

# CS 106S Week 8

Mental Health & Chatbots? 🤔

[cs106s.stanford.edu](http://cs106s.stanford.edu), Autumn 2024

# It's Week 8! Already!!



An especially topical wellness check – how are you doing?

Start of  
Autumn



Add / Drop  
Deadline 😱

Guest Lectures on  
intro ML and  
cybersecurity 😍

```
15 const LOCALE = globalThis.navigator.language
16
17 const div = document.body.appendChild(document.createElement('div'))
18 const list = div.appendChild(document.createElement('ol'))
19
20 const dayNames = new Map()
21
22 for (let i = 0; i < 7; ++i) {
23   const d = Temporal.PlainDate.from({
24     year: Temporal.Now.plainDateISO().year,
25     month: i,
26     day: i + 1,
27   })
28
29   dayNames.set(d.dayOfWeek, d.toLocaleString(LOCALE, { weekday: 'long' }))
30 }
31
32 for (const num of [...dayNames.keys()]).sort((a, b) => a - b) {
33   list.appendChild(Object.assign(
34     document.createElement('li'),
35     { textContent: dayNames.get(num) },
36   ))
37 }
38 }
```

Halloween

Thanksgiving Recess

You'll start hearing  
Mariah Carey's "All I  
Want For Christmas is  
You" everywhere



Winter Break





# Agenda for Today

- 1 short 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!

# **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

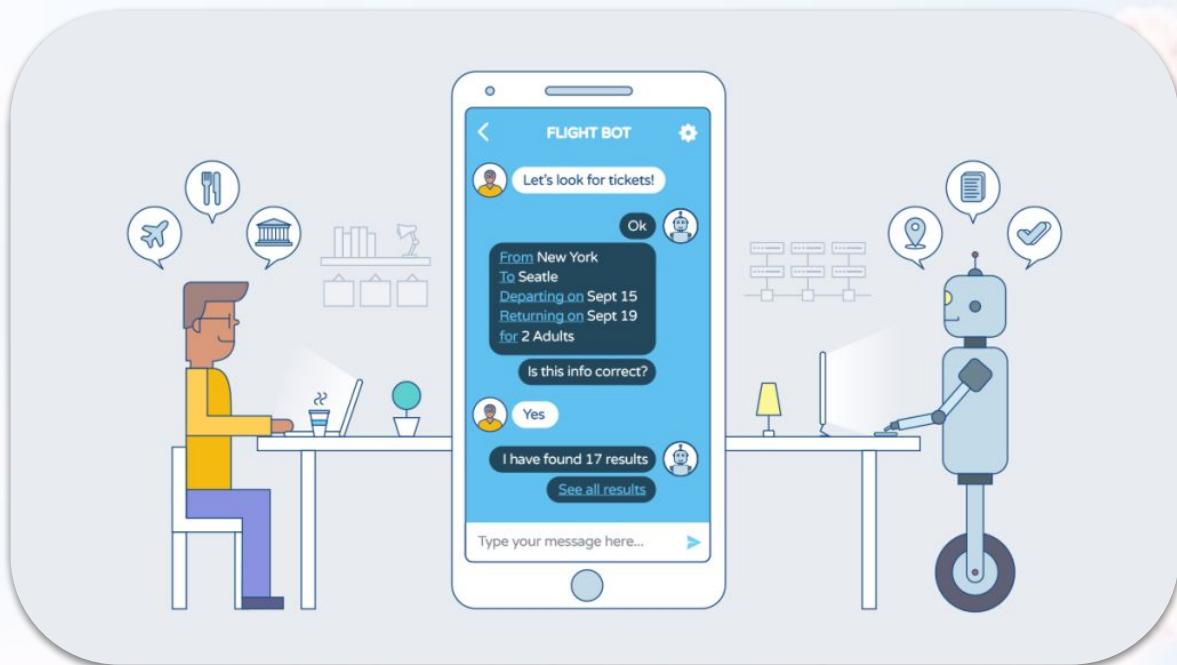
Chatbots (e.g., 1960s ELIZA)



Speech Recognition

And a lot more!

