

Computer Engineering Department

A.P. Shah Institute of Technology

— G.B.Road, Kasarvadavli, Thane(W), Mumbai-400615 UNIVERSITY OF MUMBAI Academic Year 2019-2020

A Project Report on

Artificial Teaching Assistant

Submitted in partial fulfillment of the degree of Bachelor of Engineering(Sem-7)

in.

Computer Engineering

By

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Under the Guidance of Prof.Sachin Takmare

1. Project Conception and Initiation

1.1 Abstract

- It is an Artificial Teaching Assistant that has been developed with main aim to assist teachers in their teaching process.
- It is designed to work for english language although it might work on some other language depending on the nature of the language, the structure, grammar and semantics.
- This project i.e. Artificial Teaching Assistant is as the name implies is the program developed for teaching assistance by using various techniques from artificial intelligence and image processing in order to reduce the teaching efforts in many auxiliary but time consuming teaching tasks so that teachers can focus more on the core knowledge teaching aspects.

1.2 Objectives

- As educational AI progresses and becomes more sophisticated, it's essential to include teachers in the process. In an ideal world, teachers and AI will create an immersive learning experience for students, together.
- Develop the AI programs to do many auxiliary teaching tasks like improving the quality of available images and notes, automatically corrects the spellings in the document, grammer correction, auto answering the key questions on the given contents, sentiment analysis, text summarization etc.

1.3 Literature Review

We referred various books and papers to understand various concepts related to Artificial Intelligence, Image Processing, Signal Processing, Machine Learning etc

Some of the books are:

- 1) Digital Image Processing by Rafel C. Gonzalez and Richard E. Woods
- 2) Digital Image Processing by S. Sridhar
- 3) Speech and Language Processing by Daniel Jurafsky and James H. Martin
- 4) Foundations of Statistical Natural Language Processing by Christopher D.Manning and Hinrich Schutze
- 5) Natural Language Processing with Python by Steven Bird and Ewan Klein
- 6) Artificial Intelligence A Modern Approach, Stuart J. Russell and Peter Norvig
- 7) Artificial Intelligence and Intelligent Systems, N.P.Padhy
- 8) Neural Networks, Fuzzy Logic and Genetic Algorithms, S.Rajasekaran and G.A. Pai
- 9) Fuzzy Set Theory and its Applications, Zimmermann
- 10) Digital Signal Processing John G. Proakis, Dimitris and G.Manolakis
- 11) Digital Signal Processing, A. Anand Kumar
- 12) Artificial Intelligence, Elaine Rich and Kevin Knight

1.5 Scope

- The different AI techniques available like natural language processing, image processing will be used to perform these tasks.
- Image processing technique is used for improving image quality in the available teaching material.
- Teaching notes prepared can be checked for spelling and grammar. NLP techniques are used for developing the program code to these tasks.
- The feedbacks received from students for any lecture can be analysed by the sentiment analysis program. Attempt has been made to develop an sentiment analysis program to perform aspect level of teaching staff feedback.
- Text summarisation program will automatically condense the important information in the form of summary which would benefit the teachers.

1.6 Technology stack

Python

Python is an interpreted, high-level, general-purpose programming language. Its language constructs and object-oriented approach aim to help programmers write clear, logical code for small and large scale projects.

Open CV

OpenCV (Open source computer vision) is a library of programming functions mainly aimed at real time computer vision. The library is cross-platform and free for use under the open source BSD license.

NLTK

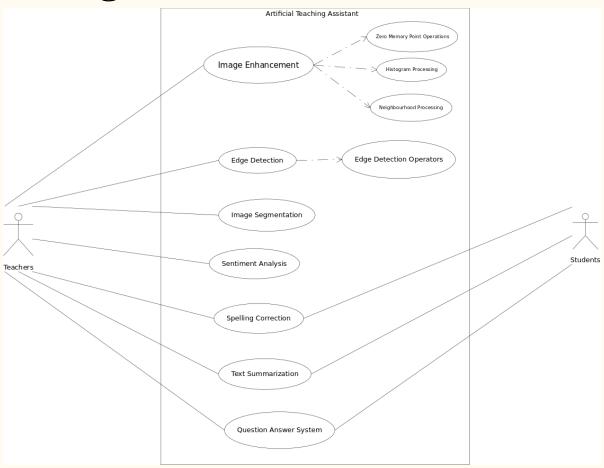
The Natural Language Toolkit, or more commonly NLTK, is a suite of libraries and programs for symbolic and statistical natural language processing for English written in the Python programming language. NLTK is a leading platform for building Python programs to work with human language data..

