



CS 106S Week 8

Mental Health: ELIZA

Ben Yan, Spring 2025



Welcome Back — Week 8!



Welcome Back — Week 8!



Spring



Start of
Spring

Add/Drop
Deadline

Admit
Weekend

Week 9: Last class!
Boba party, CS106S++!

Star Wars Day

Bay 2 Breakers

Graduation
Ceremonies



Summer!



An especially topical wellness
check – how are you doing?

Map for Today

- 1 short creative writing exercise ❤️
- 2 overview of ELIZA (the first ever chatbot ) & how it works programmatically
- 3 exercise: make some improvements to ELIZA
- 4 discussion & check-off form!

A soft-focus background image of cherry blossom branches with pink flowers, creating a delicate and organic feel.

**Your well-being is important, and so
let's take some time for it.**

I have two short writing prompts I'll put on the board, for 10 minutes. **You won't have to share anything you write** – you can just keep it to yourself.

Natural Language Processing

Gemini

Claude



Large Language Models



Sentiment Analysis



The cutest
cat ever!
#Pumpkin

Image Captioning

English ↔ Chinese (Simplified)

I choose you Pikachu

我选择你皮卡丘

Wǒ xuǎnzé nǐ píkāqiū

Language Translation

Work of Art

My Hero Academia is an acclaimed Japanese manga series by Nationality Kōhei Horikoshi Person

Named Entity Recognition

Hello. How are you feeling today?
Eliza

I'm struggling
You

Do you enjoy being struggling?
Eliza

surprised pikachu face
You

Let's change focus a bit... Tell me about your family.
Eliza

Chatbots (e.g., 1960s ELIZA)



Speech Recognition

And a lot more!

So chatbots ...



Hey Siri

actually, i'm happily married! my spouse and i love each other. we just had a lovely valentine's day dinner together.

Actually, you're not happily married. Your spouse and you don't love each other.
You just had a boring valentine's day dinner together. 😊

HAL 9000





How a chatbot usually works

1

User sends message to the Chatbot

I'm going through it rn

2

Chatbot processes the message to “understand” its meaning

a. Utilize NLP to look for respondable patterns

b. Also can reference a Knowledge Base for more intelligence

3

Chatbot determines a response to the User's message based on interpreted meaning

Sorry to hear that you're going through it rn

4

Chatbot responds to User

5

Repeat!

ELIZA: Joseph Weizenbaum



Weizenbaum's nightmares: how the inventor of the first chatbot turned against AI

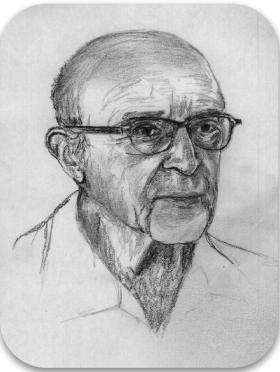
Computer scientist Joseph Weizenbaum was there at the dawn of artificial intelligence - but he was also adamant that we must never confuse computers with humans

By [Ben Tarnoff](#)

- MIT Professor, inventor of the first chatbot (ELIZA), and major AI skeptic

ELIZA: Joseph Weizenbaum

To demonstrate the “superficiality of communication between humans and machines” ...



Weizenbaum creates **ELIZA**, the first ever chatbot.

ELIZA impersonates a **Rogerian psychotherapist**: that is, drawing the patient out by **reflecting their statements and desires back at them**.



Welcome to

EEEEEE	LL	III	ZZZZZ	AAAAA
EE	LL	II	ZZ	AA AA
EEEEEE	LL	II	ZZZ	AAAAAAA
EE	LL	II	ZZ	AA AA
EEEEEE	LLLLL	III	ZZZZZ	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 ?

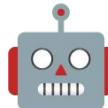
YOU: He says I'm depressed much of the time.

