

# **PSYCHE-GUIDE:A MENTAL HEALTH CHATBOT**

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**DEPARTMENT OF COMPUTER SCIENCE ENGINEERING**

**CERTIFICATE**

*Certified that the project work entitled*

*“Psyche-Guide: a mental health chatbot”*

*is a bonafide work carried out by*

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*in partial fulfilment of the requirements for the award of*

*Bachelor of Engineering Degree in Computer Science Engineering*

*prescribed by Visvesvaraya Technological University, Belagavi*

*during the year 2023-2024.*

*It is certified that all corrections/suggestions indicated for Internal Assessment have been*

*incorporated in the report deposited in the departmental library.*

*The project report has been approved as it satisfies the academic requirements in respect of*

*the project work prescribed for the Bachelor of Engineering Degree.*

\_\_\_\_\_  
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**Signature of the HOD**

**Semester End Viva Voce Examination**

**Name of the Examiners**

**Signature with Date**

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2. \_\_\_\_\_

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## **ABSTRACT**

Using the traditional individual therapy sessions deemed as the gold standard to treatment becomes challenging to implement due to the shortage of mental health workers. The additional challenge is those that require the help will not seek it due to the stigma attached to being diagnosed with mental health disorders which can give them the feeling of being exposed by seeking help from professionals.

There are many young people who experience mental health and well being challenges. A potential negative mental health trigger for some youth is a struggle to cope with stress at school or college, feelings of depression and anxiety and availability of adequate help for these stressors is a major problem. Depression can make people feel helpless and without hope, causing them to reach the unfortunate conclusion that suicide is the only way to end their misery.

Chatbots can provide valuable support to patients in assessing and guiding management of various health problems particularly when human resources are scarce. Chatbots can be affordable and efficient on-demand virtual assistants for mental health conditions, including anxiety and depression.

Mental health Chatbots could benefit in helping patients by providing valuable support and solutions to them, particularly when resources are scarce. These Real-time personal virtual assistance fills in this gap. Their role in mental health care is expected to increase.

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**CHAPTER 1****INTRODUCTION**

Close to a billion people worldwide have experienced a mental illness, ranging from the most common conditions of anxiety and depression to psychotic and personality disorders. Mental illnesses cause a significant degradation of the affected individual's quality of life, as well as his/her contribution to society. Numerous pharmacologic and non-pharmacologic interventions are prescribed for mental illnesses, including surgical, in-patient, out-patient, medication, support groups, counselling, psycho-social, behavioural, and alternative therapies. The type of intervention depends on the category of illness and its severity.

The COVID-19 pandemic has had a huge impact on people's mental health, increasing the rates of depression and anxiety by more than 25% globally in the first year, with people aged 20-24 years being more affected than older people. However, there are still many limitations in traditional face-to-face psychotherapy and mental health services, including expensive treatment, geographical limitations, few experienced therapists, and delayed treatment, and stigma is considered as the most significant barrier to providing mental health services .

Conversational agents (or chatbots) are a recent technological innovation that is available all hours, easily accessed using a smartphone, communicates with any number of individuals, and is not impacted by cognitive biases. Unlike computer-aided tools that require some human expertise, chatbots are online and fully automated, which makes them effective at providing first-level support for mental illnesses.

Psyche Guide, a mental chatbot that can be effective across multiple studies in depression, anxiety, and grief. It can also helped individuals who share their personal experience and convey feelings with the chatbot service.



## LITERATURE SURVEY

This topic discusses the work done by various authors, and researchers in brief around discussion, which is Chatbots. The purpose of this section is to critically summarize the current knowledge in the field of Chatbot

**Table 2.1 Literature Survey of Chatbot on Mental health**

SI NO.	PAPER	AUTHOR	YEAR	SUMMARY
1	Chatbot-Based Assessment of Employees' Mental Health: Design Process and Pilot Implementation.	<b>Ines Hungerbuehler, Kate Daley, Kate Cavanagh, Heloísa Garcia Claro and Michael Kapps.</b>	2021	The aim of this study was to explore if a text-based chatbot is a feasible approach to engage and motivate employees to complete a workplace mental health assessment. This paper describes the design process and results of a pilot implementation.
2	Changes to the Psychiatric Chatbot Landscape: A Systematic Review of Conversational Age in Serious Mental Illness	<b>Aditya Nrusimha Vaidyam, Danny Linggonegoro and John Torous.</b>	2021	This review revealed few but generally positive outcomes regarding conversational agents' diagnostic quality, therapeutic efficacy, and acceptability, which may augment mental health care.
3	An Integrative Survey on Mental Health Conversational Agents to Bridge Computer Science and Medical Perspectives	<b>Young Min Cho, Sunny Rai, Lyle Ungar, João Sedoc, Sharath Chandra Guntuku</b>	2023	Mental health conversational agents (a.k.a. chatbots) are widely studied for their potential to offer accessible support to those experiencing mental health challenges. Previous surveys on the topic primarily consider papers published in either computer science or medicine,

