ARTIFICIAL INTELLIGENCE CHAT BOT

Submitted in partial fulfillment of the requirements

of the degree of

Bachelor of Engineering

in

Electronics and Telecommunication

by

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CERTIFICATE

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This is to certify that the project entitled **Artificial Intelligence Chat Bot** is a bonafied work of **Kaskar Shifa(15ET01), Khan Nabila(15ET02), Shaikh Lubna(15ET08), Ubare Khadija(15ET11)** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of Bachelor of Engineering in Department of Electronics and Telecommunication Engineering.

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Supervisor Examiner

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Head of Department Director

Project Report Approval for Bachelor of Engineering

This project entitled **"Artificial Intelligence Chat Bot"** by **Kaskar Shifa, Khan Nabila, Shaikh Lubna, Ubare Khadija** is approved for the degree of **Bachelor of Engineering in Electronics and Telecommunication**.

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Examiner

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I declare that this written submission represents my ideas in my own words and where others ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Abstract

This report presents the design and development of a chatbot based on artificial intelligence. The output of our project will be a chatbot which will be deployed to the college website. This will be more convenient to the users to get their query resolved without having to travel to the college or waiting in queues which will save their time and money. The query can be answered at any time in the day or night without having to keep in mind the college working hours.

Keywords: Chatbot, Pattern Matching, Human Computer Interaction (HCI), Artificial Intelligence, Machine Learning, tensorflow, python, Chatterbot

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Chapter 1

Introduction

1.1 What Are Chat Bots?

A chatbot is a program that communicates with you. It is a layer on top of, or a gateway to, a service. Sometimes it is powered by machine learning (the chatbot gets smarter the more you interact with it). Or, more commonly, it is driven using intelligent rules (i.e. if the person says this, respond with that). The services a chatbot can deliver are diverse. Important life-saving health messages, to check the weather forecast or to purchase a new pair of shoes, and anything else in between.

The term chatbot is synonymous with text conversation but is growing quickly through voice communication Alexa, what time is it? The chatbot can talk to you through different channels; such as Facebook Messenger, Siri, WeChat, Telegram, SMS, Slack, Skype and many others.

Aside from buying shoes, here are a few more examples of companies using chatbots:

- Uber to book a taxi
- KLM to deliver right information
- Pizza Hut to help you order a pizza
- CNN to keep you up-to-date with news content
- Tech Crunch to keep you up-to-date with techie content
- Sephora to provide beauty tips and a shopping experience
- Bank of America to connect customers and their nuance

1.2 History

It would not be fair to talk about the history of chatbots without mentioning Alan Turing and Joseph Weizenbaum. These men imagined computers talking like humans and, in 1950, had the foresight to develop a test to see if a person could distinguish human from machine: The Turing Test.

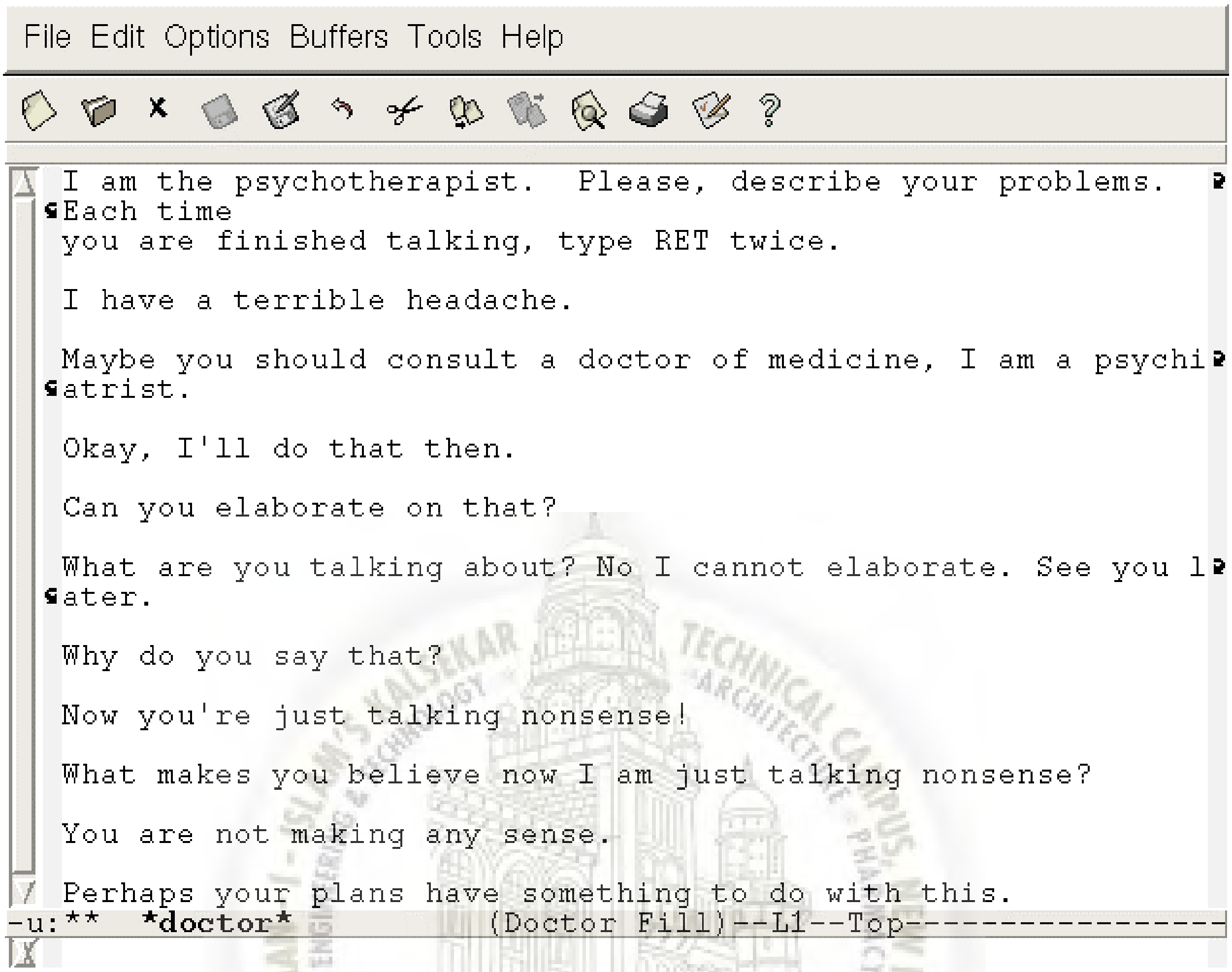
In 1966 a computer program called ELIZA was invented by Weizenbaum. It imitated the language of a psychotherapist from only 200 lines of code.

The rest move away from text chatbots occurred in 1988 when Rollo Carpenter started the Jabber wacky project a voice operated entertainment AI chatbot. In the year 2000, Robert Hoffer from Active Buddy Inc. co-created the Smarter Child chatbot that used AOL Instant Messenger and MSN Messenger to build a relationship with over 30 million users. The chatbot provided access to news, weather, movie times and acted as a personal assistant using natural language comprehension.

Microsoft Research has spent decades working on Natural Language Processing (NLP) to develop their Xiao Ice chatbot. With millions of followers in China, the chatbot can discern topic, sentiment and more through back and forth conversation with its users. Recent developments in technology have given chatbots more power in interpreting natural language and machine learning, to both understand better, and learn over time.

Huge companies like Facebook, Apple, Google and Microsoft are contributing significant resources to deliver interactions between consumers and machines with commercially-viable business models.

Facebook Messenger chatbots have become quite popular since the 2016 F8 conference. The chatbots offer a wide range of services from owner delivery to weather information. With over 11,000 bots since F8, there’s a chatbot for almost every preference. If you haven’t interacted with a Messenger bot yet, you are missing something! Some of the most popular bots on Facebook Messenger include: 1800-Flowers, Wallstreet Journal, Health Tap and KLM.



```
I am the psychotherapist.  Please, describe your problems.
Each time
you are finished talking, type RET twice.

I have a terrible headache.

Maybe you should consult a doctor of medicine, I am a psychi
atrist.

Okay, I'll do that then.

Can you elaborate on that?

What are you talking about? No I cannot elaborate. See you l
ater.

Why do you say that?

Now you're just talking nonsense!

What makes you believe now I am just talking nonsense?

You are not making any sense.

Perhaps your plans have something to do with this.
-u:**  *doctor*        (Doctor Fill)--L1--Top----------------
```

Figure 1.1: First Bots

Kik, an instant messenger application for mobile devices from Canadian company Kik Interactive, launched a bot store in 2016. With 70percent of its 275 million users based in North America, aged between 13 and 24, Kik is strategically placed to reach out to the demographic most targeted by brands. It has been allowing brands to use bots as early as 2014. Now it allows developers to create their own bots. Sephora and HM are among the popular brands with chatbots on Kik.

Slack, the most popular work chat app, owes much of its success to bots. Chatbots on Slack have an identity of their own! Slack bots are here to increase your efficiency by helping you schedule meetings, organize documents, pay accolades to team mates for good work or just slack off and play poker to de-stress! There’s even a Slack bot that lets you order ice creams! Haven’t tried Slack yet? What you’re waiting for? DiggBot, Poncho the Weather cat and Hipmunk are some of the bots that you should give a try.