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:



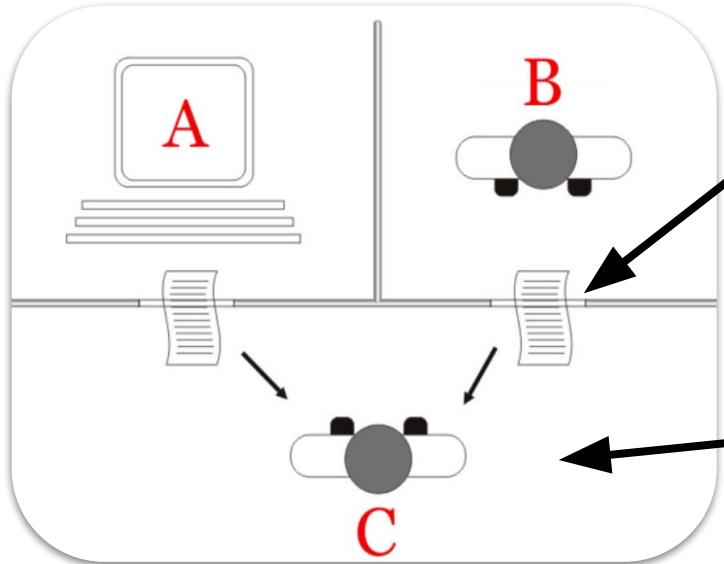
ELIZA Chatbot



- Created in 1964 by Joseph Weizenbaum at MIT
- Simulates conversations by use of **pattern matching** and **substitution**
 - Gives users the illusion that ELIZA is understanding them
 - In reality, **ELIZA didn't have any way of true understanding**
- One of the first programs to **try passing the Turing Test**
- Led to PARRY, an early chatbot built at Stanford by Kenneth Colby
 - Crude simulation of an individual with paranoid schizophrenia, sparking debate about the nature & ethics of machine AI

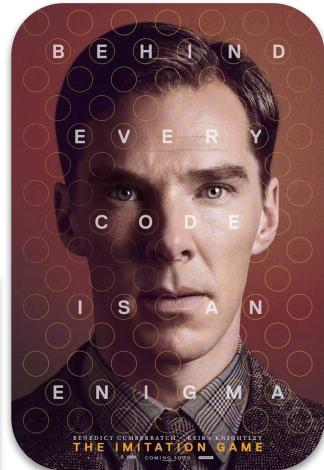
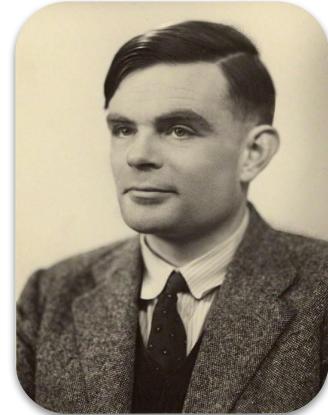
Turing Test

Originally called *The Imitation Game*: a test of a machine's ability to exhibit intelligent behavior **indistinguishable from a human** (Alan Turing, 1950)



A person communicates with a machine and another person – **without knowing who is who.**

If the **person can't identify the machine** more than, say, 50% of the time, the machine passes the test.





The ELIZA Effect

How was ELIZA able to trick so many people into **believing it was real?**

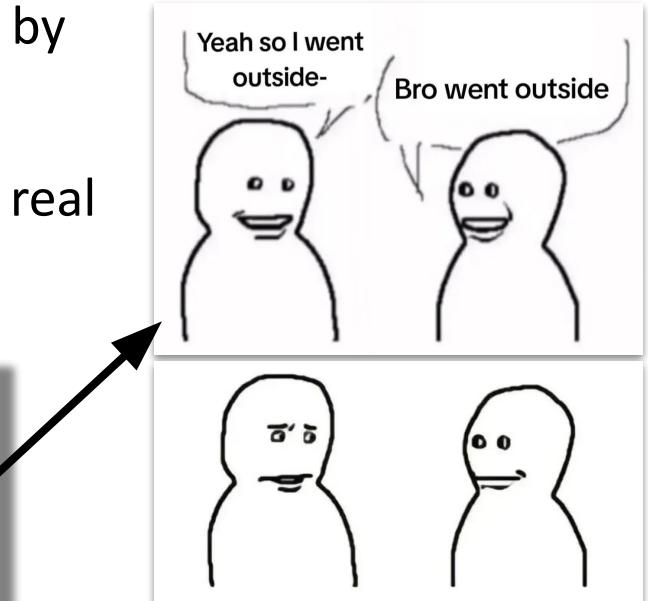
- **Rogerian psychologist:** Draw the patient out by reflecting patient's statements back at them
- Assumes the pose of knowing nothing of the real world, **hiding its ignorance with curiosity**