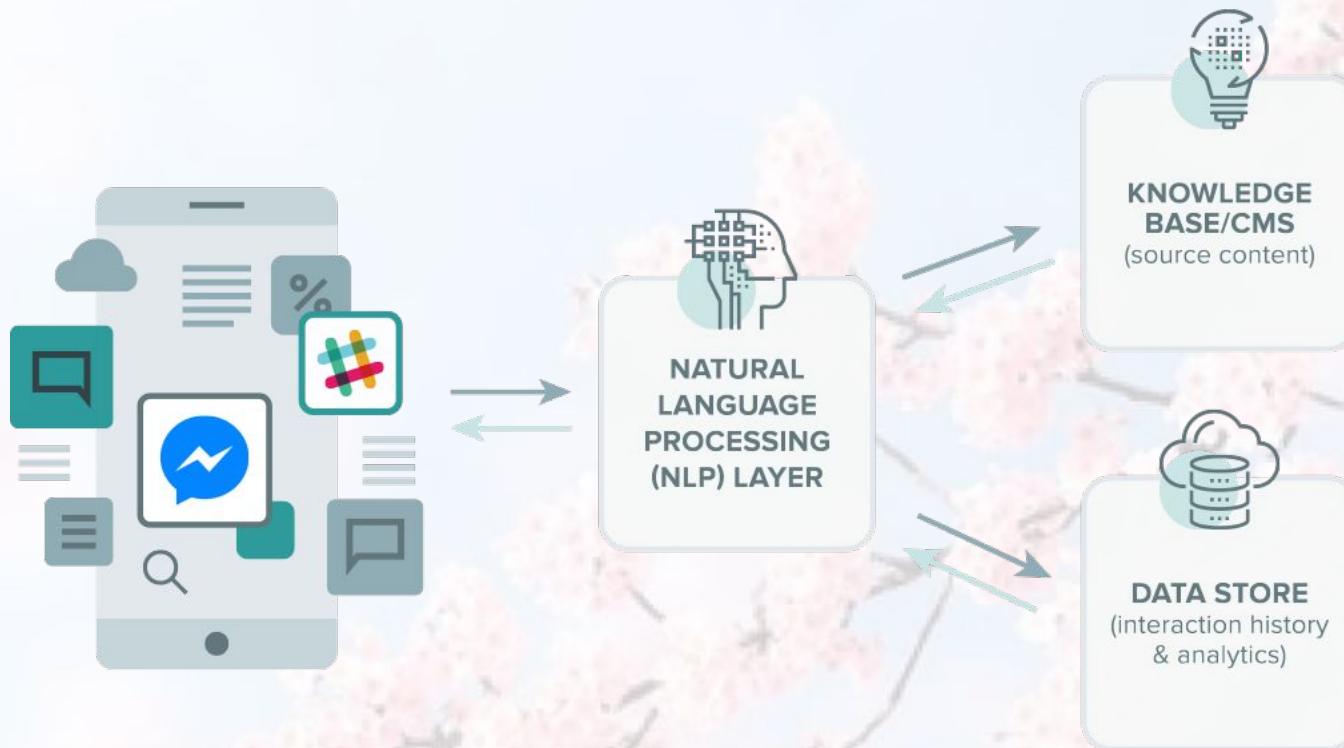
# So Chatbots ...