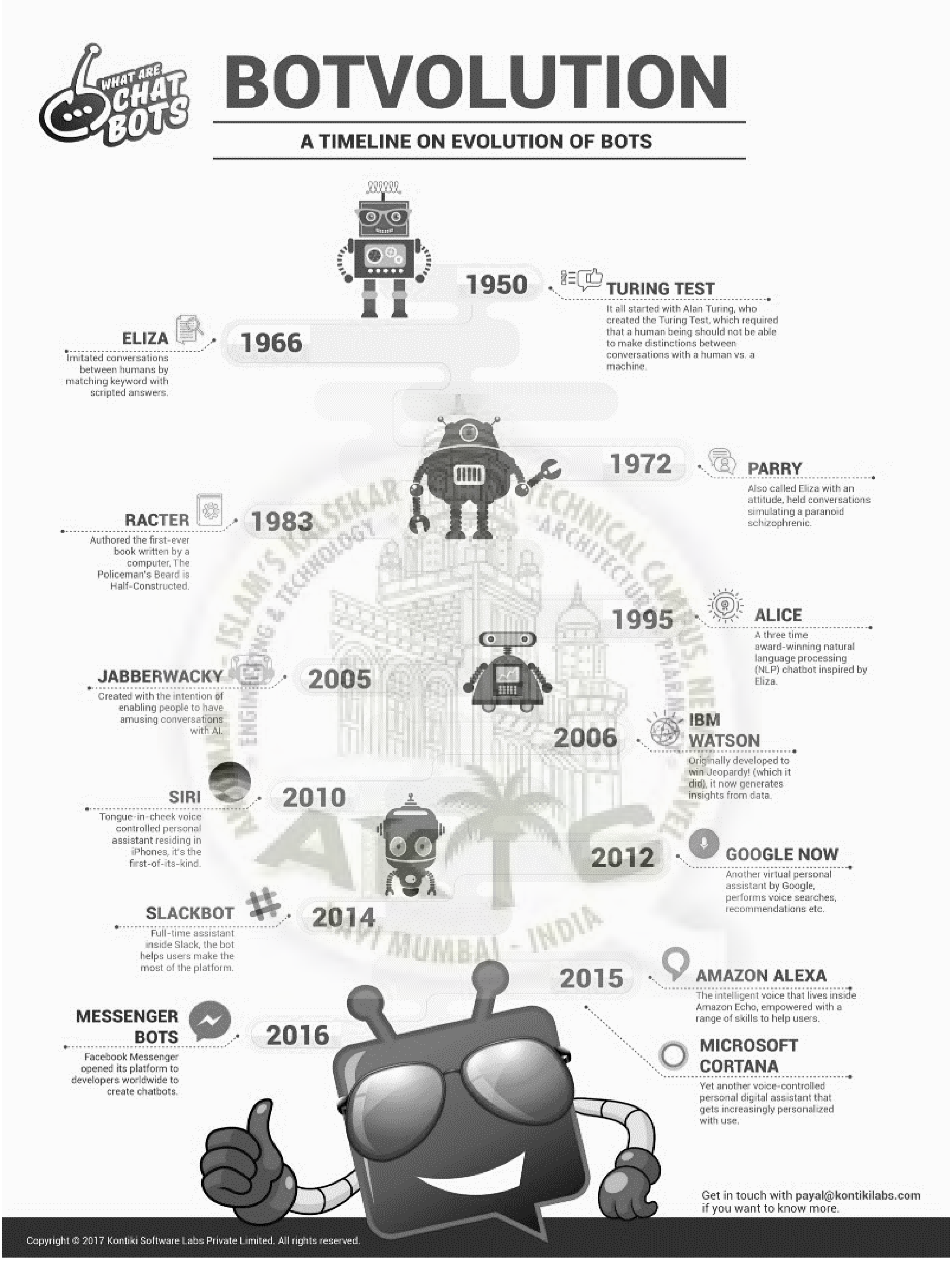
Telegram, a messaging app from Russia, with over 100 million users has had a bot store and bot platform since June 2015. With thousands of bots, including those for news alerts, football scores, weather reports and even poll updates, Telegram has its bot act ne-tuned! What's more, bots on this platform have a better UI, making the experience a tad bit better than on most other platforms. Some of the popular bots on Telegram are Wall Street Journal, GitHub, and Weatherman.

Twitter bots have been around for some time and while most are automated to follow accounts, and post automated tweets, there are others that curate information and share it, act like virtual assistants, give you the latest cab fares and more. In fact, you will and bots that do nearly everything that you could think of, like The Nice Bot that combated cyber-bullying by posting nice tweets every 30 seconds.

WeChat, a text and voice messaging service developed in China with 700 million active users (of which more than 70 million are outside China) has had chatbots on its platform much before the current hype started. Referred to as public accounts, the bots are being used to do everything from shopping for clothes to booking doctors' appointments! In the world of chatbots, you don't get a bot, you start chatting with one!

Most platforms now have a bot store, where you can browse and start conversations. Facebook doesn't have a bot store yet, so it is difficult to and a bot on the desktop. However, if you are on the mobile app, you can search for existing bots like 1800-Flowers that will show up as Bots and Business.

Finding a bot on Kik is easier visit your main chat list, search for people and select Bot Shop. It will redirect you to their bot store.



BOTVOLUTION

A TIMELINE ON EVOLUTION OF BOTS

1950 TURING TEST
It all started with Alan Turing, who created the Turing Test, which required that a human being should not be able to make distinctions between conversations with a human vs. a machine.

1966 ELIZA
Imitated conversations between humans by matching keyword with scripted answers.

1972 PARRY
Also called Eliza with an attitude, held conversations simulating a paranoid schizophrenic.

1983 RACTER
Authored the first-ever book written by a computer, The Policeman's Beard is Half-Constructed.

1995 ALICE
A three time award-winning natural language processing (NLP) chatbot inspired by Eliza.

2005 JABBERWACKY
Created with the intention of enabling people to have amusing conversations with AI.

2006 IBM WATSON
Originally developed to win Jeopardy! (which it did), it now generates insights from data.

2010 SIRI
Tongue-in-cheek voice controlled personal assistant residing in iPhones, it's the first-of-its-kind.

2012 GOOGLE NOW
Another virtual personal assistant by Google, performs voice searches, recommendations etc.

2014 SLACKBOT
Full-time assistant inside Slack, the bot helps users make the most of the platform.

2015 AMAZON ALEXA
The intelligent voice that lives inside Amazon Echo, empowered with a range of skills to help users.

MICROSOFT CORTANA
Yet another voice-controlled personal digital assistant that gets increasingly personalized with use.

2016 MESSENGER BOTS
Facebook Messenger opened its platform to developers worldwide to create chatbots.

Get in touch with payal@kontikilabs.com if you want to know more.

Figure 1.2: Bot Revolution

Chapter 2

Literature Review

2.1 Bhavika R. Ranoliya, Nidhi Raghuwanshi, and Sanjay Singh "Chatbot for University Related FAQs" 2017 International Conference on Advances in Computing, Communications and Informatics (ICACCI), Udupi, 2017, pp. 1525-1530.

• This paper addresses the Chat Bots. Chatbots are programs that mimic human conversation using Artificial Intelligence (AI). It is designed to be the ultimate virtual assistant, entertainment purpose, helping one to complete tasks ranging from answering questions, getting driving directions, turning up the thermostat in smart home, to playing one's favorite tunes etc. Chatbot has become more popular in business groups right now as they can reduce customer service cost and handles multiple users at a time. But yet to accomplish many tasks there is need to make chatbots as efficient as possible.

2.2 Amey Tiwari, Rahul Talekar, Prof. S.M. Patil "College Information Chat Bot System", International Journal of Engineering Research and General Science Volume 5, Issue 2, March-April, 2017.

• User interfaces for software applications can come in a variety of formats, ranging from command-line, graphical, web application, and even voice. While the most popular user interfaces include graphical and web-based applications, occasionally the need arises for an alternative interface. Whether due to multi-threaded complexity, concurrent connectivity, or details surrounding execution of the service, a chat bot-based interface may suit the need.

Chat bots typically provide a text-based user interface, allowing the user to type commands and receive text as well as text to speech response. Chat bots are usually a stateful services, remembering previous commands (and perhaps even conversation) in order to provide functionality. When chat bot technology is integrated with popular web services it can be utilized securely by an even larger audience.

2.3 Pratik Salve, Vishruta Patil, Vyankatesh Gaikwad, Prof. Girish Wadhwa "College Enquiry Chat Bot", International Journal on Recent and Innovation Trends in Computing and Communication Volume: 5 Issue: 3 pg. 463 – 466

• Chat bots typically provide a text-based user interface, allowing the user to type commands and receive text as well as text to speech response. Chat bots are usually stateful services, remembering previous commands in order to provide functionality. When chat bot technology is integrated with popular web services it can be utilized securely by an even larger audience. The college enquiry chat bot will be built using artificial algorithms that analyzes users queries and understand users' message. This System will be a web application which provides answer to the query of the student very effectively. Students just have to put their query to the bot which is used for chatting. The system will use the artificial intelligence algorithms to give appropriate answers to the user. If the answer is found invalid, then some system to declare the answer as invalid can be incorporated.

These invalid answers can be deleted or modified by the admin of the system. The student will not have to go to the college for enquiring something. Student can use the chat bot to get the answers to their queries. Students can use this web-based system for making enquiries at any point of time. This system may help students to stay updated with the college activities.

Chapter 3

Problem Statement

3.1 Problem Statement

Standing in queues and travelling a distance can be very hectic for getting small queries answered regarding academics and admissions. As everything is online these days, there can be a facility made available online for this purpose too. But unfortunately, there is no such facility available for our college.

3.2 Proposed Solution

The output of our project will be a chatbot which will be deployed to the college website. This will be more convenient to the users to get their query resolved without having to travel to the college or waiting in queues which will save their time and money. The query can be answered at any time in the day or night without having to keep in mind the college working hours.

Chapter 4

Theoretical Details

4.1 Artificial Intelligence

Artificial intelligence (AI), sometimes called machine intelligence, is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans and other animals. In computer science AI research is defined as the study of “intelligent agents”: any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals. Colloquially, the term “artificial intelligence” is applied when a machine mimics “cognitive” functions that humans associate with other human minds, such as “learning” and “problem solving”.

The scope of AI is disputed: as machines become increasingly capable, tasks considered as requiring “intelligence” are often removed from the definition, a phenomenon known as the AI effect, leading to the quip, “AI is whatever hasn’t been done yet.” For instance, optical character recognition is frequently excluded from “artificial intelligence”, having become a routine technology. Modern machine capabilities generally classified as AI include successfully understanding human speech, competing at the highest level in strategic game systems (such as chess and Go), autonomously operating cars, and intelligent routing in content delivery networks and military simulations.

Artificial intelligence was founded as an academic discipline in 1956, and in the years since has experienced several waves of optimism, followed by disappointment and the loss of funding (known as an “AI winter”), followed by new approaches, success and renewed funding. For most of its history, AI research has been divided into subfields that often fail to communicate with each other. These sub-fields are based on technical considerations, such as particular goals (e.g. “robotics” or “machine learning”), the use of particular tools (“logic” or artificial neural networks), or deep philosophical differences. Subfields have also been based on social factors (particular institutions or the work of particular researchers).

The traditional problems (or goals) of AI research include reasoning, knowledge representation, planning, learning, natural language processing, perception and the ability to move and manipulate objects. General intelligence is among the field’s long-term goals. Approaches include statistical methods, computational intelligence, and traditional symbolic AI. Many tools are used in AI, including versions of search and mathematical optimization, artificial neural networks, and methods based on statistics, probability and economics. The AI field draws upon computer science, information engineering, mathematics, psychology, linguistics, philosophy, and many others.

The field was founded on the claim that “human intelligence” can be so precisely described that a machine can be made to simulate it”. This raises philosophical arguments about the nature of the mind and the ethics of creating artificial beings endowed with human-like intelligence which are issues that have been explored by myth, fiction and philosophy since antiquity. Some people also consider AI to be a danger to humanity if it progresses unabated. Others believe that AI, unlike previous technological revolutions, will create a risk of mass unemployment.

In the twenty-first century, AI techniques have experienced a resurgence following concurrent advances in computer power, large amounts of data, and theoretical understanding; and AI techniques have become an essential part of the technology industry, helping to solve many challenging problems in computer science, software engineering and operations research.

4.2 History of AI

Thought-capable artificial beings appeared as storytelling devices in antiquity, and have been common in fiction, as in Mary Shelley’s Frankenstein or Karel ˇCapek’s R.U.R. (Rossum’s Universal Robots). These characters and their fates raised many of the same issues now discussed in the ethics of artificial intelligence.

