PROPOSAL

For this project, we are investigating digitizing a simplified Rational Emotive Behavior Therapy (REBT) process. The challenge is to use language theory in order to identify the components of a sentence that make up irrational beliefs and generate correct rational beliefs. Utilizing Python Natural Language Toolkit (PNLT) to parse structures and extract key words to recognize activating events that cause self-defeating thoughts and other irrational beliefs (IBs) then provide guidance to dispute and challenge IBs then further replace them with rational beliefs (RBs).

IMPORTANCE

The implications of Rational Emotive Behavior Therapy are widespread because it targets such critical (and commonly occurring) problems. The main purpose of this type of therapy is to uncover irrational beliefs in order to mitigate the negative emotions that are believed to be a direct consequence. It aims to resolve the emotional and behavioral disruption that so often affects regular people.

The core functionality of REBT is to target beliefs in order to provide solutions for emotional and behavioral challenges. In order to believe that REBT is effective it is necessary to accept the premise that human thoughts can be inexplicably powerful in affecting our perception of the events we experience and furthermore, the views we construct about our experiences are affected by our language, philosophies and beliefs.

IMPLEMENTATION

The project is implemented in Python while documentation and testing are logged using Jupyter.

jupyter

COMPSCI 4TB3: FINAL PROJECT

Rational Emotive Behavior Therapy (REBT) Chatbot

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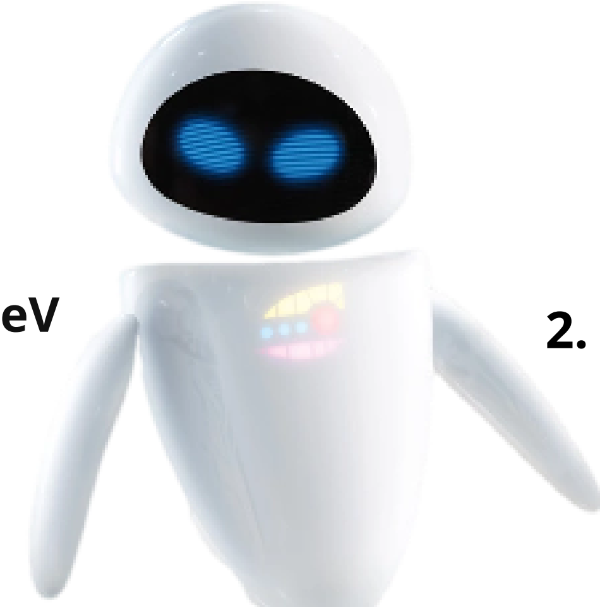
GRAMMAR

We came up with the Grammar and Production rules based on X-bar theory. Each non-terminal symbol is a lexical category in English language. (IP as Inflectional Phrase while CP as Claus Phrase)

Production Rules:

IP -> NP IBar
IBar -> I VP | VP
NP -> Det NBar | NBar | N NBar
NBar -> AdjP NBar | NBar PP | N PP | N | N CP
AdjP -> AdvP AdjBar | AdjBar
AdjBar -> Adj | Adj PP
PP -> PBar | AdvP PBar
PBar -> P NP
VP -> VBar |V VBar
VBar -> V NP | V | AdvP VBar | VBar AdvP |
V AdjP | VBar PP | V NP NP | V CP | PassiveV
AdvP -> AdvBar | AdvP AdvBar
AdvBar -> Adv
CP -> CBar
CBar -> C IP | IP



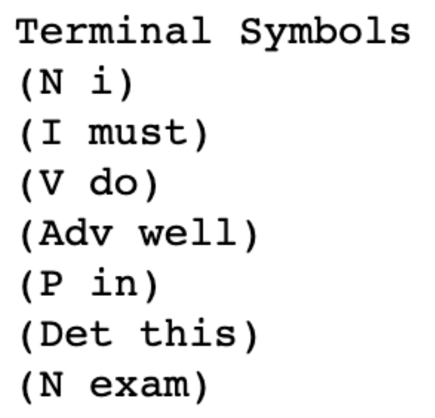
Adv -> 'really' | 'fully' | 'very' | 'well'
Adj -> 'bad' | 'worthless' | 'unlovable' | 'awful' | 'horrible'
Det -> 'my' | 'this' | 'a'
N -> 'exam' | 'people' | 'i' | 'person' | 'someone' | 'it' | 'friends'
I -> '-pst' | '+pst' | 'cannot' | 'cant' | 'haveto' | 'needto' | 'must'
V -> 'do' | 'find' | | 'be' | 'am' | 'stand'
PassiveV -> 'be-approved' | 'be-accepted' | 'be-loved'
P -> 'in' | 'by'
C -> 'that' | 'who' | 'when'