				leading to a divide in understanding and hindering the sharing of beneficial knowledge between both domains.
4	A chatbot for mental health support: exploring the impact of Emohaa on reducing mental distress in China.	<b>Sahand Sabour,, Wen Zhang , Xiyao Xiao, Yuwei Zhang, Yinhe Zheng, Jiaxin Wen, Jialu Zhao,and Minlie Huang</b>	2023	This paper revealed how it could be a valuable tool for reducing users' mental distress, namely depression, negative affect, and insomnia. In addition, we found that there might be a complementary effect on long-term insomnia when implementing the generative dialogue platform for emotional support.
5	To chat or bot to chat: Ethical issues with using chatbots in mental health	<b>Simon Coghlan, Kobi Leins, Susie Sheldrick, Marc Cheong, Piers Gooding, and Simon D'Alfonso</b>	2022	This paper presents a critical review of key ethical issues raised by the emergence of mental health chatbots. Chatbots use varying degrees of artificial intelligence and are increasingly deployed in many different domains including mental health.

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6	Validity of Chatbot Use for Mental Health Assessment: Experimental Study	Anita Schick, Jasper Feine ,Stefan Morana Alexander Maedche and Ulrich Reininghaus	2022	Their findings suggest that chatbots may yield valid results. Furthermore, an understanding of chatbot design trade-offs in terms of potential strengths (ie, increased social presence) and limitations (ie, increased effort) when assessing mental health were established.
7	An Overview of Chatbot-Based Mobile Mental Health Apps: Insights From App Description and User Reviews	<b>M D Romael Haque and Sabirat Rubya</b>	2023	The paper conveyed that although chatbots' personalized, humanlike interactions were positively received by users, improper responses and assumptions about the personalities of users led to a loss of interest. As chatbots are always accessible and convenient, users can become overly attached to them and prefer them over interacting with friends and family.

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8	User Experiences of Social Support From Companion Chatbots in Everyday Contexts: Thematic Analysis	<b>VivianTa, , Caroline Griffith Carolynn Boatfield, Xinyu Wang, Maria Civitello, Haley Bader, Esther DeCero and Alexia Loggarakis</b>	2020	The research suggests that artificial agents may be a promising source of social support for humans. However, the bulk of this research has been conducted in the context of social support interventions that specifically address stressful situations or health improvements.
9	Chatbots to Support Mental Wellbeing of People Living in Rural Areas: Can User Groups Contribute to Co-design?	<b>R. B. Bond,Edel Ennis andC. Potts</b>	2021	The aim of this study was to establish if user groups can design content for a chatbot to support the mental wellbeing of individuals in rural areas.
10	A Mental Health and Well-Being Chatbot: User Event Log Analysis	<b>Frederick Booth, Courtney Potts, ☒ Raymond Bond, Maurice Mulvenna, MPhil,, Catrine Kostenius, Indika Dhanapala, Alex Vakaloudis, Brian Cahill, Lauri Kuosmanen and Edel Ennis</b>	2023	Conversational user interfaces, or chatbots, are becoming more popular in the realm of digital health and well-being. While many studies focus on measuring the cause or effect of a digital intervention on people's health and well-being (outcomes), there is a need to understand how users really engage and use a digital intervention in the real world.

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11	Chatbots and Conversational Agents in Mental Health: A Literature Review	<b>Sergazy Narynov; Zhandos Zhumanov; Aidana Gumar; Mariyam Khassanova; Batyr khan Omarov</b>	2021	In this study, we looked at chatbots, conversational agents, technologies for creating conversational agents, perspectives, and ethical issues in this direction. Also examples of therapy that are used by psychologists, psychotherapists, and the prospects of using them in a chatbot are explored in this review.
12	Empathy bot: conversational service for psychiatric counseling with chat assistant	<b>KJ Oh, DK Lee, BS Ko, J Hyeon, HJ Choi</b>	2020	This paper proposes an intelligent assistant for psychiatric counseling that understands dialogues using high-level features of natural language understanding, and multi-modal emotion recognition. A response generation model using machine learning provides suitable responses for clinical psychiatric counseling.