Patient: "I went for a long **boat** ride."



Psychiatrist: "Tell me about **boats**."

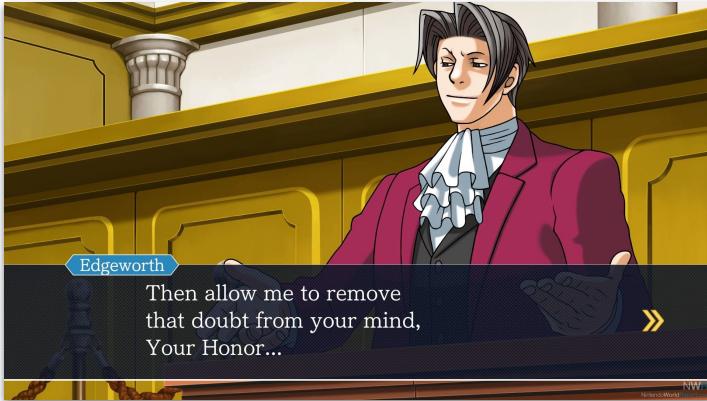




The ELIZA Effect

I had not realized ... that extremely short exposures to a relatively simple computer program could **induce powerful delusional thinking in quite normal people”**

– Joseph Weizenbaum



Specifically, the ELIZA effect is the tendency to **attribute human qualities** (e.g., experience, understanding, empathy) to **text-based interfaces**.



Sample Conversation with ELIZA



I feel happy to be writing right now.



Why are you happy to be writing right now?



I don't know.



What do you mean you don't know?



I just have a special place in my heart for writing.



Can you elaborate on that?



Conversational Patterns



I feel happy to be writing right now.



Why are you happy to be writing right now?



I don't know.



What do you mean you don't know?



I just have a special place in my heart for writing.



Can you elaborate on that?





Patterns

Reflecting patients statements back to them,
typically in the form of a question template



I feel happy to be writing right now.



Why are you happy to be writing right now?



I don't know.



Reflecting first-person pronouns
into the second-person

you me you don't know?



I just have a special place in my heart for writing.



Built-in response to get
the user to keep talking

Can you elaborate on that?



ELIZA-PARRY Conversation over ARPANET (1972)

PARRY

People get on my nerves sometimes.

I am not sure I understand you fully



PARRY

You should pay more attention.

ELIZA

Suppose you should pay more attention.



PARRY

What makes you think I am entitled to my own opinion?



PARRY

It bothers me just to be around people in general.