IMPLEMENTATION

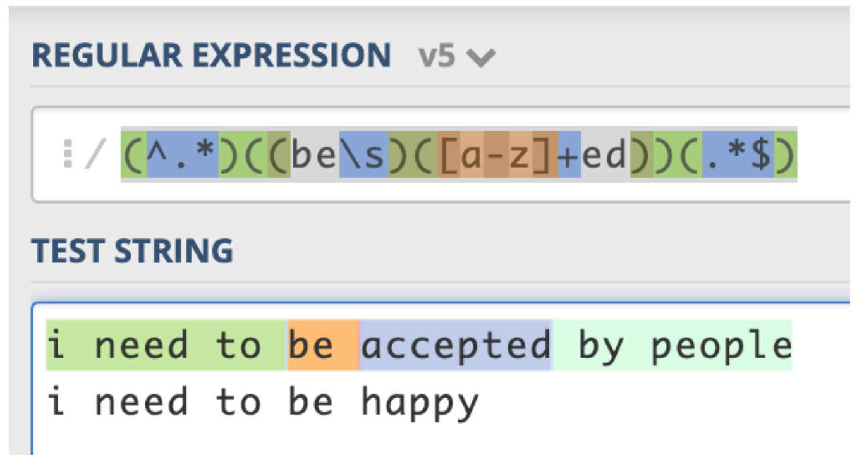
Three major steps of this application are:

User Input: "I must do well in this exam"

1. **Parsing** - *each sentence is being parsed into syntax trees then further being decomposed into different parts according to their lexical category (Part of Speech). Regular Expression is used to detect whether the sentence is in passive or active voice.*



```
Terminal Symbols
(N i)
(I must)
(V do)
(Adv well)
(P in)
(Det this)
(N exam)
```



REGULAR EXPRESSION v5

```
/ (^.*)((be\s)([a-z]+ed))(.*$)
```

TEST STRING

```
i need to be accepted by people
i need to be happy
```

2. **Dispute Construction** - *words are extracted from the hashtable based their lexical category:*

Type A: Original (Active voice): N I V A (NP): I must do well

Dispute: CP (Why) + I + N + V + A: Why must i do well

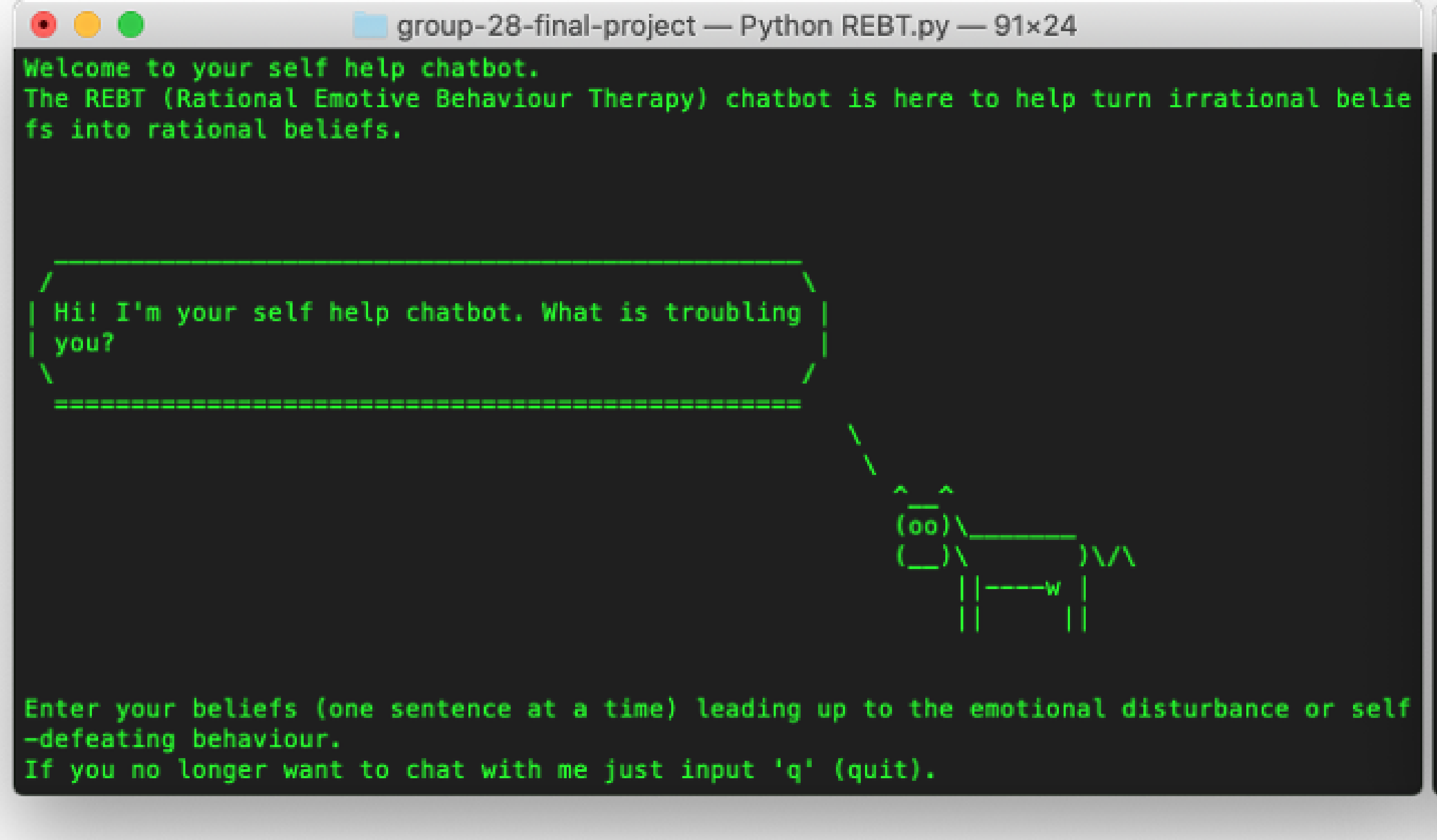
Original (Passive voice): N I PassiveV (NP): i must be accepted