1.7 Benefits for environment & Society

- Reduced Carbon Footprint
- Access to Documents from Everywhere
- Keeps Things Simple
- Reduced Costs
- Increased output and productivity
- Increased quality
- Reliability

2. Project Design

Use Case Diagramn



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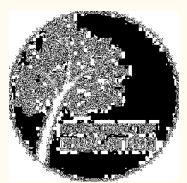
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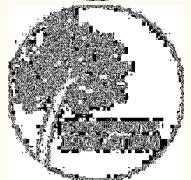














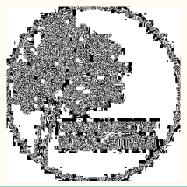
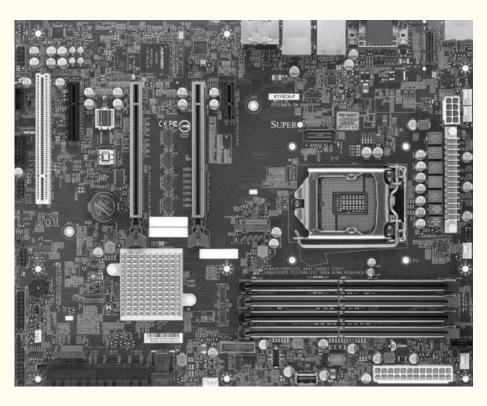


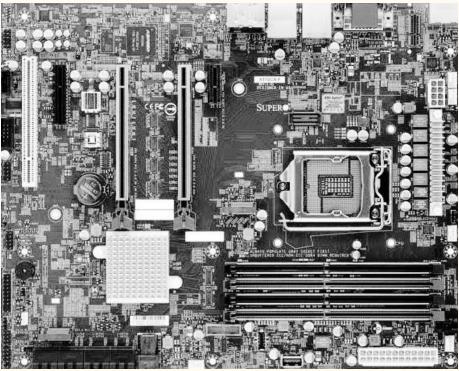
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Histogram Equalization





Histogram Equalization





Histogram Equalization

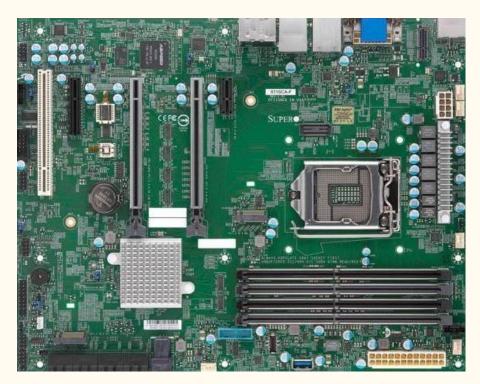




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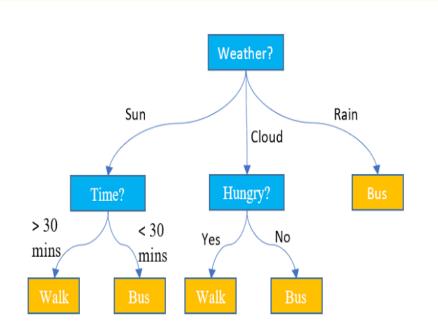
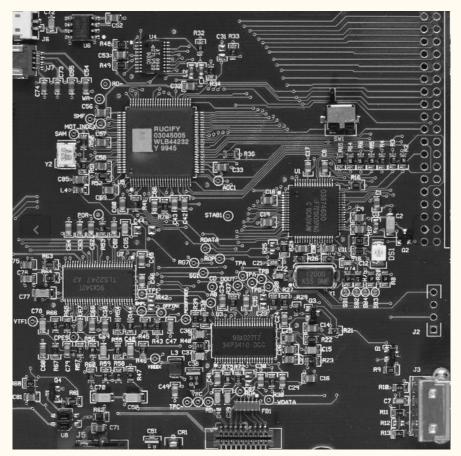