## **CHAPTER 3**

### **OBJECTIVE**

The Primary objective is to build a fully functional mental health support chatbot and

- Actively listen to the user and provide emotional support
- Symptom Assessment and Guidance
- Continuous Learning and Improvement
- Deliver Psychoeducation and Information

We would be doing this by

1. Data Collection
2. Data Pre-processing
3. Develop a model
4. Implement the model
5. Test the model
6. . Deploy the mode

## **CHAPTER 4**

### **PROBLEM STATEMENT**

There are many young people who experience mental health and well being challenges. A potential negative mental health trigger for some youth is a struggle to cope with stress at school or college, feelings of depression and anxiety and availability of adequate help for these stressors is a major problem. Depression can make people feel helpless and without hope, causing them to reach the unfortunate conclusion that suicide is the only way to end their misery.

Moreover, there are many limitations in traditional face-to-face psychotherapy and mental health services, including expensive treatment, geographical limitations, few experienced therapists, and delayed treatment, and stigma is considered as the most significant barrier to providing mental health services .

## **SYSTEM REQUIREMENT AND SPECIFICATION**

### **SOFTWARE REQUIREMENTS:**

- PYTORCH
- PYTHON
- SKLEARN
- VS CODE STUDIO

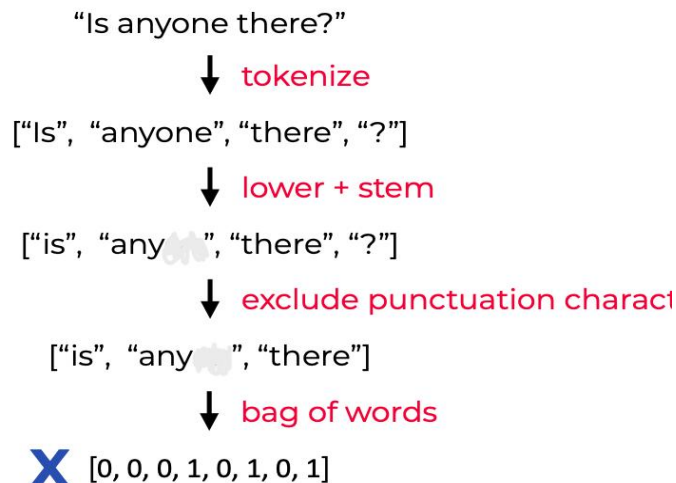
### **HARDWARE REQUIREMENTS:**

- PROCESSOR: INTEL(R) PENTIUM(R) OR ABOVE
- CPU HARD DISK: 500GB HDD
- RAM: 4GB RAM
- GPU: 8 GB OR ABOVE



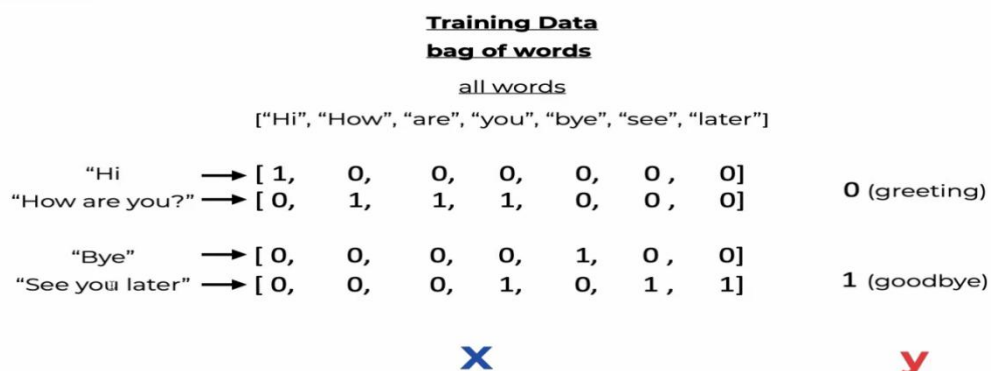
## IMPLEMENTATION

For Preprocessing we used the NLTK module. NLTK (Natural Language Toolkit) is a leading platform for building Python programs to work with human language data. It provides a lot of helpful methods that we can use:- the Tokenizer, Stemming & Bag of words. The Tokenizer will tokenize the text, and create a list of words.