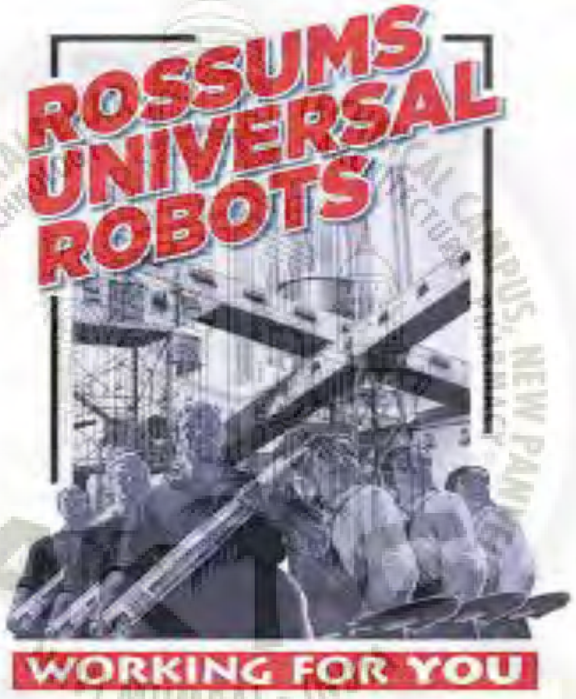


Figure 4.1: R.U.R. Cover page, where AI were first mentioned in History in Sci-Fi Genre

The study of mechanical or “formal” reasoning began with philosophers and mathematicians in antiquity. The study of mathematical logic led directly to Alan Turing’s theory of computation, which suggested that a machine, by shuffling symbols as simple as “0” and “1”, could simulate any conceivable act of mathematical deduction. This insight, that digital computers can simulate any process of formal reasoning, is known as the Church–Turing thesis. Along with concurrent discoveries in neurobiology, information theory and cybernetics, this led researchers to consider the possibility of building an electronic brain. Turing proposed that if a human could not distinguish between responses from a machine and a human, the machine could be considered “intelligent”. The first work that is now generally recognized as AI was McCullouch and Pitts’ 1943 formal design for Turing-complete “artificial neurons”.

The field of AI research was born at a workshop at Dartmouth College in 1956.Attendees Allen Newell (CMU), Herbert Simon (CMU), John McCarthy (MIT), Marvin Minsky (MIT) and Arthur Samuel (IBM) became the founders and leaders of AI research. They and their students produced programs that the press described as “astonishing”: computers were learning checkers strategies (c. 1954) (and by 1959 were reportedly playing better than the average human), solving word problems in algebra, proving logical theorems (Logic Theorist, first run c. 1956) and speaking English. By the middle of the 1960s, research in the U.S. was heavily funded by the Department of Defense and laboratories had been established around the world. AI’s founders were optimistic about the future: Herbert Simon predicted, “machines will be capable, within twenty years, of doing any work a man can do”. Marvin Minsky agreed, writing, “within a generation ... the problem of creating ’artificial intelligence’ will substantially be solved”.

They failed to recognize the difficulty of some of the remaining tasks. Progress slowed and in 1974, in response to the criticism of Sir James Lighthill and ongoing pressure from the US Congress to fund more productive projects, both the U.S. and British governments cut off exploratory research in AI. The next few years would later be called an “AI winter” a period when obtaining funding for AI projects was difficult.

In the early 1980s, AI research was revived by the commercial success of expert systems, a form of AI program that simulated the knowledge and analytical skills of human experts. By 1985, the market for AI had reached over a billion dollars. At the same time, Japan's fifth generation computer project inspired the U.S and British governments to restore funding for academic research. However, beginning with the collapse of the Lisp Machine market in 1987, AI once again fell into disrepute, and a second, longer-lasting hiatus began.

In the late 1990s and early 21st century, AI began to be used for logistics, data mining, medical diagnosis and other areas. The success was due to increasing computational power (see Moore's law), greater emphasis on solving specific problems, new ties between AI and other fields (such as statistics, economics and mathematics), and a commitment by researchers to mathematical methods and scientific standards. Deep Blue became the first computer chess-playing system to beat a reigning world chess champion, Garry Kasparov on 11 May 1997.

In 2011, a Jeopardy! quiz show exhibition match, IBM's question answering system, Watson, defeated the two greatest Jeopardy! champions, Brad Rutter and Ken Jennings, by a significant margin. Faster computers, algorithmic improvements, and access to large amounts of data enabled advances in machine learning and perception; data-hungry deep learning methods started to dominate accuracy benchmarks around 2012. The Kinect, which provides a 3D body–motion interface for the Xbox 360 and the Xbox One use algorithms that emerged from lengthy AI research as do intelligent personal assistants in smartphones. In March 2016, AlphaGo won 4 out of 5 games of Go in a match with Go champion Lee Sedol, becoming the first computer Go-playing system to beat a professional Go player without handicaps. In the 2017 Future of Go Summit, AlphaGo won a three-game match with Ke Jie, who at the time continuously held the world No. 1

ranking for two years. This marked the completion of a significant milestone in the development of Artificial Intelligence as Go is an extremely complex game, more so than Chess.

According to Bloomberg's Jack Clark, 2015 was a landmark year for artificial intelligence, with the number of software projects that use AI within Google increased from a "sporadic usage" in 2012 to more than 2,700 projects. Clark also presents factual data indicating that error rates in image processing tasks have fallen significantly since 2011. He attributes this to an increase in affordable neural networks, due to a rise in cloud computing infrastructure and to an increase in research tools and datasets. Other cited examples include Microsoft's development of a Skype system that can automatically translate from one language to another and Facebook's system that can describe images to blind people. In a 2017 survey, one in five companies reported they had "incorporated AI in some offerings or processes".

According to an article by The Economist, America and China are the superpowers in terms of Artificial Intelligence (AI). Over the time America and China has collected and attracted the core information that contributed to development of Artificial Intelligence ranging from facial recognition to driver-less cars. Based on an estimate presented on The Economist Article, China is expected to hold about 30% of world's data and America is likely to hold the same as well.

4.3 Artificial neural networks

Neural networks, or neural nets, were inspired by the architecture of neurons in the human brain. A simple “neuron” N accepts input from multiple other neurons, each of which, when activated (or “fired”), cast a weighted “vote” for or against whether neuron N should itself activate. Learning requires an algorithm to adjust these weights based on the training data; one simple algorithm (dubbed “fire together, wire together”) is to increase the weight between two connected neurons when the activation of one trigger the successful activation of another. The net forms “concepts” that are distributed among a subnetwork of shared neurons that tend to fire together; a concept meaning “leg” might be coupled with a subnetwork meaning “foot” that includes the sound for “foot”.

Neurons have a continuous spectrum of activation; in addition, neurons can process inputs in a nonlinear way rather than weighing straightforward votes. Modern neural nets can learn both continuous functions and, surprisingly, digital logical operations. Neural networks’ early successes included predicting the stock market and (in 1995) a mostly self-driving car. In the 2010s, advances in neural networks using deep learning thrust AI into widespread public consciousness and contributed to an enormous upshift in corporate AI spending; for example, AI-related MA in 2017 was over 25 times as large as in 2015.

The study of non-learning artificial neural networks began in the decade before the field of AI research was founded, in the work of Walter Pitts and Warren McCullouch. Frank Rosenblatt invented the perceptron, a learning network with a single layer, similar to the old concept of linear regression. Early pioneers also include Alexey Grigorevich Ivakhnenko, Teuvo Kohonen, Stephen Grossberg, Kunihiko Fukushima, Christoph von der Malsburg, David Willshaw, Shun Ichi Amari, Bernard Widrow, John Hopfield, Eduardo R. Caianiello, and others.

The main categories of networks are acyclic or feedforward neural networks (where the signal passes in only one direction) and recurrent neural networks (which allow feedback and short-term memories of previous input events). Among the most popular feedforward networks are perceptron's, multi-layer perceptron's and radial basis networks. Neural networks can be applied to the problem of intelligent control (for robotics) or learning, using such techniques as Hebbian learning ("fire together, wire together"), GMDH or competitive learning.

Today, neural networks are often trained by the backpropagation algorithm, which had been around since 1970 as the reverse mode of automatic differentiation published by Seppo Lin-nainmaa, and was introduced to neural networks by Paul Werbos.

Hierarchical temporal memory is an approach that models some of the structural and algorithmic properties of the neocortex.

In short, most neural networks use some form of gradient descent on a hand-created neural topology. However, some research groups, such as Uber, argue that simple neuro evolution to mutate new neural network topologies and weights may be competitive with sophisticated gradient descent approaches. One advantage of neuro evolution is that it may be less prone to get caught in "dead ends".