Image Sharpening



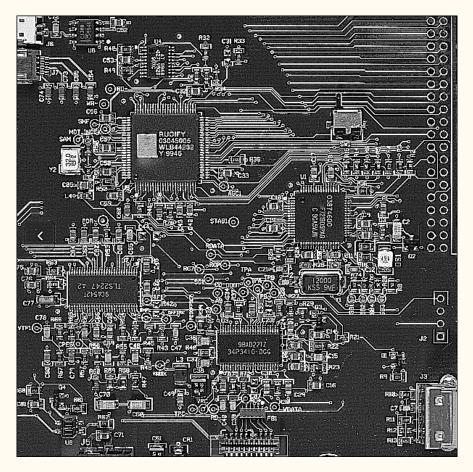


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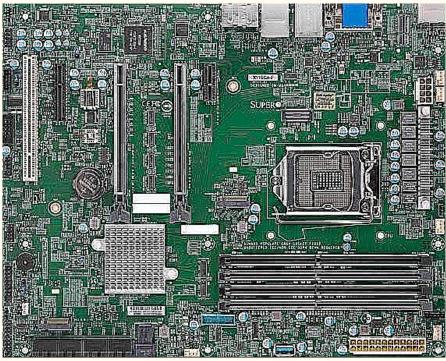
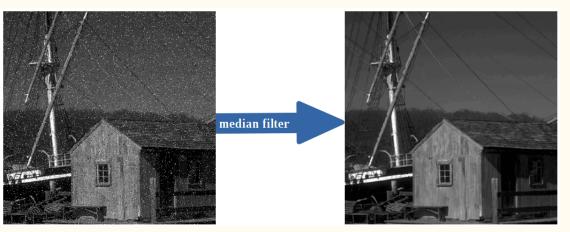


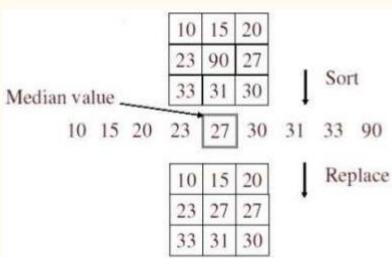
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Median Filter





Median Filter





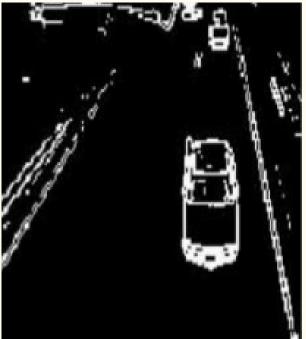
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Edge Detection







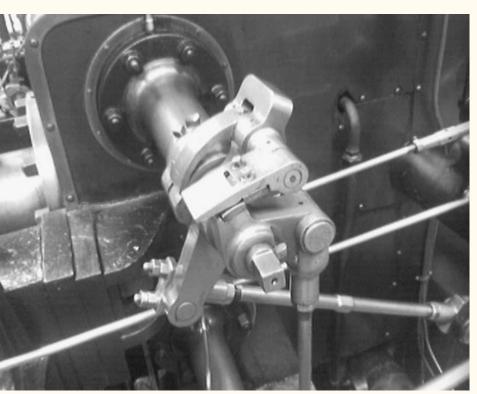
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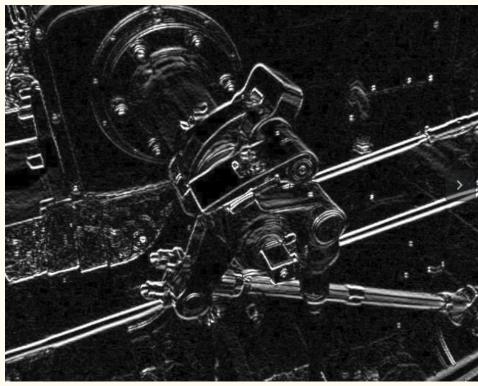