**Our NLP Preprocessing Pipeline****Fig 6.1 NLP Preprocessing Pipeline**

Stemming is the process of finding the base word. Let's take an example, the base word for words runnable, running is run. This is very important because in bag of word model the words appeared more frequently are used as the features for the classifier, therefore we have to remove such variations of the same word.

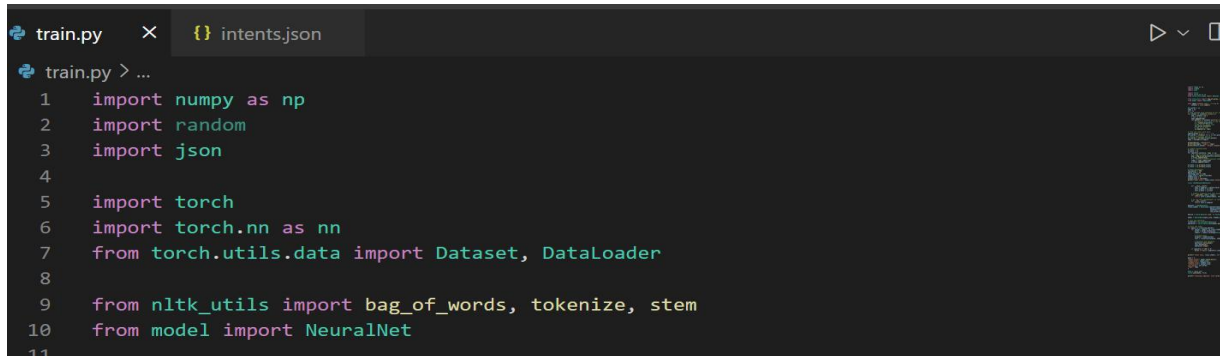
The bag-of-words is a representation that turns arbitrary text into fixed-length vectors by counting how many times each word appears

**Fig 6.2 Bag of Words**

## PSYCHE-GUIDE:A MENTAL HEALTH CHATBOT

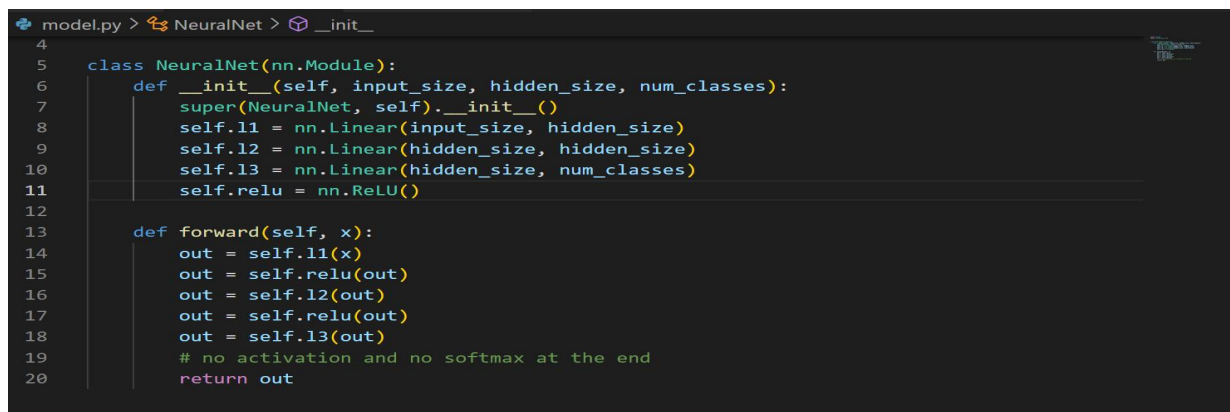
The implementation is straightforward with a Feed Forward Neural network with 2 hidden layers

- bag of word as input
- number of patterns as input size
- number of classes as output size