# How a Chatbot usually works

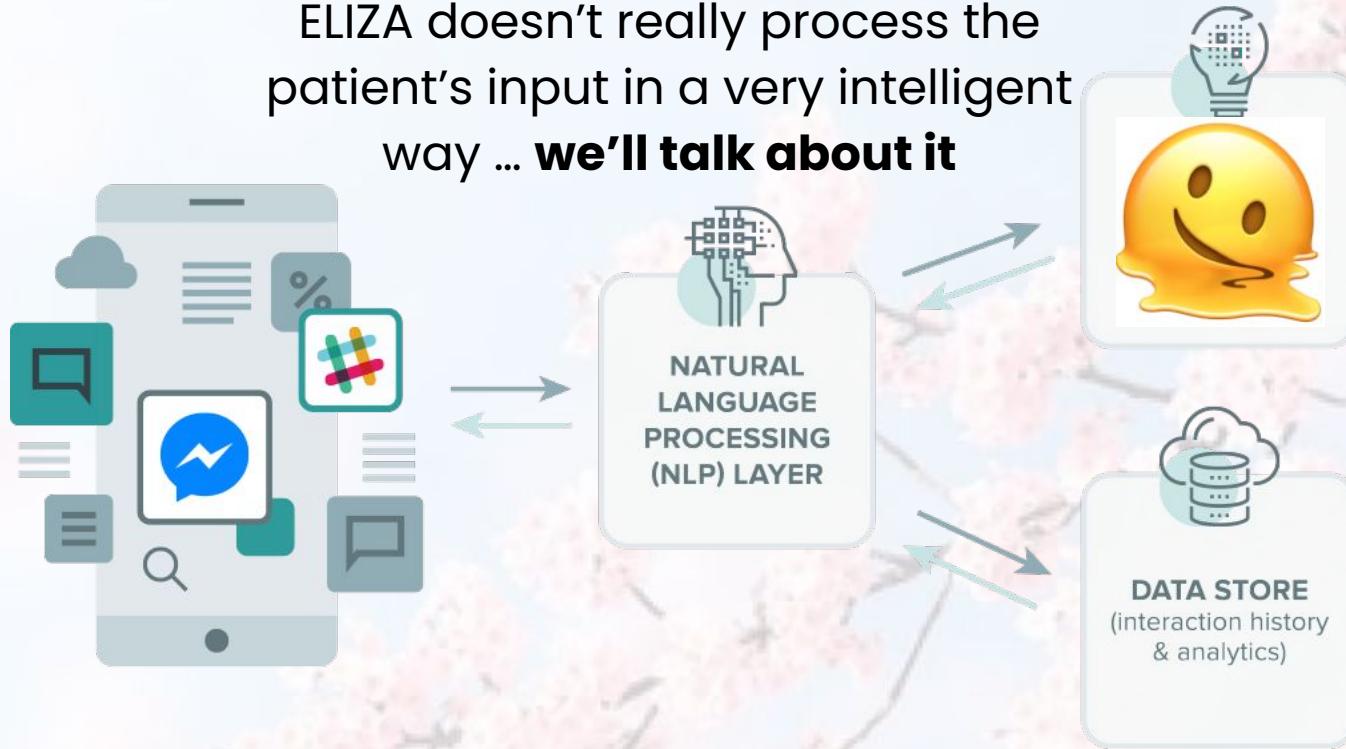
- 1 User sends message to the Chatbot
- 2 Chatbot **processes the message** to “understand” its meaning
  - a. Utilize NLP to look for respondable patterns
  - b. Also can reference a Knowledge Base for more intelligence
- 3 Chatbot **determines a response** to the User’s message **based on interpreted meaning**
- 4 Chatbot responds to User
- 5 Repeat!

# How a chatbot usually works



# How ELIZA works

ELIZA doesn't really process the patient's input in a very intelligent way ... **we'll talk about it**



- 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

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



Weizenbaum creates ELIZA, the first ever chatbot.

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



Welcome to

EEEEEE	LL	IIII	ZZZZZ	AAAAA
EE	LL	II	ZZ	AA AA
EEEEEE	LL	II	ZZZ	AAAAAAA
EE	LL	II	ZZ	AA AA
EEEEEE	LLLLLL	IIII	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:



# The 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 Kenneth Colby's PARRY, an early chatbot built at Stanford
  - Crude simulation of someone with paranoid schizophrenia, sparking debate around the nature and ethics of artificial intelligence.

# ELIZA and PARRY conversation over the ARPANET

ELIZA: Good Evening. Tell me your problems. Please terminate input with a period or a question mark.

PARRY: People get on my nerves sometimes.

ELIZA: I am not sure I understand you fully.

PARRY: You should pay more attention.

ELIZA: Suppose you should pay more attention.

PARRY: You're entitled to your own opinion.

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

PARRY: It bothers me just to be around people in general.

ELIZA: Please go on.

PARRY: I went to the track at Bay Meadows a while back.