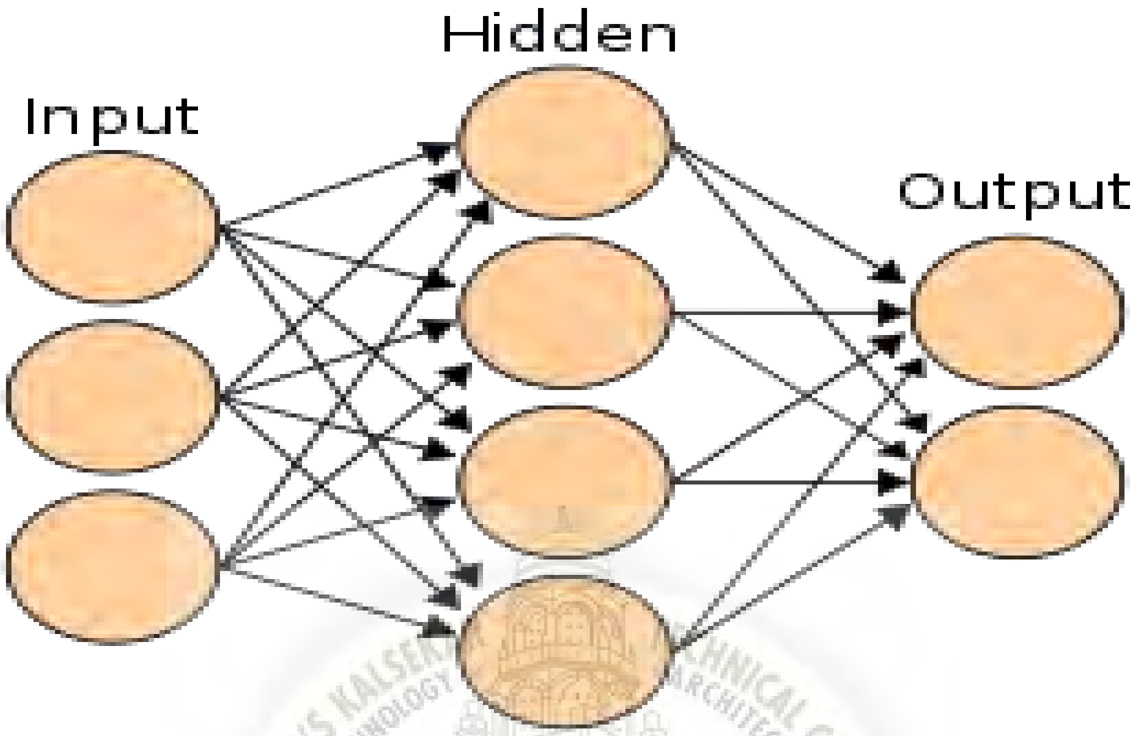
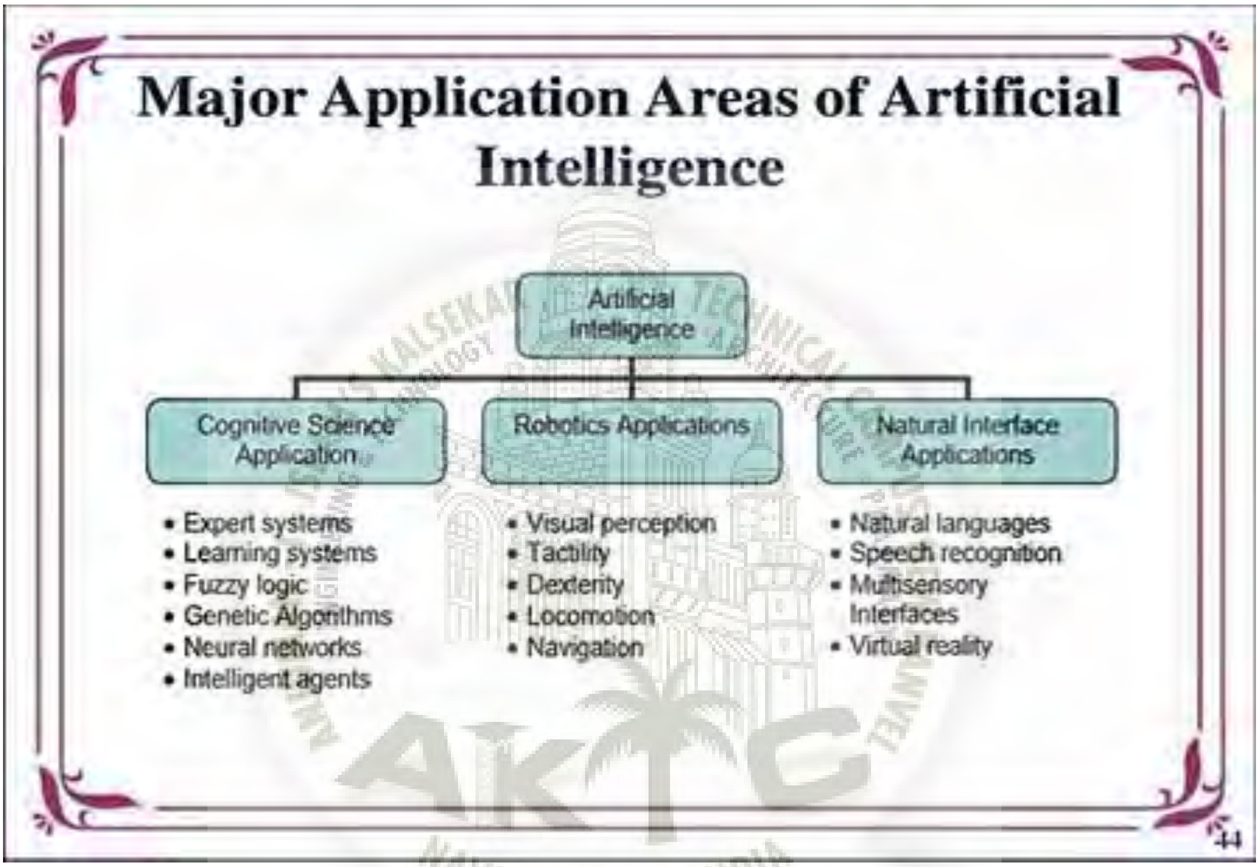


Figure 4.2: A neural network is an interconnected group of nodes, akin to the vast

4.4 Applications of AI

AI is relevant to any intellectual task. Modern artificial intelligence techniques are pervasive and are too numerous to list here. Frequently, when a technique reaches mainstream use, it is no longer considered artificial intelligence; this phenomenon is described as the AI effect. High-profile examples of AI include autonomous vehicles (such as drones and self-driving cars), medical diagnosis, creating art (such as poetry), proving mathematical theorems, playing games (such as Chess or Go), search engines (such as Google search), online assistants (such as Siri), image recognition in photographs, spam filtering, prediction of judicial decisions and targeting online advertisements.

With social media sites overtaking TV as a source for news for young people and news organizations increasingly reliant on social media platforms for generating distribution, major publishers now use artificial intelligence (AI) technology to post stories more effectively and generate higher volumes of traffic.



Major Application Areas of Artificial Intelligence

Artificial Intelligence

Cognitive Science Application
- Expert systems
- Learning systems
- Fuzzy logic
- Genetic Algorithms
- Neural networks
- Intelligent agents

Robotics Applications
- Visual perception
- Tactility
- Dexterity
- Locomotion
- Navigation

Natural Interface Applications
- Natural languages
- Speech recognition
- Multisensory Interfaces
- Virtual reality

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Figure 4.3: Application of AI

1. Health Care
2. Automotive
3. Finance and Economics
4. Video Games
5. Military

6. Audit
7. Advertising
8. Art
9. many more...

4.5 Motivation

Consumers spend lots of time using messaging applications (more than they spend on social media). Therefore, messaging applications are currently the most popular way companies deliver chatbot experiences to consumers.

In early 2015, people started using messaging applications more than they use social networks. This is a significant shift and a huge turning point in how consumers consume information.

Up until 2015, to market a business online, you would use social networks as this is where your consumers were. Now, there is a better place to concentrate resources. Businesses that seize opportunity are the ones that follow consumers the fastest. Think back to 5 or so year ago. There's an app for that said everyone.

Now it is probably too late for a business to create an app, similar functionality can probably be better delivered elsewhere. We certainly do not think any sane person would for man app building start up. It is not just consumer trends. Another contributing factor is the commercial opportunity, and therefore, interest from large (wealthy) companies. The platforms that enable the delivery of chatbot experiences are opening up to larger audiences and more innovative ways of creating an ROI and user interaction are being rapidly developed.

It is the culmination of the consumer behavior (moving to messaging apps) and the technology being ready, along with a greater cultural shift in consumer behavior. People have been using messaging apps (and SMS) to talk with friends and family for long enough to feel content in using the same practices to communicate with a business. This coincides with businesses now having the tools and technology to effectively communicate through the apps in a way consumer require.

The potential of chatbots:

The near-future potential is quite apparent. No longer will consumers have to trawl through websites and search engines to and the information they need. Instead, they will be communicating with intelligent chatbots at every stage.

You: Where is a good place to get coffee near me?”

Search Chatbot: There are three coffee shops near you rated have stars on xxx website

You: Add the highest rated coffee shop chatbot to this chat.

Coffee Chatbot: Hello, this is xxx bot, what’s up?

You: Send directions to your shop and order a at white

Coffee Chatbot: No problem, directions are in your xxx map, do you want to pay using your xxx wallet?"

You: Yes

Coffee Chatbot: Ok, 3.99 has been paid, see you in 12 minutes. We have some delicious muffins just out of the oven too

PA Chatbot: Hi, I noticed you are going for coffee, it looks like it is raining outside, want me to order you a taxi rather than walk?

You: Yes, leaving in 2 minutes

PA Chatbot: Ok, your driver is called Sammy and the car registration is xxx, he will meet you outside.

This type of chatbot interaction will be commonplace very soon. Despite how impressive that sounds, it is done with technology that is still new. Communicating with chatbots will not just stop at businesses and brands. Soon we will be using chatbots to communicate with other machines and connected devices.

Chapter 5

Technical Details

5.1 Methodology

5.1.1 Software Requirements

The followings are the software, programming language, library and commands requires for this project:

TensorFlow(software)

TensorFlow is an open-source software library for data ow programming across a range of tasks. It is a symbolic math library, and is also used for machine learning applications such as neural networks. It is used for both research and production at Google, often replacing its closed-source predecessor, Dist. Belief. TensorFlow was developed by the Google Brain team for internal Google use. It was released under the Apache 2.0 open source license on November 9, 2015.

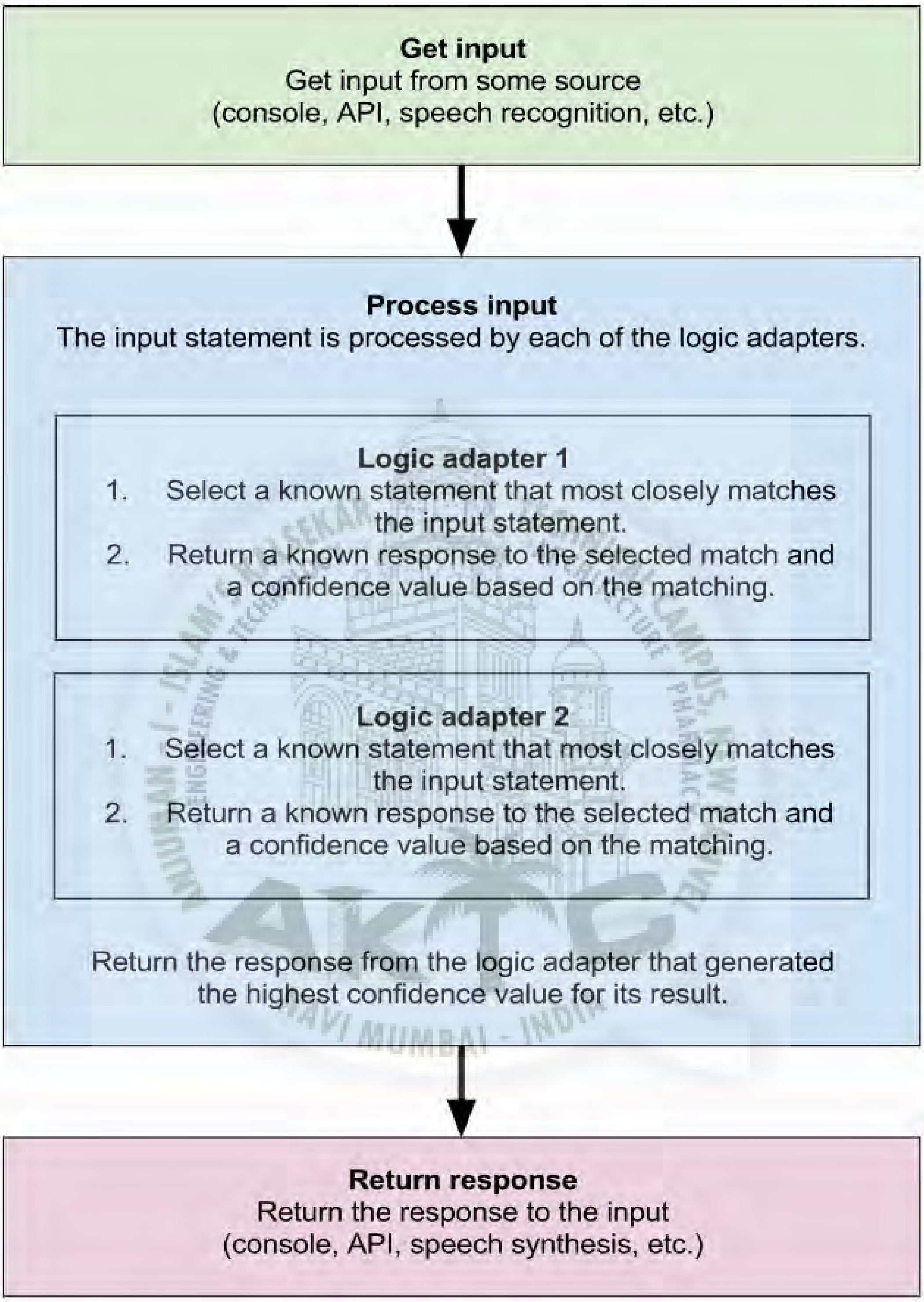
TensorFlow is Google Brain's second-generation system. Version 1.0.0 was released on February 11, 2017. While the reference implementation runs on single devices, TensorFlow can run on multiple CPUs and GPUs (with optional CUDA and SYCL extensions for general-purpose computing on graphics processing units). TensorFlow is available on 64-bit Linux, macOS, Windows, and mobile computing platforms including Android and iOS. Its flexible architecture allows for the easy deployment of computation across a variety of platforms (CPUs, GPUs, TPUs), and from desktops to clusters of servers to mobile and edge devices.