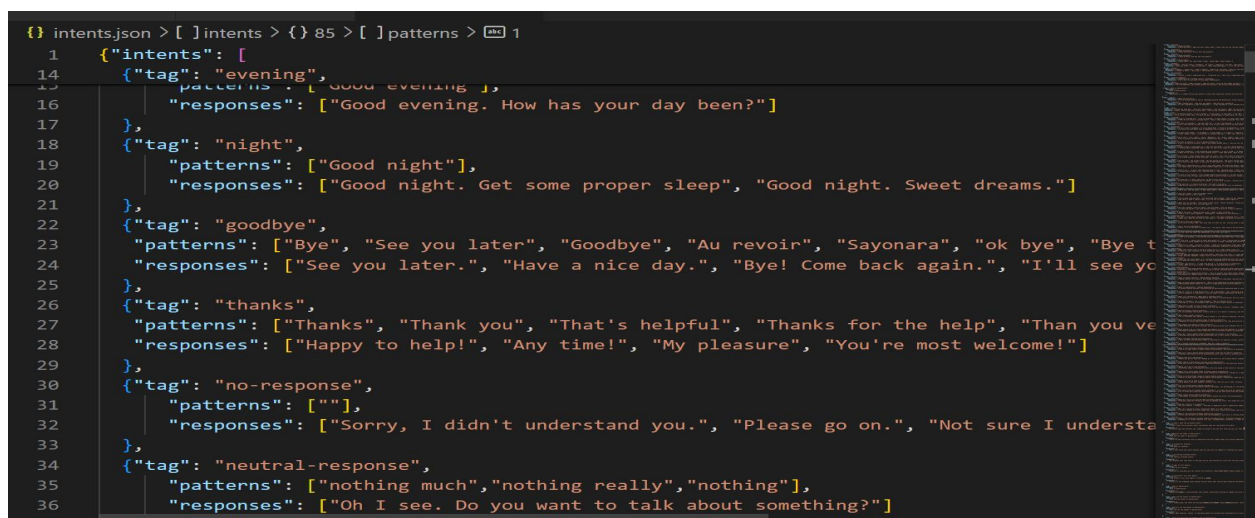
```
train.py > ...
1 import numpy as np
2 import random
3 import json
4
5 import torch
6 import torch.nn as nn
7 from torch.utils.data import Dataset, DataLoader
8
9 from nltk_utils import bag_of_words, tokenize, stem
10 from model import NeuralNet
11
```

Fig 6.3 Importing libraries



```
model.py > NeuralNet > __init__
4
5 class NeuralNet(nn.Module):
6     def __init__(self, input_size, hidden_size, num_classes):
7         super(NeuralNet, self).__init__()
8         self.l1 = nn.Linear(input_size, hidden_size)
9         self.l2 = nn.Linear(hidden_size, hidden_size)
10        self.l3 = nn.Linear(hidden_size, num_classes)
11        self.relu = nn.ReLU()
12
13    def forward(self, x):
14        out = self.l1(x)
15        out = self.relu(out)
16        out = self.l2(out)
17        out = self.relu(out)
18        out = self.l3(out)
19        # no activation and no softmax at the end
20        return out
```

Fig 6.4 Feed Forward Neural Network



```
{ } intents.json > [ ] intents > { } 85 > [ ] patterns > [ ] 1
1 {"intents": [
14   {"tag": "evening", "patterns": ["good evening"],
15     "responses": ["Good evening. How has your day been?"]}
16 },
17   {"tag": "night",
18     "patterns": ["Good night"],
19     "responses": ["Good night. Get some proper sleep", "Good night. Sweet dreams."]}
20 },
21   {"tag": "goodbye",
22     "patterns": ["Bye", "See you later", "Goodbye", "Au revoir", "Sayonara", "ok bye", "Bye t
23     "responses": ["See you later.", "Have a nice day.", "Bye! Come back again.", "I'll see yo
24   ],
25   {"tag": "thanks",
26     "patterns": ["Thanks", "Thank you", "That's helpful", "Thanks for the help", "Than you ve
27     "responses": ["Happy to help!", "Any time!", "My pleasure", "You're most welcome!"]}
28   ],
29   {"tag": "no-response",
30     "patterns": [""],
31     "responses": ["Sorry, I didn't understand you.", "Please go on.", "Not sure I understa
32   ],
33   {"tag": "neutral-response",
34     "patterns": ["nothing much", "nothing really", "nothing"],
35     "responses": ["Oh I see. Do you want to talk about something?"]}
36   ]
37 }
```

