

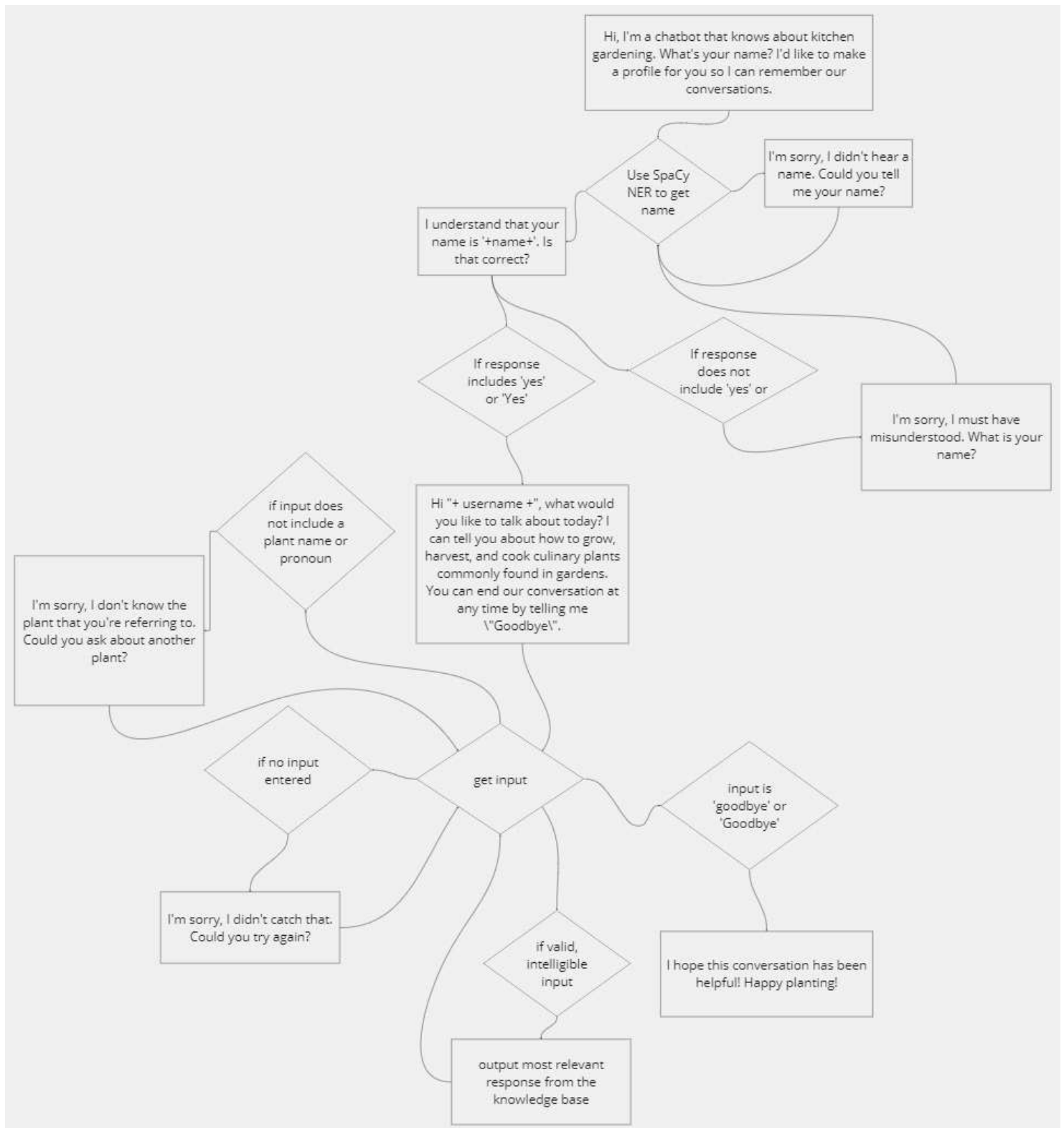
# Chatbot Project 2

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This chatbot has been created to give advice on growing, harvesting, and cooking common plants from kitchen gardens. I chose to use a text classification model instead of a generative text model in order to prevent inaccurate responses due to the small size of the dataset, as the dataset has only 92 rows with 9 possible responses to different types of questions for each plant. Due to the nature of the response dataset, I believe that a generative text model would have caused the chatbot to hallucinate and provide inaccurate responses, and I wanted to preserve the accuracy of the information. Instead, when the user interacts with the chatbot, the chatbot feeds the user text into a text classification model that identifies what type of question the user is likely to be asking. This text classification model is a multinomial naive bayes model with a tf-idf vectorizer, both from the scikit-learn library. I then check if each plant in the dataset exists in the sentence. If there are no plants in the sentence, I use SpaCy to check for pronouns in the sentence, and I provide the response based on the plant that was previously discussed. If they do not use a pronoun and none of the dataset plants are in the sentence, the chatbot assumes that they have used the name of an unknown plant and apologizes, and asks them to ask about a different plant. Finally, each entry by the user is evaluated for sentiment by a MLPClassifier neural net with the same vectorizer, and if the sentiment labeled positive I add the topic of the sentence to the likes for the user, and similarly if the sentiment is labeled negative I add the topic to the dislikes. To identify the name of the user in the introductory conversation, I used the SpaCy named entity recognition tool.