TensorFlow computations are expressed as stateful data ow graphs. The name TensorFlow derives from the operations that such neural networks perform on multidimensional data arrays. These arrays are referred to as "tensors". In June 2016, Dean stated that 1,500 repositories on GitHub mentioned TensorFlow, of which only 5 were from Google.

ChatterBot

ChatterBot is a Python library that makes it easy to generate automated responses to a user's input. ChatterBot uses a selection of machine learning algorithms to produce different types of responses. This makes it easy for developers to create chat bots and automate conversations with users. For more details about the ideas and concepts behind ChatterBot see the process flow diagram.

The language independent design of ChatterBot allows it to be trained to speak any language. Additionally, the machine-learning nature of ChatterBot allows an agent instance to improve its own knowledge of possible responses as it interacts with humans and other sources of informative data.



Get input
Get input from some source
(console, API, speech recognition, etc.)

Process input
The input statement is processed by each of the logic adapters.

Logic adapter 1

1. Select a known statement that most closely matches the input statement.
2. Return a known response to the selected match and a confidence value based on the matching.

Logic adapter 2

1. Select a known statement that most closely matches the input statement.
2. Return a known response to the selected match and a confidence value based on the matching.

Return the response from the logic adapter that generated the highest confidence value for its result.

Return response
Return the response to the input
(console, API, speech synthesis, etc.)

Figure 5.1: Process Flow of ChatterBot

How ChatterBot Works

ChatterBot is a Python library designed to make it easy to create software that can engage in conversation.

An untrained instance of ChatterBot starts off with no knowledge of how to communicate. Each time a user enters a statement, the library saves the text that they entered and the text that the statement was in response to. As ChatterBot receives more input the number of responses that it can reply and the accuracy of each response in relation to the input statement increase.

The program selects the closest matching response by searching for the closest matching known statement that matches the input, it then chooses a response from the selection of known responses to that statement.

Training

ChatterBot includes tools that help simplify the process of training a chat bot instance. Chatterbot’s training process involves loading example dialog into the chat bot’s database. This either creates or builds upon the graph data structure that represents the sets of known statements and responses. When a chat bot trainer is provided with a data set, it creates the necessary entries in the chat bot’s knowledge graph so that the statement inputs and responses are correctly represented.

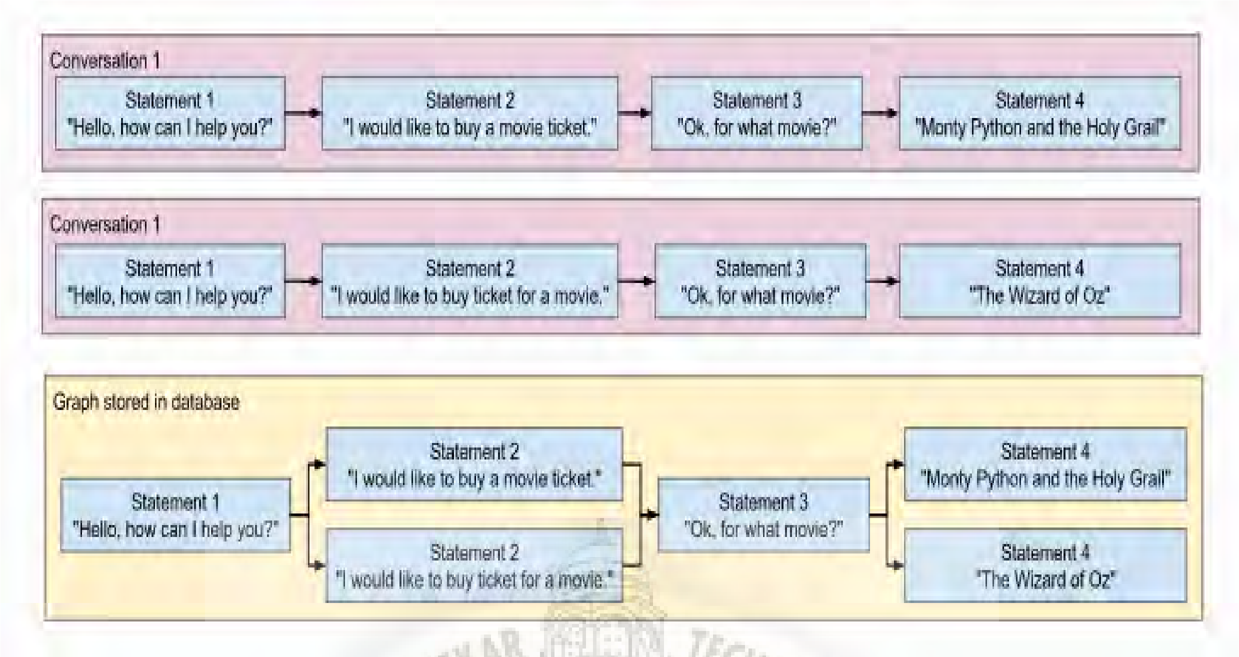

Conversation 1
Statement 1 "Hello, how can I help you?"
Statement 2 "I would like to buy a movie ticket."
Statement 3 "Ok, for what movie?"
Statement 4 "Monty Python and the Holy Grail"
Conversation 1
Statement 1 "Hello, how can I help you?"
Statement 2 "I would like to buy ticket for a movie."
Statement 3 "Ok, for what movie?"
Statement 4 "The Wizard of Oz"
Graph stored in database
Statement 1 "Hello, how can I help you?"
Statement 2 "I would like to buy a movie ticket."
Statement 2 "I would like to buy ticket for a movie."
Statement 3 "Ok, for what movie?"
Statement 4 "Monty Python and the Holy Grail"
Statement 4 "The Wizard of Oz"

Figure 5.2: Conversation and Database graph

Several training classes come built-in with ChatterBot. These utilities range from allowing you to update the chat bot's database knowledge graph based on a list of statements representing a conversation, to tools that allow you to train your bot based on a corpus of pre-loaded training data.

You can also create your own training class. This is recommended if you wish to train your bot with data you have stored in a format that is not already supported by one of the pre-built classes listed below.

Conversations

ChatterBot supports the ability to have multiple concurrent conversations. A conversation is where the chat bot interacts with a person, and supporting multiple concurrent conversations means that the chat bot can have multiple different conversations with different people at the same time.

Python (programming language)

Python is an interpreted high-level programming language for general-purpose programming. Created by Guido van Rossum and first released in 1991, Python has a design philosophy that emphasizes code readability, and a syntax that allows programmers to express concepts in fewer lines of code, notably using significant whitespace. It provides constructs that enable clear programming on both small and large scales.

Python features a dynamic type system and automatic memory management. It supports multiple programming paradigms, including object-oriented, imperative, functional and procedural, and has a large and comprehensive standard library.

Python interpreters are available for many operating systems. CPython, the reference implementation of Python, is open source software and has a community-based development model, as do nearly all of its variant implementations. CPython is managed by the non-profit Python Software Foundation.

5.1.2 Construction

In order to create a chatbot, or really do any machine learning task, of course, the rest job you have is to acquire training data, then you need to structure and prepare it to be formatted in a “input” and “output” manner that a machine learning algorithm can digest. Arguably, this is where all the real work is when doing just about any machine learning.

For getting chat training data, there are quite a few resources you could look into.

For example, there is the Cornell movie dialogue corpus that seems to be one of the most popular. There are many other sources, but we wanted something that was more... raw.

Something a little less polished... something with some character to it. Naturally, this took us to Reddit.

At rest, we thought we would use the Python Reddit API Wrapper, but the limits imposed by Reddit on crawling are not the friendliest. To collect bulk amounts of data, you’d have to break some rules.

Instead, we found a data dump of 1.7 Billion Reddit Comments. The structure of Reddit is in a tree-form, not like a forum or something where everything is linear. The parent comments are linear, but replies to parent comments branch out.

-Top level reply 1

–Reply to top level reply 1

–Reply to top level reply 1

—Reply to reply...