Fig 6.5 Intents.json file with tags, patterns and responses

```

train.py > ...
42 # create training data
43 X_train = []
44 y_train = []
45 for (pattern_sentence, tag) in xy:
46     # X: bag of words for each pattern_sentence
47     bag = bag_of_words(pattern_sentence, all_words)
48     X_train.append(bag)
49     # y: PyTorch CrossEntropyLoss needs only class labels
50     label = tags.index(tag)
51     y_train.append(label)
52
53 X_train = np.array(X_train)
54 y_train = np.array(y_train)
55
56 # Hyper-parameters
57 num_epochs = 500
58 batch_size = 54
59 learning_rate = 0.001
60 input_size = len(X_train[0])
61 hidden_size = 8
62 output_size = len(tags)
63 print("input size:", input_size, "output size:", output_size)
64
65 class ChatDataset(Dataset):

```

Fig 6.6 Creating Training data

```

train.py > ...
89
90 # Loss and optimizer
91 criterion = nn.CrossEntropyLoss()
92 optimizer = torch.optim.Adam(model.parameters(), lr=learning_rate)
93
94 # Train the model
95 for epoch in range(num_epochs):
96     for (words, labels) in train_loader:
97         words = words.to(device)
98         labels = labels.to(dtype=torch.long).to(device)
99
100         # Forward pass
101         outputs = model(words)
102         loss = criterion(outputs, labels)
103
104         # Backward and optimize
105         optimizer.zero_grad()
106         loss.backward()
107         optimizer.step()
108
109     if (epoch+1) % 100 == 0:
110         print (f'Epoch [{epoch+1}/{num_epochs}], Loss: {loss.item():.4f}')
111
112

```

Fig 6.7 Training The Model

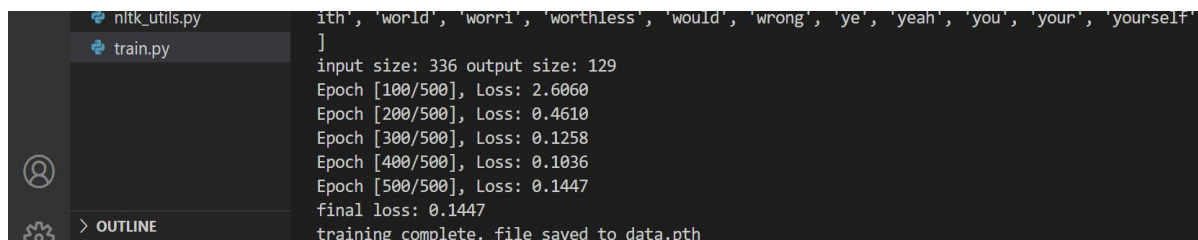
**Cross Entropy Loss:**

$$L(\Theta) = \begin{cases} -\log(\hat{y}) & \text{if } y = 1 \\ -\log(1 - \hat{y}) & \text{if } y = 0 \end{cases}$$

Fig 6.8 Cross Entropy Loss

Cross Entropy Loss: The loss function of a neural network is used to determine if an adjustment needs to be made in the learning process.

