

Paper 1

# ELIZA

<https://web.stanford.edu/class/linguist238/p36-weizenbaum.pdf>

ELIZA (Weizenbaum, 1966) is the most important chatbot dialogue system in the history of the field of Conversational AIs. ELIZA was designed to simulate a Rogerian psychologist, based on a branch of clinical psychology whose methods involve drawing the patient out by reflecting patient's statements back at them. Rogerian psychology is the rare type of conversation in which, as Weizenbaum points out, one can "assume the pose of knowing almost nothing of the real world". If a patient says "I went for a long boat ride" and the psychiatrist says "Tell me about boats", you don't assume she didn't know what a boat is, but rather assume she had some conversational goal.

Most chatbots trying to pass the Turing test choose a domain with similar properties. Consider the following conversation where ELIZA tries to give very therapeutic advice, (from a full interaction given in the original paper).

Person: Men are all alike.

ELIZA: IN WHAT WAY

Person: They're always bugging us about something or other.

ELIZA: CAN YOU THINK OF A SPECIFIC EXAMPLE

Person: Well my boyfriend made me come here.

ELIZA: YOUR BOYFRIEND MADE YOU COME HERE

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

ELIZA: I AM SORRY TO HEAR THAT YOU ARE DEPRESSED

..

..

ELIZA: WHO ELSE IN YOUR FAMILY TAKES CARE OF YOU

Person: My father

ELIZA: YOUR FATHER

Person: You are like my father in some ways.

ELIZA: WHAT RESEMBLANCE DO YOU SEE

Person: You are not very aggressive but I think you don't want me to notice that.

ELIZA: WHAT MAKES YOU THINK I AM NOT AGGRESSIVE

Person: You are afraid of me

ELIZA: DOES IT PLEASE YOU TO BELIEVE I'M AFRAID OF YOU

Person: My father is afraid of everybody

ELIZA: WHAT ELSE COMES TO YOUR MIND WHEN YOU THINK OF YOUR FATHER

Person: Bullies.

ELIZA: DOES THAT HAVE ANYTHING TO DO WITH THE FACT THAT YOUR

BOYFRIEND MADE YOU COME HERE

ELIZA works by, pattern/transform rule matching .

Consider the following:

(\$ YOU \$ ME) [pattern] -> (WHAT MAKES YOU THINK I \$ YOU) [transform]

This rule would transfer, "You hate me" into "WHAT MAKES YOU THINK I HATE YOU" .

Each ELIZA pattern/rule is linked to a keyword that might occur in a user input. Keywords are associated with a rank, with specific words being more highly ranked, and more general words ranking lower.

Consider the following user sentence:

I know everybody laughed at me

Because it has the word "I", this sentence could match the following rule whose keyword is I:

(I \*) -> (YOU SAY YOU 2)

Producing:

YOU SAY YOU KNOW EVERYBODY LAUGHED AT YOU

If no keyword matches, ELIZA chooses a non-committal response like

PLEASE GO ON,

THAT'S VERY INTERESTING or I SEE.

The algorithm that drives it:

function ELIZA GENERATOR(user, sentence ) returns response

Find the word w in sentence that has the highest keyword rank

if w exists

    Choose the highest ranked rule r for w that matches sentence

    response ← Apply the transform in r to sentence

    if w = 'my'

        future←Apply a transformation from the 'memory' rule list to sentence

        Push future onto memory stack

    else (no keyword applies)

        either response←Apply the transform for the NONE keyword to sentence

        or

        response←Pop the top response from the memory stack

return (response)

# Anaphora Resolution (Hindi)

<https://www.aclweb.org/anthology/I13-1130.pdf>

Informally, Co-reference resolution is the task of finding all expressions that refer to the same entity in a text.

Formally, co-reference consists of two linguistic expressions—antecedent and anaphor. The anaphor is the expression whose interpretation (i.e., associating it with an either concrete or abstract real-world entity) depends on that of the other expression. The antecedent is the linguistic expression on which an anaphor depends. Thus, the coreference resolution task is to discover the antecedent for each anaphor in a given text.

It is an important step for a lot of higher level NLP tasks that involve natural language understanding such as document summarization, question answering, and information extraction.

Research on coreference resolution in the general English domain dates back to 1960s and 1970s. However, research on coreference resolution in the field of indian regional languages like hindi has not seen major development.

Most coreference resolution approaches which use deeper linguistic features are based on phrase structure based grammatical models. Instead, linguistic features from a dependency grammar model are used. Hence, the first aim is to develop a rule based approach by studying and analyzing patterns in the CPG based dependency structure that can be formulated as rules to resolve references. Observation shows that some categories of pronominal references such as Reflexives, Relatives, First and Second person can be easily resolved by formulating rules based on dependency structures. However, for some ambiguous references, specifically in third person pronouns, although syntactic constraint do reduce search space, they fail to uniquely identify the referent. In resolution of such references, morphological, grammatical, distance and semantic features also play an important role.

The rule based module attempts to locate the referent of the pronoun using the constraints derived from the dependency structures and relations. First, the category of the pronoun is identified. After the category is identified, a set of rules defined for each category is applied to locate the referent.

Eg.

### - Reflexives

In Hindi Possessive reflexives are the most frequent reflexives which are only used in possession relation within the same clause and are different from third person possessive pronouns. Unlike English reflexives, they are not inflected with the gender and number of the possessor, but that of the possession. They include [apnA (apana), apnF (apanii), apn (apane)] (own)

### - Spatial

Locative (spatial) pronouns refer to location or places. They include vhA\ ('there') and yhA\ ('here').

Spatial pronouns can be resolved by selecting the noun phrase nearest to the pronoun which has 'LOCATION' as NER-Category or the nearest NP with the dependency label 'k7p' or 'k2p'

### - Relatives

In Hindi, relative pronouns include jo (which) and its case forms such as Ejs (to which), Ejss (from which) etc. the referent of the relative pronoun should be selected as the noun-phrase to which the clause containing relative pronoun is attached.

### - Personal

All personal pronouns in Hindi are marked for number, respect and case. If the first person pronoun is a part of attributional clause, then its reference is the speaker of that clause. It is almost always 'k1' of the main clause. Similarly the referent of a second person pronoun in an attributional clause, is mostly the 'k4' or experiencer of the main clause

The rule based system achieves a substantial accuracy of 60% which implies that dependency relations can help achieve an acceptable resolution performance for Hindi.