I used the Vegetables, herbs, and edible flowers dataset from <https://data.world/sharon/vegetables-herbs-and-edible-flowers> by Sharon Brener to create the chatbot knowledge base. I manually modified the data to make the sentences clearer and more complete. I also created a questions.csv file to train the text classification model on the likely questions that might be asked about each plant based on the topics in the knowledge base. The questions dataset was very small, so I used a multinomial naive bayes classifier as they are less likely to struggle with small datasets than neural nets or other models, and actually are less likely to overfit with a small dataset. I cleaned the questions data by replacing numbers by num, replacing punctuation by punct, and removing stopwords. Inside the tf-idf vectorizer I converted all text to lowercase and removed all words that were in 80% or more of the entries, as those would likely be irrelevant to the model. This cleaning is also performed for each of the user's entries. Finally, I used the sentiment-emotion-labelled\_Dell\_tweets.csv dataset from kaggle to train the sentiment identifier. I mostly cleaned it the same way as the questions dataset, but I also removed instances of urls and user tags as the responses to the chatbot would likely not include those. I limited the model to only using the text and sentiment columns of the dataset as any other data available in tweets would not be available to the chatbot.

# Dialogue Tree and Logic



# Sample Dialogue Interactions

The following is a sample interaction with this chatbot.

Hi, I'm a chatbot that knows about kitchen gardening. What's your name?

I'd like to make a profile for you so I can remember our conversations.

Adrianna

I understand that your name is Adrianna. Is that correct?

Yes

Hi Adrianna, what would you like to talk about today? I can tell you about how to grow, harvest, and cook culinary plants commonly found in gardens.

You can end our conversation at any time by telling me "Goodbye".

How do I cook peas?

Raw straight from the pod in the garden is best! Raw in salads. Steamed lightly. Small pods can be steamed whole.

How do I grow them?

Peas are easy to grow. Sow in the garden. Sow the seed at a depth approximately three times the diameter of the seed. Peas are best planted at soil temperatures between 8°C and 24°C.

Do they need to be spaced far apart?

Space plants 5 - 8 cm apart.

When should I harvest them?

Harvest them in 9-11 weeks. Pick the pods every day to increase production.

What about potatoes?

Peeled or unpeeled and scrubbed, potatoes can be boiled, baked, fried and roasted. - The only way they are not used is raw. Keep in a pot of cold water after peeling, otherwise they will discolour.

Can I freeze potatoes?

I'm sorry, I don't know about that for Potato.

Where can I learn more about potatoes?

Peeled or unpeeled and scrubbed, potatoes can be boiled, baked, fried and roasted. - The only way they are not used is raw. Keep in a pot of cold water after peeling, otherwise they will discolour.

Goodbye

I hope this conversation has been helpful! Happy planting!

# User Models

The user models were created in an xml file. Each username has its own tag under the root tag <users>, and under the user each <l> tag is a liked topic and each <d? tag is a disliked topic. The following is a screenshot of a sample user model.

```
<users>
  <Adrianna>
    <l>
      Potato
    </l>
    <l>
      Carrot
    </l>
    <l>
      Amaranth
    </l>
    <d>
      Brussels Sprouts
    </d>
    <d>
      Peas
    </d>
  </Adrianna>
</users>
```

# Evaluations

This chatbot's strength was that the responses would always be accurate information about the plant in question. In exchange for accuracy, I gave up flexibility, as this chatbot can only give responses that already exist in the knowledge base. This chatbot improved upon the previous likes/dislikes model that I used on Project 1 by shifting from simple word recognition to a sentiment analysis model. The accuracy of the responses could have been improved by having a larger, more varied questions dataset for it to learn accurate responses categories, but I was unable to create a very large dataset due to the necessity of creating this supervised dataset by hand. The survey questions are as follows:

1. How much did this AI seem to know about kitchen gardening?
  - a. Very Little
  - b. A little
  - c. Some
  - d. A lot
  - e. Quite a lot
2. How well did this AI identify what you wanted to talk about?
  - a. Not at all
  - b. Not very well
  - c. Somewhat
  - d. Very well
  - e. Extremely well
3. How well did the responses make sense?
  - a. Very little
  - b. A little
  - c. Some
  - d. A lot
  - e. Quite a lot
4. How likely are you to interact with this AI again?
  - a. Not at all likely
  - b. Not very likely
  - c. Somewhat likely
  - d. Very likely
  - e. Extremely likely

The responses given by the survey participants were as follows:

User A:

- |          |             |                |                    |
|----------|-------------|----------------|--------------------|
| 1. A lot | 2. Somewhat | 3. Quite a lot | 4. Somewhat likely |
|----------|-------------|----------------|--------------------|

User B:

- |                |                   |          |                    |
|----------------|-------------------|----------|--------------------|
| 1. Quite a lot | 2. Extremely well | 3. A lot | 4. Not very likely |
|----------------|-------------------|----------|--------------------|

User C:

- |          |              |                |                    |
|----------|--------------|----------------|--------------------|
| 1. A lot | 2. Very well | 3. Quite a lot | 4. Not very likely |
|----------|--------------|----------------|--------------------|

# Citations

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<https://data.world/sharon/vegetables-herbs-and-edible-flowers>

Ankit Kumar, *Sentiments & Emotions Labelled Tweets*, kaggle, March 2024,  
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