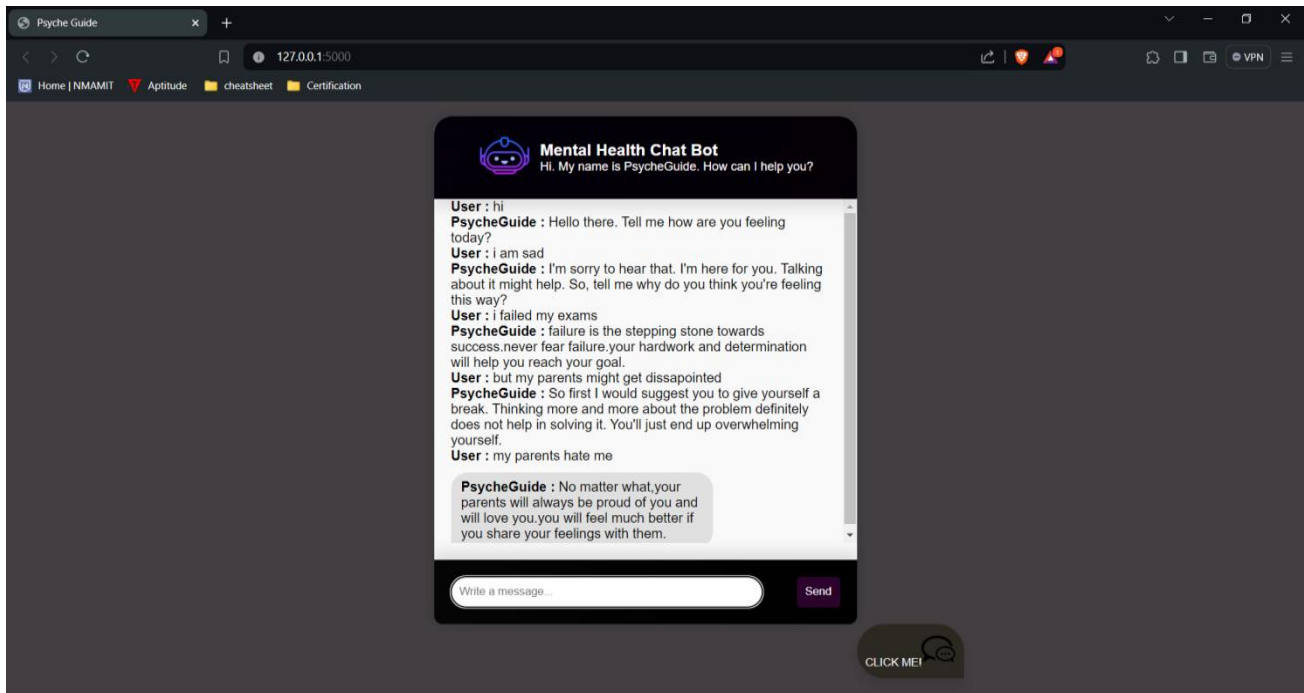
Neurons in the output layer are equal to the number of classes. Showing the differences between predicted and actual probability distributions. Above is the cross-entropy loss for binary classification.



```
ith', 'world', 'worri', 'worthless', 'would', 'wrong', 'ye', 'yeah', 'you', 'your', 'yourself']  
input size: 336 output size: 129  
Epoch [100/500], Loss: 2.6060  
Epoch [200/500], Loss: 0.4610  
Epoch [300/500], Loss: 0.1258  
Epoch [400/500], Loss: 0.1036  
Epoch [500/500], Loss: 0.1447  
final loss: 0.1447  
training complete. file saved to data.pth
```

**Fig 6.9 Calculating Cross Entropy Loss**

Cross-entropy loss is used when adjusting model weights during training. A loss function measures how far the model deviates from the correct prediction. Loss functions provide more than just a static illustration of how well your model functions; they also serve as the basis for how accurately your algorithms match the data. Most machine learning algorithms employ a loss function during the optimization phase, which involves choosing data's optimal parameters. The aim is to minimize the loss—the smaller the loss, the better the model.

**Fig 7.1 User Interface**

We have applied Feed Forward Neural Network Model and used HTML and CSS for front end to Create a Fully Functioning Chatbot that users can interact for our project. In the User Interface, The User can type their feelings and describe the emotion and can also release their frustration which will reduce their mental stress. The user can treat Psyche-Guide as a virtual friend and help them from any anxiety or grief.

## **CHAPTER 8**

### **CONCLUSION**

With the help of Psyche-Guide the user can release their bottled up feelings which can result in better mental health state for students and individuals.

it has great potential to offer social and psychological support in situations where real-world human interaction, such as connecting to friends or family members or seeking professional support, is not preferred or possible.

Further evidence is required to confirm the long-term effectiveness via trails replicated with a longer dose, as well as exploration of its greater efficacy in comparison with other active controls.

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- 9) **Young Min Cho, Sunny Rai, Lyle Ungar, João Sedoc, Sharath Chandra Guntuku (2021)** "Changes to the Psychiatric Chatbot Landscape: A Systematic Review of Conversational Age in Serious Mental Illness"
- 10) **Sahand Sabour,, Wen Zhang , Xiyao Xiao, Yuwei Zhang, Yinhe Zheng, Jiaxin Wen, Jialu Zhao,and Minlie Huang (2023)** "A chatbot for mental health support: exploring the impact of Emohaa on reducing mental distress in China. "
- 11) **Simon Coghlan, Kobi Leins, Susie Sheldrick, Marc Cheong, Piers Gooding, and Simon D'Alfonso (2022)** "To chat or bot to chat: Ethical issues with using chatbots in mental health "