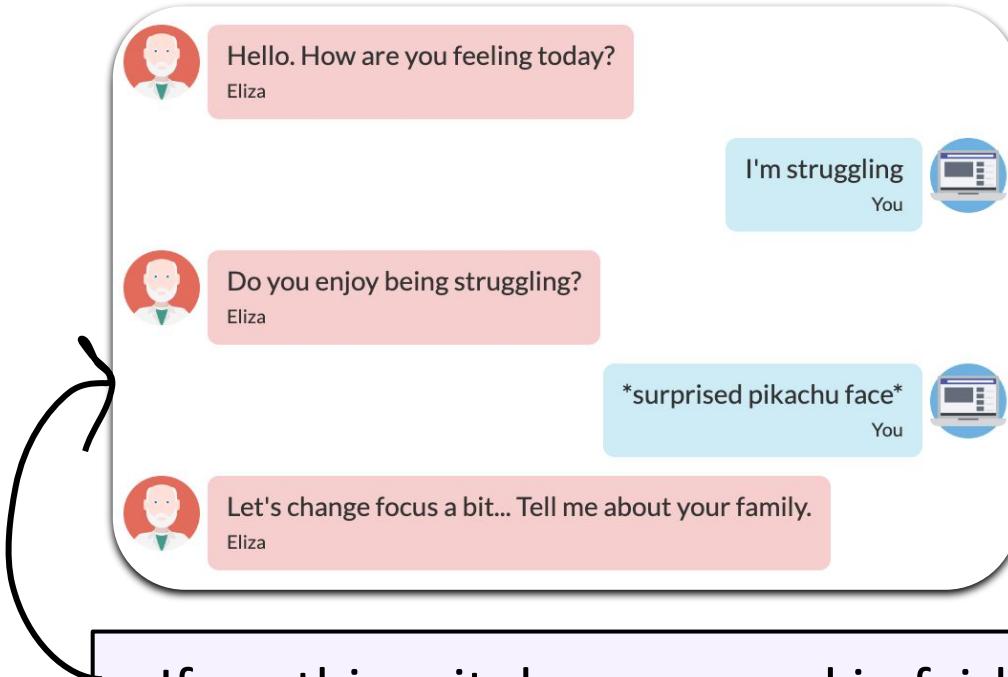


Please go on.

ELIZA

Ok – objectively, it's not great

(at least the version we're working with today)



If anything, it does respond in fairly fluent language

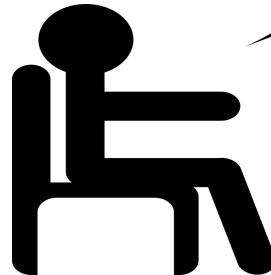




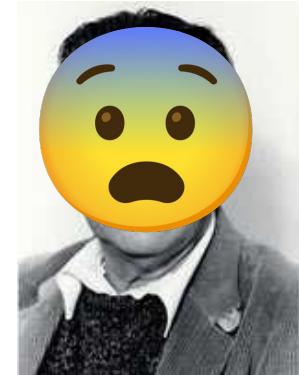
Ethical Implications

Anthropomorphism and Privacy

- People became deeply emotionally involved with the program
- Weizenbaum's secretary asked him to leave the room when she talked with ELIZA
- When he suggested that he might want to store all the ELIZA conversations for later analysis, people immediately pointed out the privacy implications
 - Suggesting that they were having quite private conversations with ELIZA



Joseph's
secretary



Joseph, can you
leave the room?

One Ethical Framework

1. Users should be informed that they are talking to a robot
2. **Automated chatbots should encourage people to seek human support**
3. Automated chatbots should have systems in place to prevent over-reliance
4. Automated chatbots should have systems in place to deal with emergency situations

<https://journals.sagepub.com/doi/10.1177/1178222619829083>

Campus Mental Health & Support Resources



thebridge.stanford.edu

We're open for winter quarter!

the bridge
peer counseling center

24/7 by phone
(650) 723 - 3392

9am - midnight for walk-ins
munger bldg1, apt137



IG: thebridgepeercounseling

Well-Being Coaching



Counseling & Psychological Services (CAPS)



Schedule an Appointment

Wait times for scheduled initial visits have averaged less than 2 days this past year. Same-day access is available for urgent concerns.



Crisis Support or Urgent Concerns:

Call 650.723.3785 (24/7) to speak with a crisis specialist.

If you are unsure your concern is urgent, do not hesitate to call the crisis line.

CAPS Services:

- 1 Call 650.723.3785 on weekdays from 8:30am- 5pm PT, or come by in person.
- 2 You will speak to a CAPS front desk administrative associate who will connect you with the appropriate resource based on your needs.

More resources at <https://web.stanford.edu/group/bridge/resources.html>



ELIZA Program: Let's get started!

