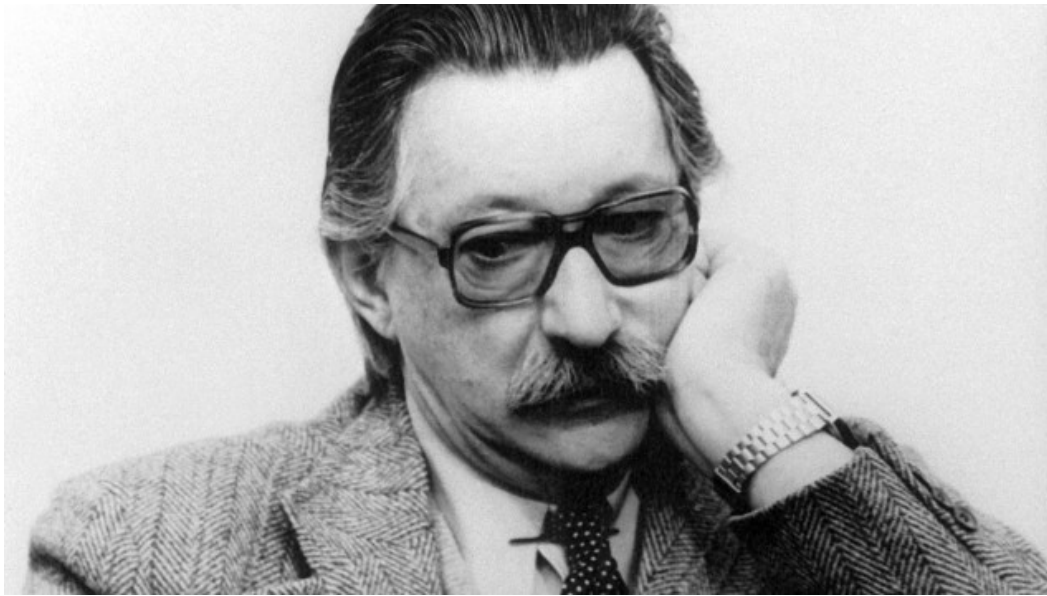


CSU33012 Software Engineering

Biography of A Software Engineer

Joseph Weizenbaum



"Mathematics is a game. It is entirely abstract."

"Hidden behind that recognition that mathematics is the easiest is the corresponding recognition that real life is the hardest."

Introduction

Joseph Weizenbaum is often considered the 'father' of modern AI. He was a computer science professor at MIT, designer of the first computerized banking system and creator of the 'first' AI program ELIZA. Media sensationalism surrounded his work; a New York Times article from 1968 describes ELIZA as a 'computer being taught to understand English' (Wilford, 1968).

Technological developments in artificial intelligence (AI), particularly AI-2 intelligences or *expert systems* are expected to create order-of-magnitude improvements in software productivity and quality. Weizenbaum's fame helped pave the way for essential AI research

and funding, but he was one of few that considered the ethical and moral ramifications of his work. In fact the concept of drawing logical inferences from a vastly growing knowledge base has long been implemented in software before and after ELIZA's inception.

Indeed, Weizenbaum's true contribution to the canon of computer science has always been his relentless questioning of technology and the "hacker's ethic". How do we introduce computers into society? Why create for the sake of creating? Does the public truly understand the construction of their online identities?

At the core of his speeches and interviews lies a fundamental and moral principle of software engineering. He challenged those within his field to think harder about the essential complexity of specifying what to build and where it fits within society.

Early Life and Career

Joseph Weizenbaum was born in Berlin, Germany in 1923. He emigrated to the United States after a further wave of anti-semitic rules in 1935, and served in the U.S. Army Air Corps during the Second World War.

It is often noted by academics studying Weizenbaum that his early experiences with Facism and the nuclear arms race were at the core of his critical stances on technology. The Nazis abused language to mislead people, and modern missile systems could not exist without computers.

Weizenbaum graduated from Mathematics at Wayne State University, Detroit in 1948. From 1952 he worked on analog and digital computers, eventually producing the first automated check-processing computer for the Bank of America. He notably invented SLIP, a list-processing language while under General Electric. By 1963, Weizenbaum had become an associate professor in electrical engineering for MIT.

The ELIZA Program

Published by Weizenbaum in 1966, the ELIZA program was an experiment in natural language processing rather than an attempt to create an intelligent computer. The narrative surrounding ELIZA's inception is rich and detailed.

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Welcome to
          EEEEE LL   IIII ZZZZZZ  AAAA
          EE    LL   II    ZZ  AA  AA
          EEEEE LL   II    ZZZ  AAAAAA
          EE    LL   II    ZZ  AA  AA
          EEEEE LLLLL IIII ZZZZZZ  AA  AA

Eliza is a mock Rogerian psychotherapist.
The original program was described by Joseph Weizenbaum in 1966.
This implementation by Norbert Landsteiner 2005.

ELIZA: Is something troubling you ?
YOU:   Men are all alike.
ELIZA: What is the connection, do you suppose ?
YOU:   They're always bugging us about something or other.
ELIZA: Can you think of a specific example ?
YOU:   Well, my boyfriend made me come here.
ELIZA: Is it important to you that your boyfriend made you come here ?
YOU:   He says I'm depressed much of the time.
ELIZA: I am sorry to hear that you are depressed.
YOU:   It's true. I am unhappy.
ELIZA: Can you explain what made you unhappy ?
YOU:   █
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Firstly, ELIZA was named after the play *Pygmalion*, in which a language professor attempts to 'train' the character Eliza Doolittle into sounding and acting like an English aristocrat. This namesake was far from unintentional; ELIZA used a technique known as the *Rogerian method* in which the therapist repeats back most of what is said to the patient, with no judgement. The underlying conversational program was named the DOCTOR script.