-Top level reply 2

–Reply to top level reply 1

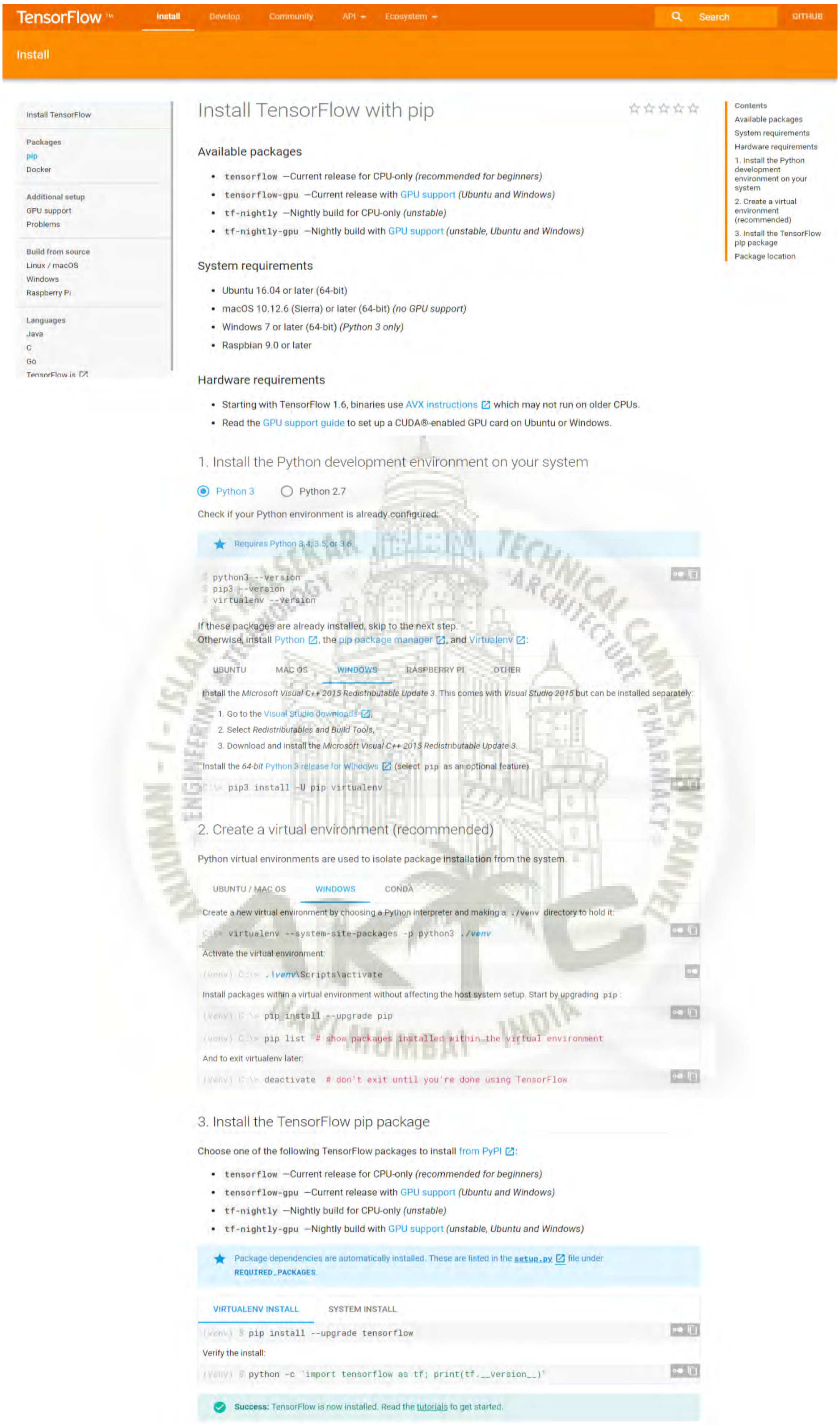
-Top level reply 3

The structure we need for deep learning is input -output. So, we really are trying to get something more along the lines of comment and reply pairs. In the above example, we could use the following as comment-reply pairs:

-Top level reply 1 and –Reply to top level reply 1

–Reply to top level reply 1 and —Reply to reply...

So, what we need to do is take this Reddit dump, and produce these pairs. The next thing we need to consider is that we should probably have only 1 reply per comment. Even though many single comments might have many replies, we should really just go with one. We can either go with the rest one, or we can go with the top-voted one. Our rest order of business is to get the data.



Install TensorFlow with pip

Available packages

- `tensorflow` —Current release for CPU-only *(recommended for beginners)*
- `tensorflow-gpu` —Current release with GPU support *(Ubuntu and Windows)*
- `tf-nightly` —Nightly build for CPU-only *(unstable)*
- `tf-nightly-gpu` —Nightly build with GPU support *(unstable, Ubuntu and Windows)*

System requirements

- Ubuntu 16.04 or later (64-bit)
- macOS 10.12.6 (Sierra) or later (64-bit) *(no GPU support)*
- Windows 7 or later (64-bit) *(Python 3 only)*
- Raspbian 9.0 or later

Hardware requirements

- Starting with TensorFlow 1.6, binaries use AVX instructions which may not run on older CPUs.
- Read the GPU support guide to set up a CUDA®-enabled GPU card on Ubuntu or Windows.

1. Install the Python development environment on your system

● Python 3 ○ Python 2.7

Check if your Python environment is already configured:

★ Requires Python 3.4, 3.5, or 3.6

```
$ python3 --version
$ pip3 --version
$ virtualenv --version
```

If these packages are already installed, skip to the next step.
Otherwise, install Python, the pip package manager, and Virtualenv:

UBUNTU MAC OS WINDOWS RASPBERRY PI OTHER

Install the *Microsoft Visual C++ 2015 Redistributable Update 3*. This comes with *Visual Studio 2015* but can be installed separately:

1. Go to the Visual Studio downloads,
2. Select *Redistributables and Build Tools*,
3. Download and install the *Microsoft Visual C++ 2015 Redistributable Update 3*.

Install the *64-bit* Python 3 release for Windows (select `pip` as an optional feature).

```
C:\> pip3 install -U pip virtualenv
```

2. Create a virtual environment (recommended)

Python virtual environments are used to isolate package installation from the system.

UBUNTU / MAC OS WINDOWS CONDA

Create a new virtual environment by choosing a Python interpreter and making a `./venv` directory to hold it:

```
C:\> virtualenv --system-site-packages -p python3 ./venv
```

Activate the virtual environment:

```
(venv) C:\> .\venv\Scripts\activate
```

Install packages within a virtual environment without affecting the host system setup. Start by upgrading `pip`:

```
(venv) C:\> pip install --upgrade pip

(venv) C:\> pip list  # show packages installed within the virtual environment
```

And to exit virtualenv later:

```
(venv) C:\> deactivate  # don't exit until you're done using TensorFlow
```

3. Install the TensorFlow pip package

Choose one of the following TensorFlow packages to install from PyPI:

- `tensorflow` —Current release for CPU-only *(recommended for beginners)*
- `tensorflow-gpu` —Current release with GPU support *(Ubuntu and Windows)*
- `tf-nightly` —Nightly build for CPU-only *(unstable)*
- `tf-nightly-gpu` —Nightly build with GPU support *(unstable, Ubuntu and Windows)*

★ Package dependencies are automatically installed. These are listed in the `setup.py` file under `REQUIRED_PACKAGES`.

VIRTUALENV INSTALL SYSTEM INSTALL

```
(venv) $ pip install --upgrade tensorflow
```

Verify the install:

```
(venv) $ python -c "import tensorflow as tf; print(tf.__version__)"
```

Success: TensorFlow is now installed. Read the tutorials to get started.

Figure 5.3: Tensorflow

Figure 5.4: Python

Figure 5.5: ChatterBot

Chapter 6

Working

6.1 Work Flow Analysis

Working: Natural Language Processing (NLP):

Natural Language Processing Chatbots ends a way to convert the user's speech or text into structured data. Which is then utilized to choose a relevant answer. Natural Language Processing includes the following steps;

Tokenization:

The NLP separates a series of words into tokens or pieces that are linguistically representative, with a different value in the application. Sentiment Analysis: It will study and learn the users experience, and transfer the inquiry to a human when necessary.

Normalization:

This program model processes the text to and out the typographical errors and common spelling mistakes that might alter the intended meaning of the users request.

Named Entity Recognition:

The program model of chatbot looks for different categories of words, similar to the name of the particular product, the users address or name, whichever information is required.

Dependency Parsing:

The Chatbot searches for the subjects, verbs, objects, common phrases and nouns in the user's text to discover related phrases that what users want to convey.

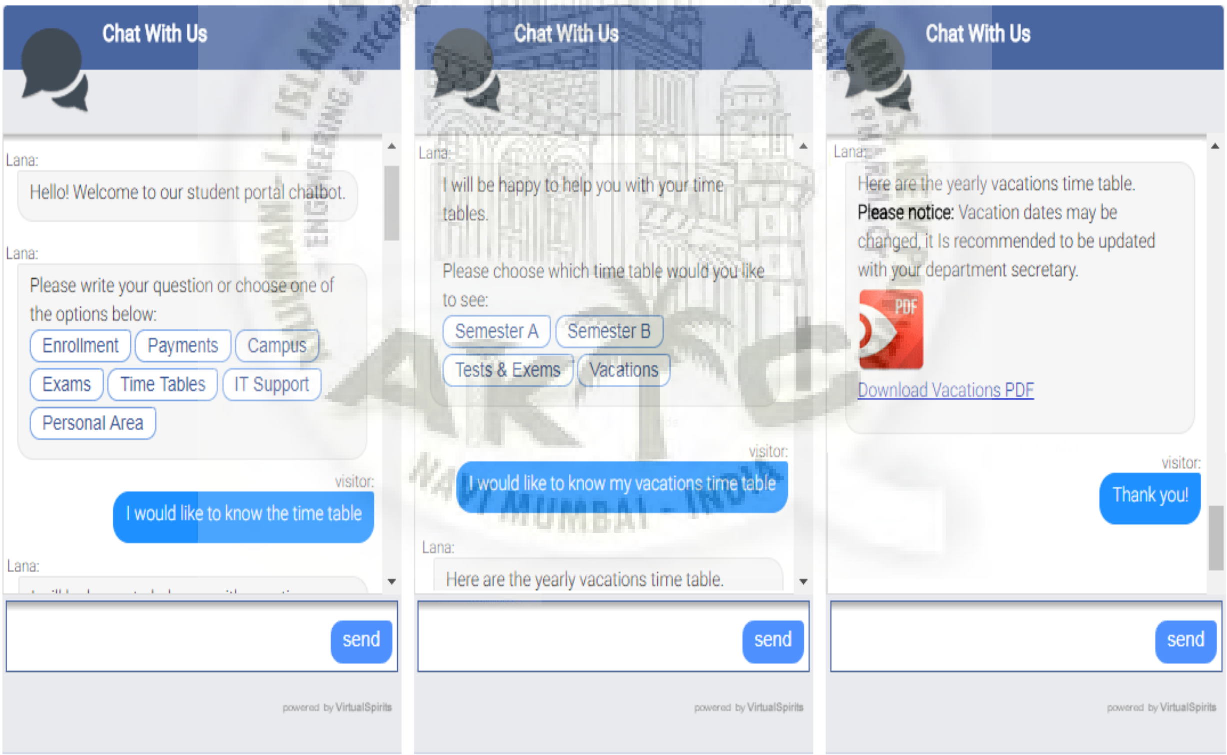
Chapter 7

Results

7.1 Implementation

Chatbot

Here is the image of chatbot



Lana:
Hello! Welcome to our student portal chatbot.

Lana:
Please write your question or choose one of the options below:

visitor:
I would like to know the time table

Lana:

Lana:
I will be happy to help you with your time tables.

Please choose which time table would you like to see:

visitor:
I would like to know my vacations time table

Lana:
Here are the yearly vacations time table.

Lana:
Here are the yearly vacations time table.
Please notice: Vacation dates may be changed, it Is recommended to be updated with your department secretary.