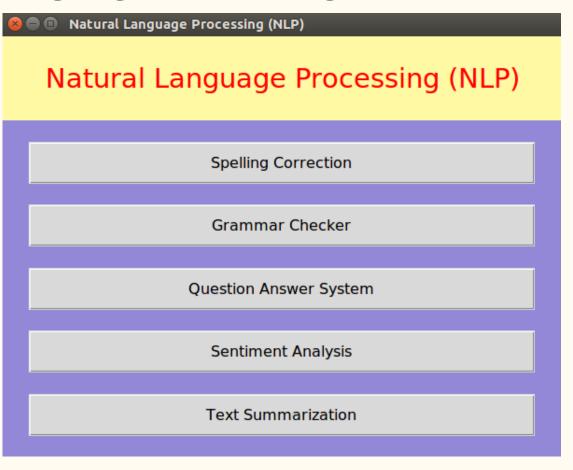


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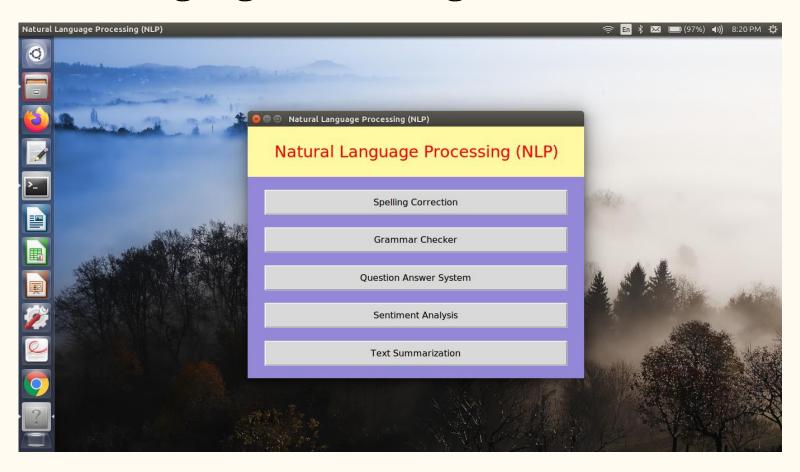




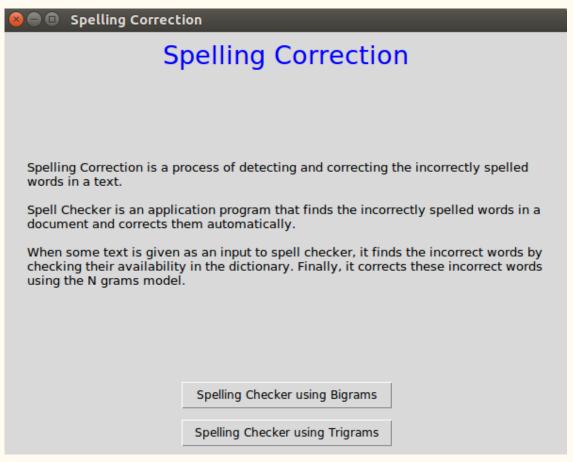
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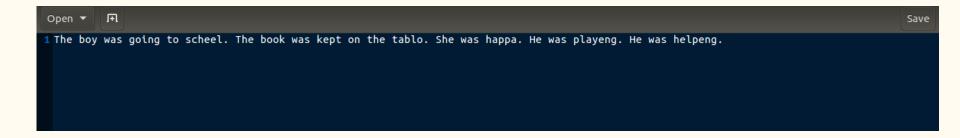
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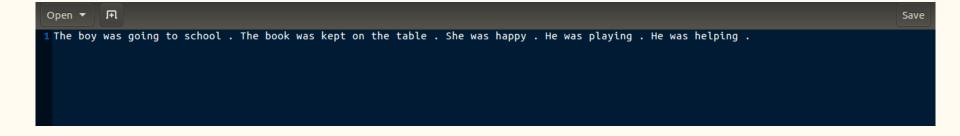


Spelling Correction

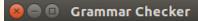


Spelling Correction





Grammar Checker



Grammar Checker

A grammar checker is a program that attempts to verify a written text for grammatical correctness.