Dispute: CP (Why) + I + N + PassiveV: Why must i be accepted

Type B: Original: N V A/N: I am awful

Dispute: "Where is the evidence that " + N + V + A: Where is the evidence that I am awful

3. **Construct a relevant rational belief** - *differentiate the two types of RBs based on the existence of IP similar to Dispute*



group-28-final-project — Python REBT.py — 91×24

```
Welcome to your self help chatbot.
The REBT (Rational Emotive Behaviour Therapy) chatbot is here to help turn irrational belie
fs into rational beliefs.



  __________________________________________________
 /                                                  \
| Hi! I'm your self help chatbot. What is troubling |
| you?                                              |
 \                                                  /
  ==================================================
                                                      \
                                                       \
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                                                        (__)\       )\/\
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Enter your beliefs (one sentence at a time) leading up to the emotional disturbance or self
-defeating behaviour.
If you no longer want to chat with me just input 'q' (quit).
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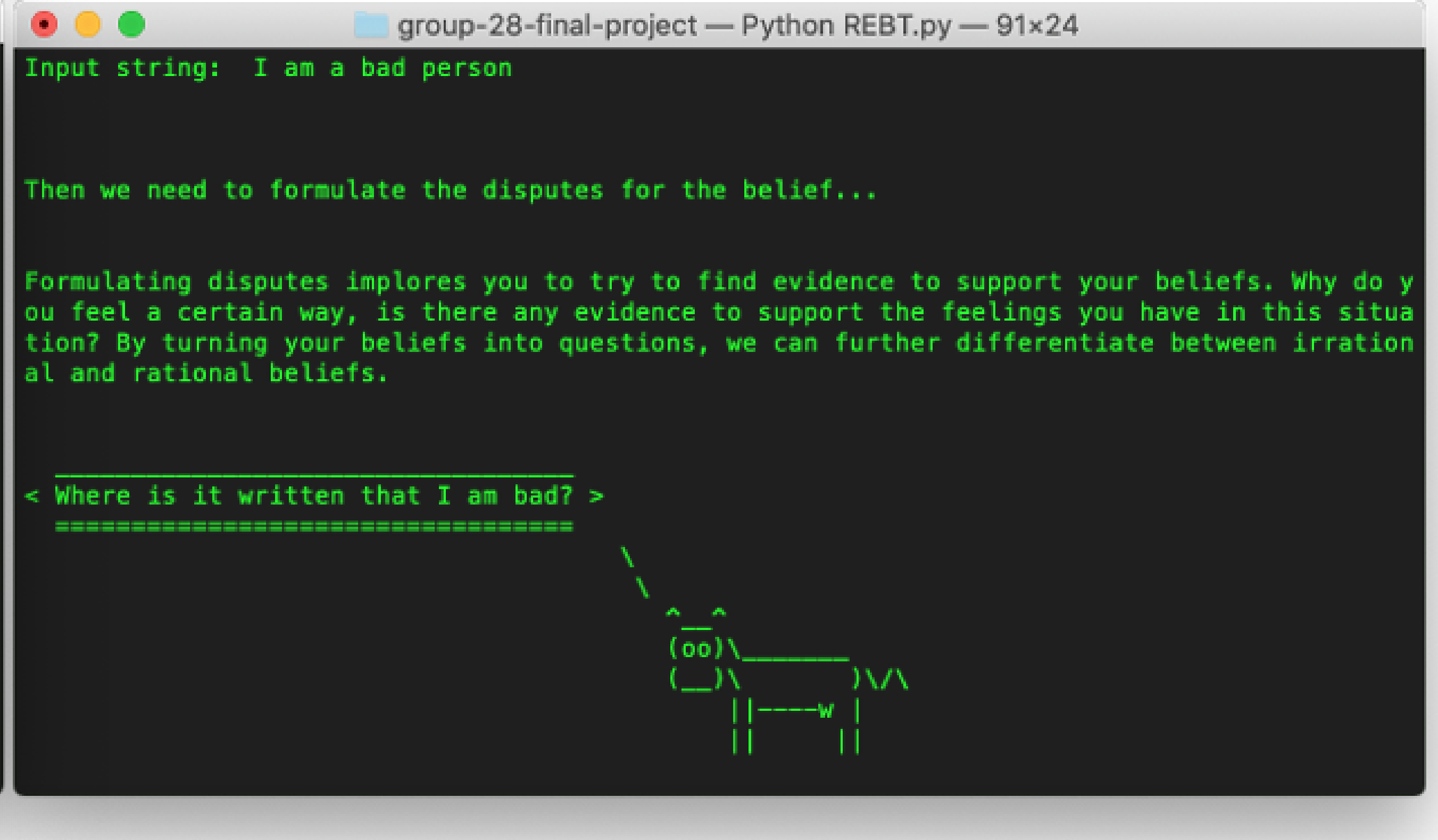

group-28-final-project — Python REBT.py — 91×24