Secondly, several well-known anecdotes reveal that even users highly aware of ELIZA's functionality maintained their personal belief that ELIZA was intelligent. Weizenbaum's secretary, in the midst of using ELIZA famously asked the scientist "would you mind leaving the room please?".

Weizenbaum was horrified by ELIZA's capability to manipulate people into revealing their personal thoughts with DOCTOR; relatively simple programming by today's standards. His interest had always been to explore the human tendency to project an anthropomorphic identity onto a machine, but the reaction to ELIZA surpassed his expectations. In his 1976 book *Computer Power and Human Reason*, he recalls; "What I had not realized is that extremely short exposures to a relatively simple computer program could induce powerful delusional thinking in quite normal people." (Weizenbaum, 1976)

Criticism and Opposition

Weizenbaum's concerns with the responsibilities of software engineers- or all computer scientists predate ELIZA. At the RAND Corporation Symposium in 1965 he joined other speakers in his apprehensions towards computers. Weizenbaum states to an audience '*Atomic scientists said after 1945 that they felt they had known sin*', alluding to the perceived deception he would soon achieve through ELIZA.

Weizenbaum has publicly turned against his technical achievements; described as a 'lone Jeremiah howling in the wilderness' (Loeb, 2021). That is to say - criticism of AI is not lacking, but truly rare coming from a computer scientist, speaking the same technical language as his opponents. He has publicly [opposed fellow AI theorist John McCarthy](#) over bringing morality and philosophy into science. Harvard Professors Daniel Dennett and Marvin Minsky have accused Weizenbaum of favouring "life" over a hypothetically intelligent machine. There are numerous interviews and publication reviews that archive Weizenbaum at the forefront policing the boundaries between human and machines. His strongest evaluations of computers and AI have been outlined below.

Language Abuse and Mistaken Identity

The metaphor of 'actors' and 'actresses' within the canon of Weizenbaum's writings is quite prevalent. ELIZA spurred interest in the psychotherapy community for apparently all the wrong reasons; he writes in *Computer Power* "what can the psychiatrist's image of his patient be when he sees himself... but as an information processor following rules?". ELIZA often uses 'key' phrases such as "I am sorry that you are depressed" deterministically in response to expressions of sadness- but this is blatantly untrue. ELIZA is incapable of expressing emotions yet all the same capable of revealing the deepest annals of the human circuit.

It could be said that the advent of social media embraces the general public's sensational rationalizations about a technology they do not understand, studying how to make users share more personal data. In 2008 Weizenbaum participated in the World Economic Forum in the "Virtual Worlds- Fiction or Reality?" panel. In this video he visibly expresses discontent at Reid Hoffman, founder of LinkedIn, who claims that his software is 'me establishing my

identity'. Much like how ELIZA misled its users into believing a poor substitute for human contact, does he resign himself to an entire populace content with a poor substitute for human expression?

Human Thought vs. Machine Thought

As Weizenbaum's secretary afforded ELIZA the protections of deep intimacy, his colleagues envisioned a future for truly thinking, intelligent machines. Professor Herbert A. Simon of Carnegie-Mellon university has been recorded calling Weizenbaum a "carbon-based chauvinist", implicating his opponent as a racist in favour of human life.

Weizenbaum's plea to take software programs seriously in a social and philosophical context is again tied deeply to his personal experience. Consider the '[Chinese Room Experiment](#)', popularized by American philosopher John Searle. The thought experiment involves a man locked within a room, with no understanding of Chinese language, who is able to fool those outside the room into believing he knows Mandarin by simply following a set of instructions. The point of this experiment is that computers can be used to help rationalize the human brain but can never truly simulate biological processes, as the man inside may never achieve understanding of Chinese yet has but all the rules.

The broad conclusion to this argument is that the artificial intelligence community in Weizenbaum's time desperately tried to refute Searle's thought experiment. Scientific ideologies enter the public consciousness very quickly- in Weizenbaum's case, the idea that some human beings are erasable vermin lead to the Holocaust. Simply put, if you opposed the Chinese experiment, you believed that the brain was reducible to a set of instructions, a rejection of living things and a disdain for human beings. Weizenbaum warns of allowing such discourse to enter the public consciousness.

Conclusion

The post-war period of the 1960s and 1970s was an international period of social tumult in the technical-scientific communities. Personal correspondence between Weizenbaum and the similarly minded public intellectual Lewis Mumford in the form of letters reveals the loneliness of becoming a social critic. Mumford was an author whose career was built on the genre of humanistic criticism; fearing the power of complex technical systems and the 'myth of the machine'. Weizenbaum writes of his life as a "struggle to become and remain free". No further major scientific breakthroughs were attributed to Weizenbaum, and he died after returning to Germany in 2008.

Frederick Brooks does not go so far as to call *expert systems* a 'silver bullet' for the difficulties of software engineering, but instead sees potential in 'useful expert advisors' capable of automating simple tasks. Integrated development environments (IDEs) offer code auto-completion and unit testing modules can generate test cases to a relatively useful degree. That much has come true of Brooks' predictions for *expert systems* programming, but perhaps his view on software *complexity* poses the greater comparison to Weizenbaum's values.

In a 1985 interview with Diana Ben-Aaron, Weizenbaum warns that the computer is often posed as an '*upside-down* solution', presented with no apparent problem. Time and time again, the true complexity of software engineering comes from the question of what the system is trying to accomplish in the first place. And Weizenbaum, asks further of programmers, to ask more questions in pursuit of real social change.

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