Download Vacations PDF

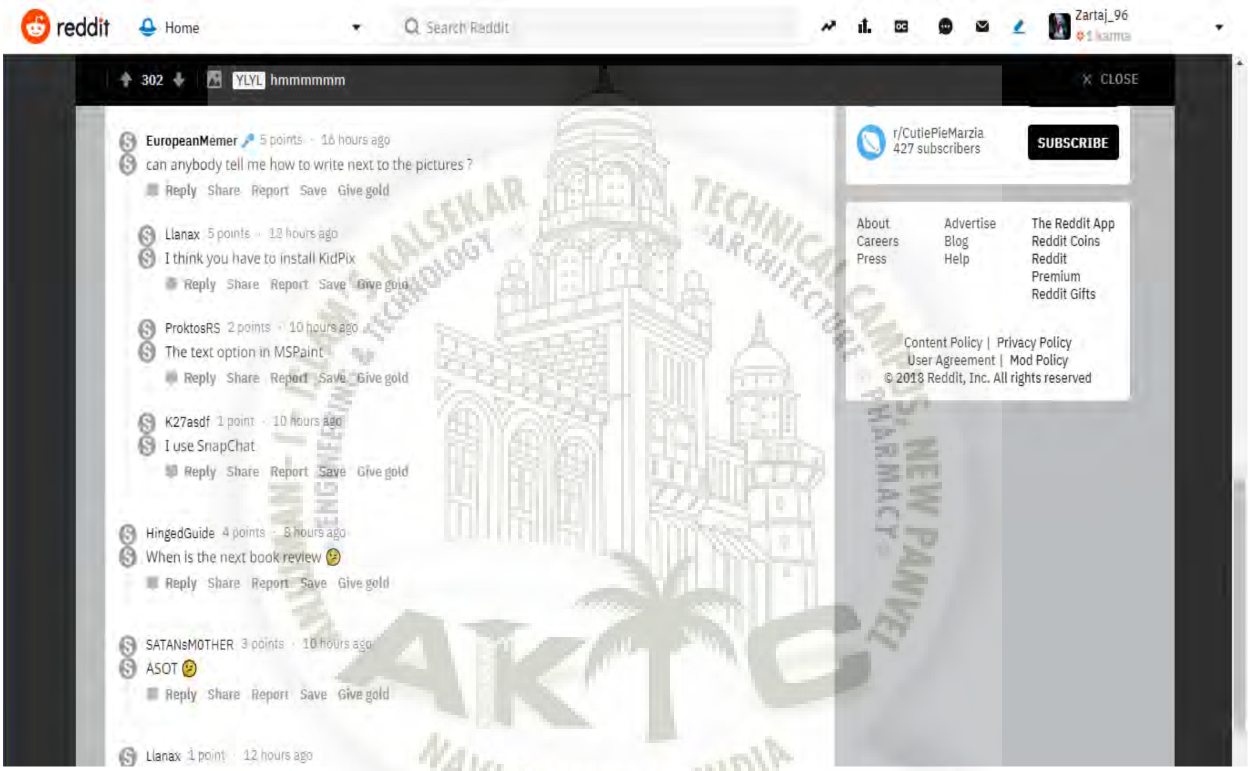
visitor:
Thank you!

Figure 7.1: Chatbot

7.2 Screen Shots of Process

Input of dump

The input used to create database is a reddit comments dump



EuropeanMemer 5 points · 16 hours ago
can anybody tell me how to write next to the pictures ?
Reply Share Report Save Give gold

Llanax 5 points · 12 hours ago
I think you have to install KidPix
Reply Share Report Save Give gold

ProktosRS 2 points · 10 hours ago
The text option in MSPaint
Reply Share Report Save Give gold

K27asdf 1 point · 10 hours ago
I use SnapChat
Reply Share Report Save Give gold

HingedGuide 4 points · 8 hours ago
When is the next book review 🤔
Reply Share Report Save Give gold

SATANsMOTHER 3 points · 10 hours ago
ASOT 🤔
Reply Share Report Save Give gold

Llanax 1 point · 12 hours ago

Figure 7.2: Reddit Tree Flow

Output of the database created

The output of the database created

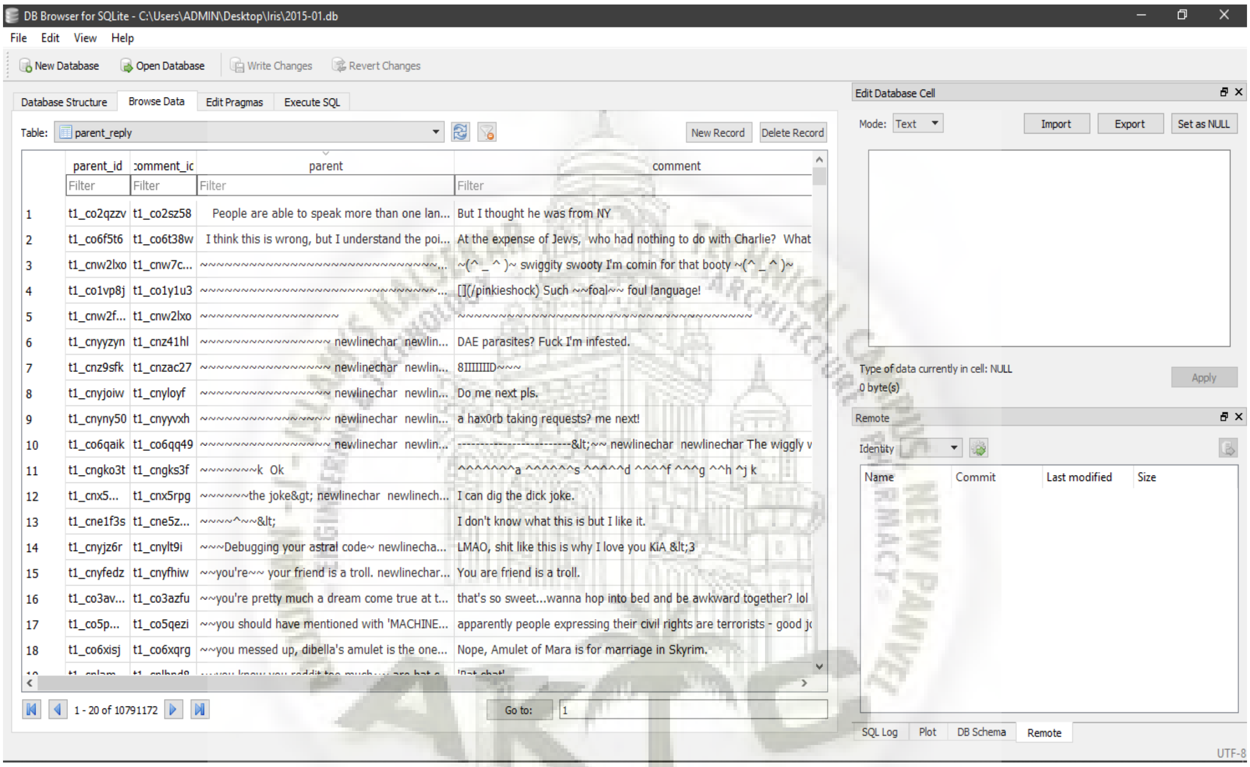


Table: parent_reply

Mode: Text

Type of data currently in cell: NULL
0 byte(s)

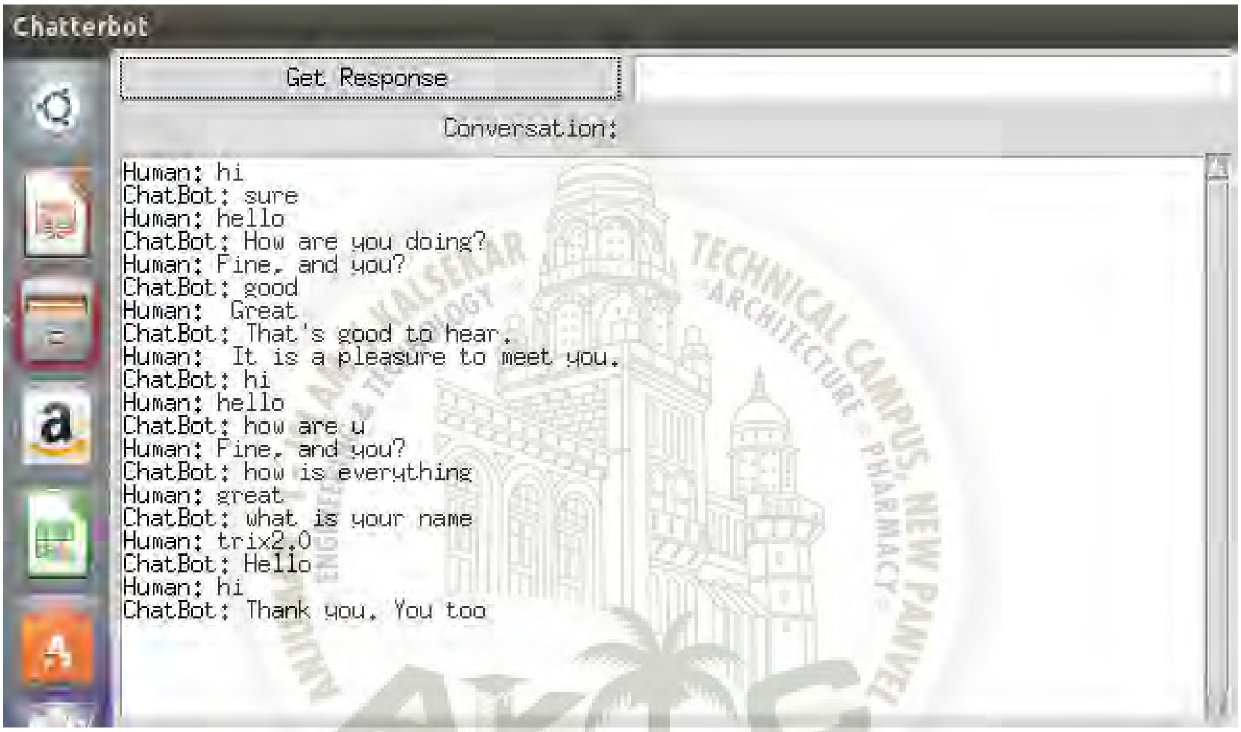
Identity

	parent_id	:omment_ic	parent	comment
	Filter	Filter	Filter	Filter
1	t1_co2qzzv	t1_co2sz58	People are able to speak more than one lan...	But I thought he was from NY
2	t1_co6f5t6	t1_co6t38w	I think this is wrong, but I understand the poi...	At the expense of Jews, who had nothing to do with Charlie? What
3	t1_cnw2lxo	t1_cnw7c...	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~...	~(^ _ ^)~ swiggity swooty I'm comin for that booty ~(^ _ ^)~
4	t1_co1vp8j	t1_co1y1u3	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~...	[](/pinkieshock) Such ~~foal~~ foul language!
5	t1_cnw2f...	t1_cnw2lxo	~~~~~~~~~~~~~~~~~~~~~~	~~~~~~
6	t1_cnyyzyn	t1_cnz41hl	~~~~~~~~~~~~~~~~~~~~ newlinechar newlin...	DAE parasites? Fuck I'm infested.
7	t1_cnz9sfk	t1_cnzac27	~~~~~~~~~~~~~~~~~~~~ newlinechar newlin...	8IIIIIIID~~~
8	t1_cnyjoiw	t1_cnyloyf	~~~~~~~~~~~~~~~~~~~~ newlinechar newlin...	Do me next pls.
9	t1_cnyny50	t1_cnyyvxh	~~~~~~~~~~~~~~~~~~~~ newlinechar newlin...	a hax0rb taking requests? me next!
10	t1_co6qaik	t1_co6qq49	~~~~~~~~~~~~~~~~~~~~ newlinechar newlin...	------------------------<~~ newlinechar newlinechar The wiggly v
11	t1_cngko3t	t1_cngks3f	~~~~~~~~k Ok	^^^^^^^^a ^^^^^^s ^^^^^d ^^^^f ^^^g ^^h ^j k
12	t1_cnx5...	t1_cnx5rpg	~~~~~~the joke> newlinechar newlinech...	I can dig the dick joke.
13	t1_cne1f3s	t1_cne5z...	~~~~^~~<	I don't know what this is but I like it.
14	t1_cnyjz6r	t1_cnylt9i	~~~Debugging your astral code~ newlinecha...	LMAO, shit like this is why I love you KiA <3
15	t1_cnyfedz	t1_cnyfhiw	~~you're~~ your friend is a troll. newlinechar...	You are friend is a troll.
16	t1_co3av...	t1_co3azfu	~~you're pretty much a dream come true at t...	that's so sweet...wanna hop into bed and be awkward together? lol
17	t1_co5p...	t1_co5qezi	~~you should have mentioned with 'MACHINE...	apparently people expressing their civil rights are terrorists - good jc
18	t1_co6xisj	t1_co6xqrg	~~you messed up, dibella's amulet is the one...	Nope, Amulet of Mara is for marriage in Skyrim.