```
Input string:  I am a bad person



Then we need to formulate the disputes for the belief...


Formulating disputes implores you to try to find evidence to support your beliefs. Why do y
ou feel a certain way, is there any evidence to support the feelings you have in this situa
tion? By turning your beliefs into questions, we can further differentiate between irration
al and rational beliefs.



  __________________________________
< Where is it written that I am bad? >
  ==================================
                                    \
                                     \
                                      ^__^
                                      (oo)\_______
                                      (__)\       )\/\
                                          ||----w |
                                          ||     ||
```

ANALYSIS

In order to dispute users' irrational beliefs and provide guidance, the program has to have a good understanding of different parts of speech (PoS) of the user input. For our application, we mainly focused on modal verbs and APs (Adverb and Adjectives Phrases), since both lexical categories of words are potentially attached with strong feelings in English.

Modal verbs, such as "must", "have to", "can", etc., are used to express an ability, necessity, or obligation, hence it is critical to capture these words. For simplification, we did not strictly follow X-bar theory as modal verbs are supposed to be under I-bar and specified as "AuxV", we marked them as "I" instead.

For our purpose, we can categorize all the user inputs into 2 types:

Type A: NP + I + V + (PP) (e.g: I must do well in this exam)

Type B: NP + V + AdjP (e.g: I am awful)

To dispute the type A, we use a construct a sentence using a production of 'why' + I ('must') + NP ('I') + V (do well) while for type B, we use a production of "where is it written that " + NP + V + AdjP.

In order to generate rational beliefs, we substitute IPs that have shown strong feelings with other modal verbs.

INSIGHTS

The goal of this project is to use concepts of parsing and code generation to generate positive beliefs from negative beliefs using the pre-existing rules of the REBT. This is important because the project is meant to be a predecessor for chatbot style therapy sessions (REBT) .

With only 3 small python files (each less than 150 lines of code) it is possible to create a functioning REBT framework. Although we have only dealt with one form/procedure for REBT, it can be extended to bigger applications.

RESOURCES

- O'Grady, W. and J. Archibald. Contemporary Linguistic Analysis: An Introduction. Toronto: Pearson, 2012 (7th edition).
- Merrells, T. and A. Moro. Study Guide to accompany Contemporary Linguistic Analysis. Toronto: Pearson, 2012 (7th edition).
- Python Natural Language Toolkit: https://www.nltk.org/