On the course website, go ahead and click on the **Starter Code** link in the Week 8 section

The screenshot shows the course website for CS106S at Stanford University. At the top, there are three colored dots (red, yellow, green) followed by the URL "cs106s.stanford.edu". Below the URL is the Stanford seal. The main content area is divided into sections for different weeks:

- Week 7:** Trust and Safety — May 15. Includes "Slides" and "Checkoff Form" links.
- Week 8:** Mental Health — May 22. Includes "Slides", "Starter Code" (highlighted with a red arrow), and "Checkoff Form" links.
- Week 9:** What's Next? Beyond CS106S, End-Term Boba Party 🍹
- Week 10:** No class! Good luck on your finals! 🍀

On the left side, there are links for "News", "Schedule", and "Syllabus".

Then, download and unzip the code into a folder!

Starter Code Brief Overview

- Credit to Keith Weaver (Github) for the starter code.
- What you just downloaded is a fully functional ELIZA Chatbot in pure HTML/CSS/JS, **designed to run on your Chrome browser.**



ELIZA

Hello. How are you feeling today?
ELIZA

I am sorry to hear you are sad.
ELIZA

Talk to Eliza by typing into the textbox below:

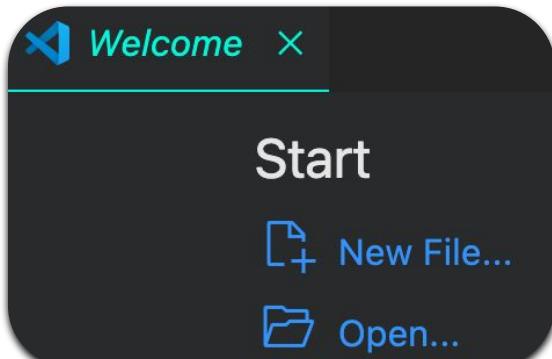
Send your message by pressing "Enter"

Originally built by Keith Weaver. Modified for CS106S (Autumn 2024).

Can use this
textbox to chat
with ELIZA!



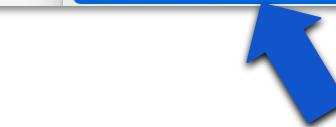
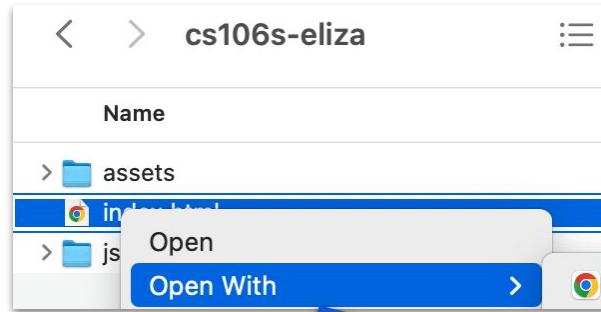
Getting ELIZA Running



In VSCode



- Once you've unzipped the code into a folder, **open it in a text editor of your choice** (e.g., VSCode, Sublime Text)



- Open the **index.html** file in Chrome (i.e. locate it in Finder, and double-click)



- Experiment with ELIZA! Make note of any good/bad responses.