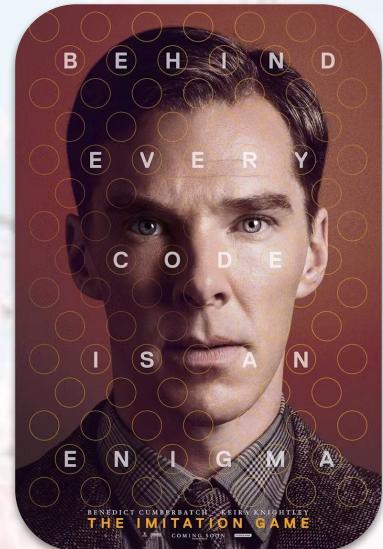
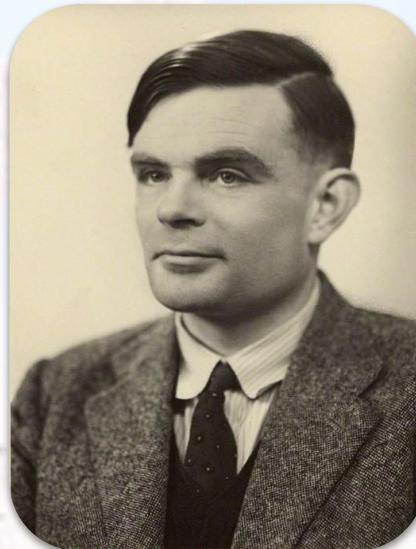
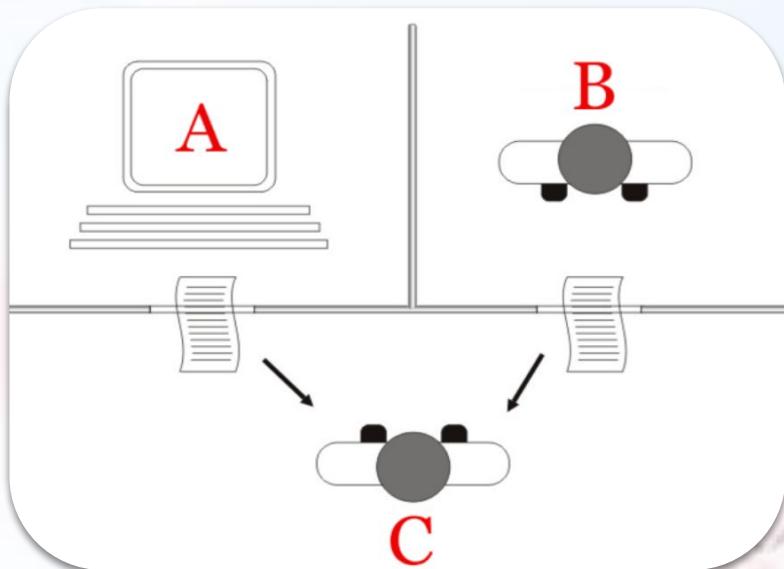
ELIZA: What does that suggest to you?

PARRY: I went to the races.



# Turing Test

Originally called *The Imitation Game*: a test of a machine's ability to exhibit intelligent behavior **indistinguishable from a human**



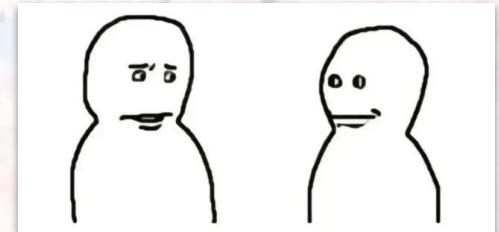
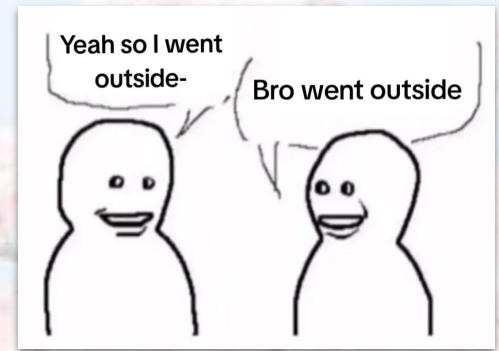
# How was ELIZA able to trick so many people into believing it was real?