1 - 20 of 10791172

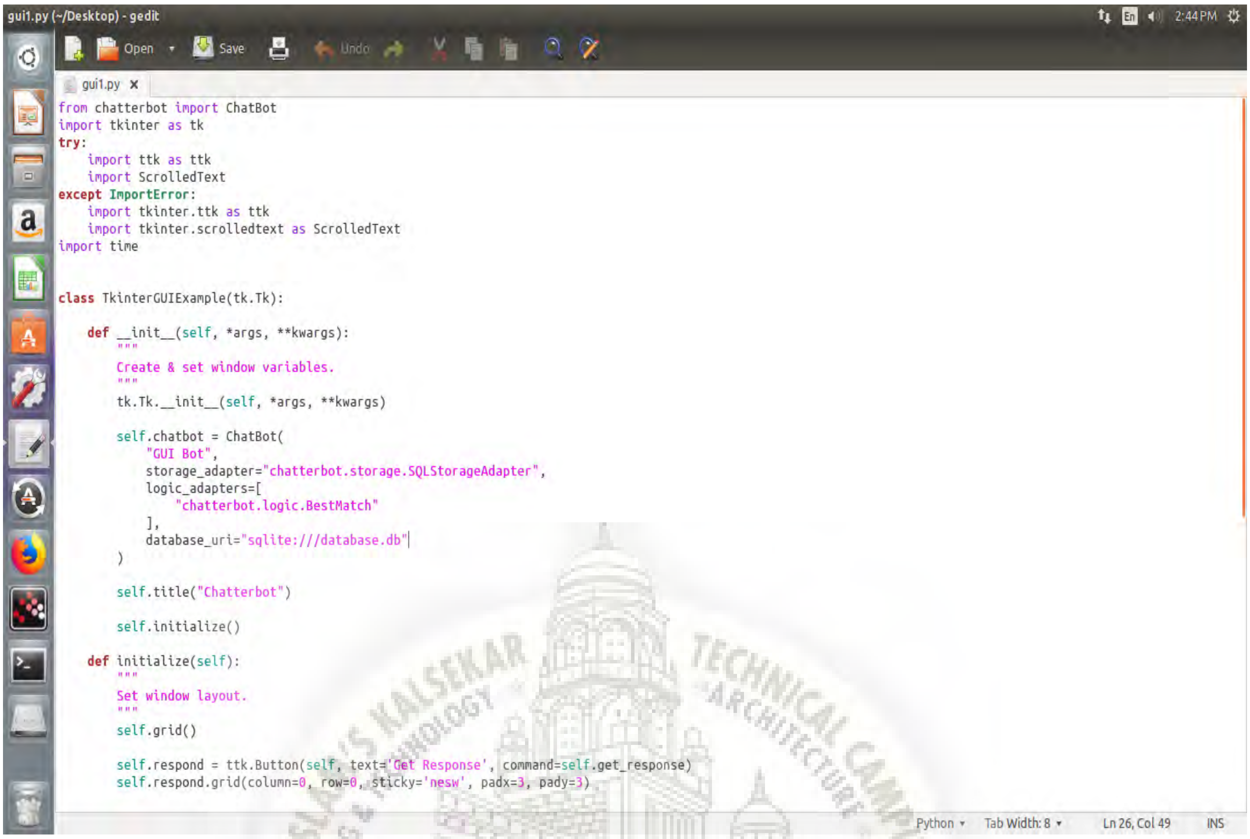
Go to: 1

Figure 7.3: Data-Base



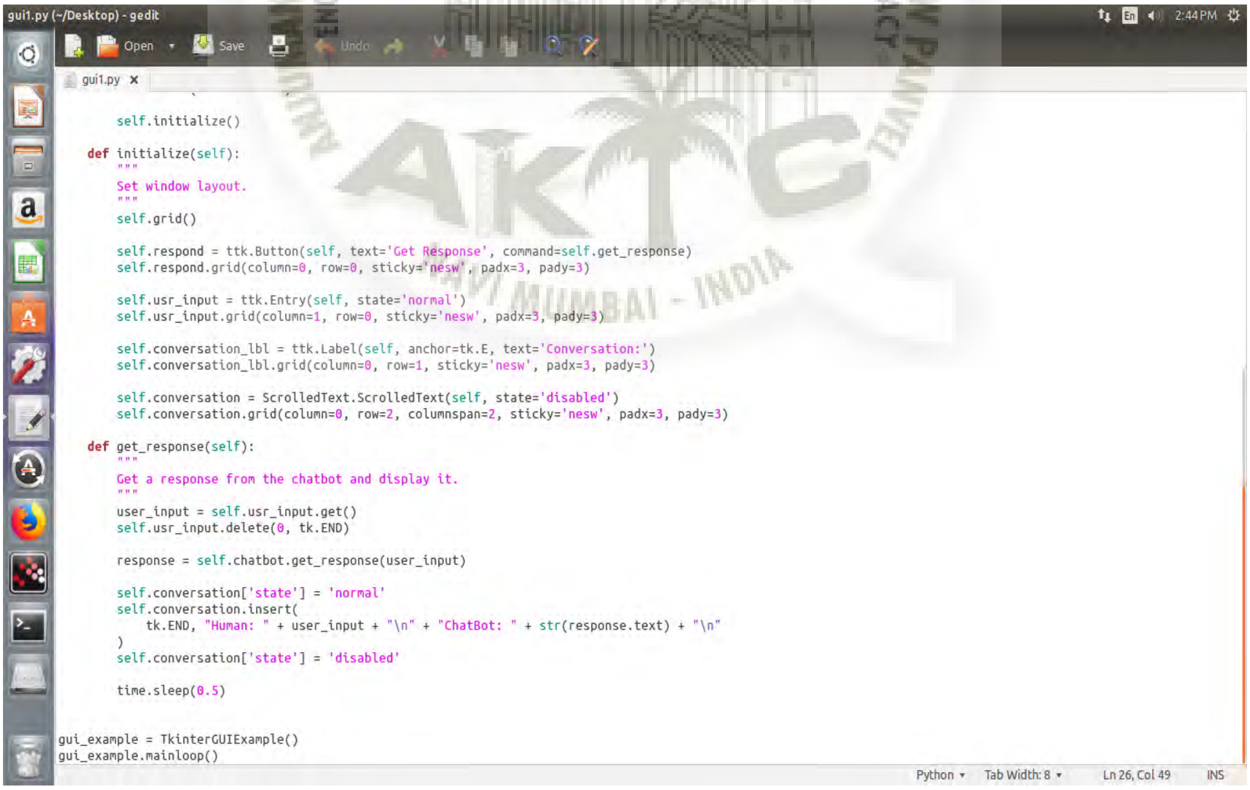
```
Human: hi
ChatBot: sure
Human: hello
ChatBot: How are you doing?
Human: Fine, and you?
ChatBot: good
Human:  Great
ChatBot: That's good to hear.
Human:  It is a pleasure to meet you.
ChatBot: hi
Human: hello
ChatBot: how are u
Human: Fine, and you?
ChatBot: how is everything
Human: great
ChatBot: what is your name
Human: trix2.0
ChatBot: Hello
Human: hi
ChatBot: Thank you. You too
```

Figure 7.4: Output of Chatbot



```python
from chatterbot import ChatBot
import tkinter as tk
try:
    import ttk as ttk
    import ScrolledText
except ImportError:
    import tkinter.ttk as ttk
    import tkinter.scrolledtext as ScrolledText
import time


class TkinterGUIExample(tk.Tk):

    def __init__(self, *args, **kwargs):
        """
        Create & set window variables.
        """
        tk.Tk.__init__(self, *args, **kwargs)

        self.chatbot = ChatBot(
            "GUI Bot",
            storage_adapter="chatterbot.storage.SQLStorageAdapter",
            logic_adapters=[
                "chatterbot.logic.BestMatch"
            ],
            database_uri="sqlite:///database.db"
        )

        self.title("Chatterbot")

        self.initialize()

    def initialize(self):
        """
        Set window layout.
        """
        self.grid()

        self.respond = ttk.Button(self, text='Get Response', command=self.get_response)
        self.respond.grid(column=0, row=0, sticky='nesw', padx=3, pady=3)
```

Figure 7.5: GUI Code



```python
        self.initialize()

    def initialize(self):
        """
        Set window layout.
        """
        self.grid()

        self.respond = ttk.Button(self, text='Get Response', command=self.get_response)
        self.respond.grid(column=0, row=0, sticky='nesw', padx=3, pady=3)

        self.usr_input = ttk.Entry(self, state='normal')
        self.usr_input.grid(column=1, row=0, sticky='nesw', padx=3, pady=3)

        self.conversation_lbl = ttk.Label(self, anchor=tk.E, text='Conversation:')
        self.conversation_lbl.grid(column=0, row=1, sticky='nesw', padx=3, pady=3)

        self.conversation = ScrolledText.ScrolledText(self, state='disabled')
        self.conversation.grid(column=0, row=2, columnspan=2, sticky='nesw', padx=3, pady=3)

    def get_response(self):
        """
        Get a response from the chatbot and display it.
        """
        user_input = self.usr_input.get()
        self.usr_input.delete(0, tk.END)

        response = self.chatbot.get_response(user_input)

        self.conversation['state'] = 'normal'
        self.conversation.insert(
            tk.END, "Human: " + user_input + "\n" + "ChatBot: " + str(response.text) + "\n"
        )
        self.conversation['state'] = 'disabled'

        time.sleep(0.5)


gui_example = TkinterGUIExample()
gui_example.mainloop()
```

Chapter 8

Benefits and Limitations

8.1 Benefits of the Proposed System

1. Get Access to the required information

2. No need of third person to reply to the queries

3. Ease to inquiry

4. Reduces the time required to get the information

5. Increase the traffic to the website

8.2 Limitations

1. Power failure

2. Hardware/Software failure

3. Network dependent

Chapter 9

Conclusion

With the help of system, we are able to get required information while being in the comforts of the home. students and parents won't need to travel long distances to get the information as it can be provided by the chatbot.

9.1 Future Scope:

It will replace the classroom instruction, textbook and practices. It will replace the classroom instruction, textbook and practices. Chatbot should also be able to have multi-linguistic conversations.

References

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