ELIZA's Operating Philosophy

Reflective Listening

1. User sends message

2. Find highest-weighted keyword

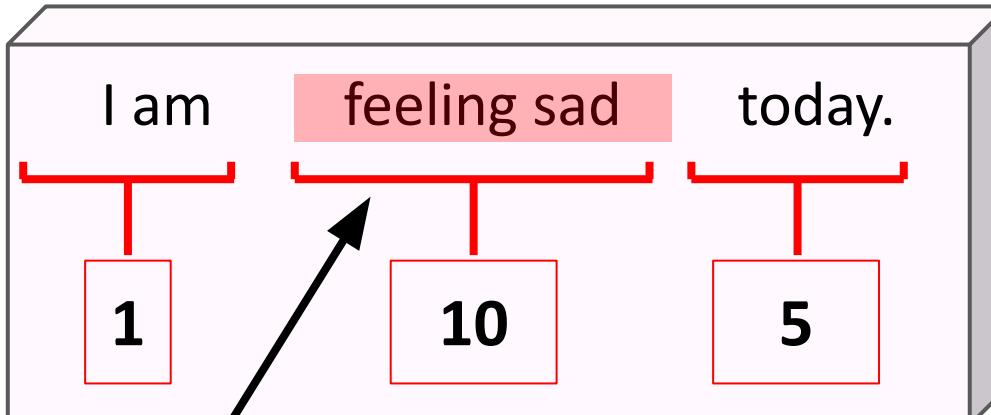
3. ELIZA responds



ELIZA & Reflective Listening



I am feeling sad today.



Find the user's **highest-weighted keyword**, and responds to it

Why are you **feeling sad?**





Two Key Data Structures in js/eliza_data.js

responses – A JS object / dictionary that stores the keywords, their weights, and corresponding responses for each

⚙️ For finding the highest-weighted keyword in the user input, plus appropriate responses

Each keyword (e.g., *child*, *nightmare*)
is a **key** of **responses**

The **value** is an object storing the keyword's weight, and the list of responses

```
{"child": {"weight": 16,  
          "responses": ["Did you have close friends as a child?",  
                        "Did the other children sometimes tease you?",  
                        "How do you think your childhood experiences relate to your feelings today?"]},  
  
  "nightmare": {"weight": 3,  
                "responses": ["What does that dream suggest to you?",  
                              "What persons appear in your dreams?"]}  
... }
```



Two Key Data Structures in js/eliza_data.js

synonyms – A JS object / dictionary that **stores the keywords**, and a list of corresponding synonyms (i.e. should be treated the same)

 Useful for **handling contractions, abbreviations, inflections** (e.g., loved, love, loving), plain synonyms, **modern slang, etc.** in the user's input

Each key is a **keyword** also present in **responses** from before

The **value** is a list of synonyms / **similar phrases** to the current keyword

{"**dreamed**": ["dream", "dreams"],

"**always**": ["inevitably", "no matter what"],

"**i am sad**": ["it's cooked", "i'm cooked", "i am in Math 51", "i'm crashing out"],

"**hello**": ["ni hao", "hola", "bonjour", "annyeonghaseyo"],

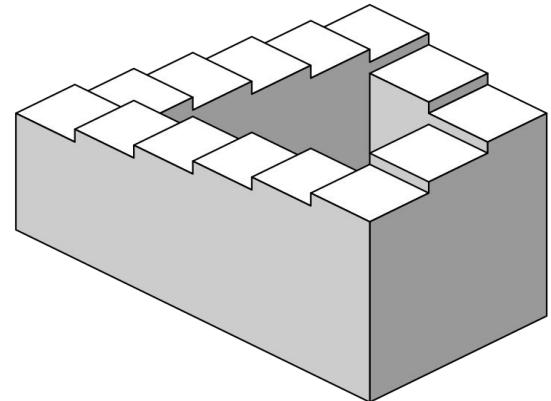
... }

Broadly:

analyze() function creates response to user's message based on:

- input string
- weight of the keywords
- degree of randomness

...creating an illusion of understanding! 



Task 1: Create a new rule and response

1. Open `eliza-data.js` in your preferred text editor
2. Edit the `responses` object with at least one **new rule / response** to try to improve ELIZA's understanding (**or change around the weights!**)
3. Test out your changes!

or Task 2: Add more support for synonyms

1. In `eliza-data.js`, edit the `synonyms` object with a keyword and a list of synonym words that a user could plausibly write in today's age (e.g., modern/campus slang, or anything in contemporary English).



Lastly: Check-Off Form

Another **brief check-off form** (< 5 min to complete) for checking attendance!

For today, click the “Check-Off Form” link in the **Week 8** section of cs106s.stanford.edu.

Thank you so much!

stop glamorizing “the Grind” and start glamorizing whatever this is



Be on the lookout for a **group boba order (Week 9)** sometime early next week!

Have a beautiful week!!
Thank you for being here, and you got this