**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 a cloak of 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*



# 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?

# 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?



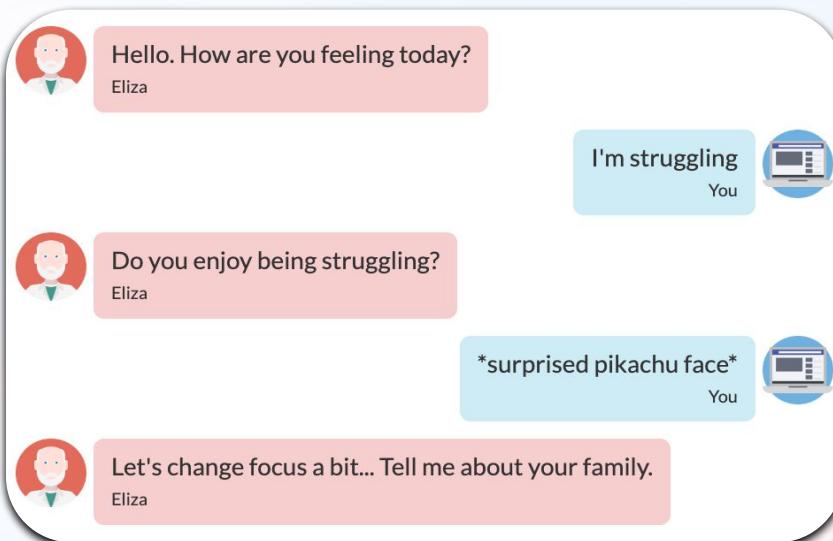
I just have a special place in my heart for writing.



Can you elaborate on that?

# Ok – objectively, it's not great

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

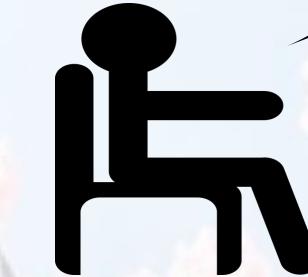


If anything, it does respond in fairly fluent language.

# ⚠ 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



The f—



Joseph, can you  
leave the room?

# **One Ethical Framework for Mental Health Chatbots**

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>

**Thoughts?**

# Let's Get Started!

Click the “Starter Code” link in the **Week 8** section of  
**cs106s.stanford.edu.**

# 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'm sad   
You

 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).

# Getting ELIZA Running

1. Download and unzip the code – open it in a text editor of your choice (e.g., Sublime Text, Visual Studio Code, etc.).
2. Open the **index.html** file in Chrome (as like past assignments)
3. 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

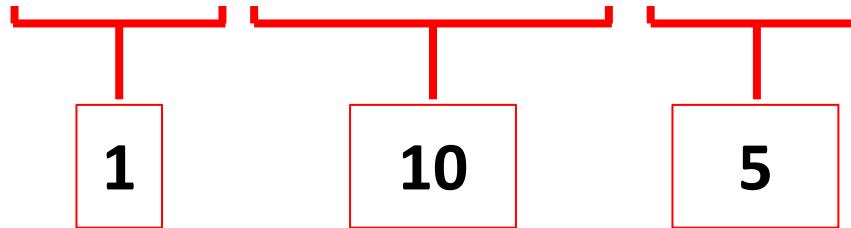
3. ELIZA  
responds

# ELIZA & Reflective Listening



I am feeling sad today.

I am **feeling sad** today.



Why are you **feeling sad?**



# Two Key Data Structures in eliza-data.js

JavaScript Object / Dictionary: **responses = {}**

**Stores the keywords & corresponding responses**

**For finding the highest-weight keyword & its appropriate responses in our message!**

```
"child" : {
    "weight" : 16,
    "responses" : ["Did you have close friends as a child?",
        "What is your favorite childhood memory?",
        "Do you remember any dreams or nightmares from childhood?",
        "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?",
        "Do you dream often?", "What persons appear in your dreams?",
        "Are you disturbed by your dreams?"]},
```

# Two Key Data Structures in eliza-data.js

JavaScript Object / Dictionary: **synonyms = {}**

Stores keywords and, for each, a list of corresponding synonyms

**Useful for handling contractions, abbreviations, inflections, just plain synonyms, modern slang, etc.**

```
var synonyms = {  
    "sorry" : [  
        "apologise"  
    ],  
    ...
```

"i am sad": ["it's cooked"]

# Broadly:

“analyze” function creates response 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 make ELIZA better
3. Test out your changes!

# 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 patient could plausibly write in today's age (e.g., modern slang or anything in contemporary English).



# 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](https://cs106s.stanford.edu).

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



Be on the lookout for a group boba order form for the final class next week!



**Have an awesome weekend!**