The most commonly used mathematical system for modeling constituent structure in English and other natural languages is the Context Free Grammar (CFG).

A context free grammar consists of a set of rules or productions and a lexicon of words and symbols. Each rule or production expresses the ways in which the symbols of the language can be grouped and ordered together.

The symbols that are used in a CFG are divided into two classes: terminals and non terminals.

The symbols that correspond to words in the language (the,school etc) are called terminal symbols; the lexicon is the set of rules that introduce these terminal symbols.

The symbols that express clusters or generalizations of these are called nonterminals.

Check Grammar

Grammar Checker

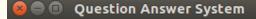
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I I shot an apple in my pajamas. The man saw a dog in the park. The man a park the saw dog in. The angry bear chased the frightened little squirrel. The man a. Man dog park.

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Open v Fl

1 *****Grammatically Correct Sentences*****

2 3 I shot an apple in my pajamas.
4 The man saw a dog in the park.
5 The angry bear chased the frightened little squirrel.
6 6 7 *****Grammatically Incorrect Sentences*****
8 9 The man a park the saw dog in.
10 The man a.
11 Man dog park.
12 13 *****Ambiguous Sentences*****
14 15 I shot an apple in my pajamas.
16 The man saw a dog in the park.
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Question Answer System



Question Answer System

Question answering is the task of returning a particular piece of information to the user in response to a question.

There are many situations where the user wants a particular piece of information rather than an entire document or document set.

We call the task factoid question answering if the information is a simple fact, and particularly if this fact has to do with a named entity like a person, organization, or location.

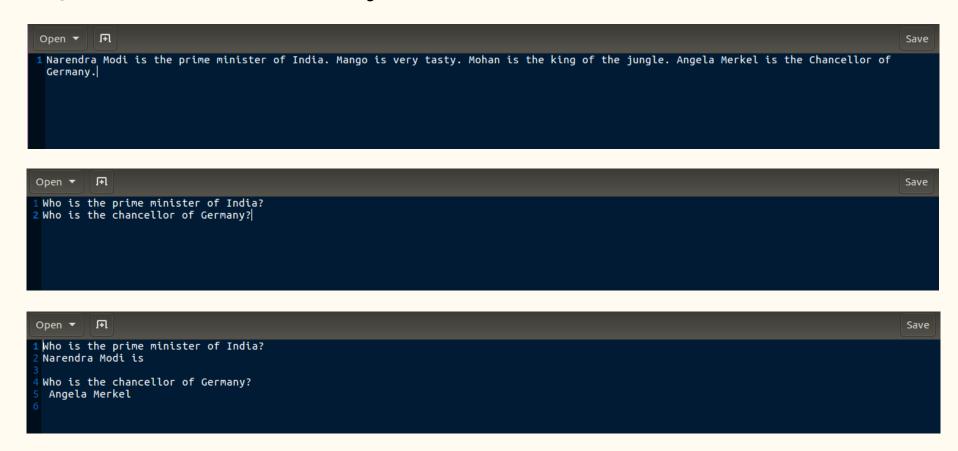
The task of a factoid question answering system is thus to answer questions by finding from the given article or document, short text segments that are likely to contain answers to questions, reformatting them, and presenting them to the user.

The three phases of a modern factoid question answering system are :

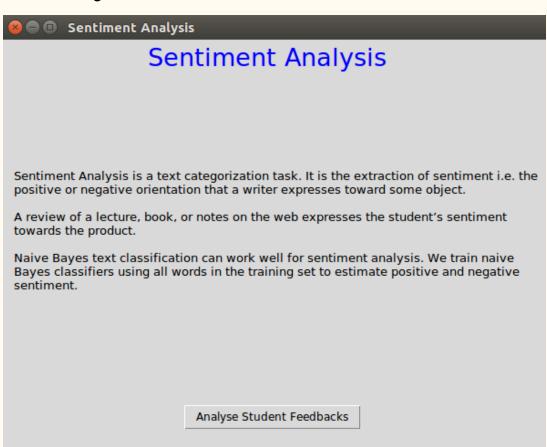
- 1) Question processing
- 2) Passage retrieval and ranking
- 3) Answer processing

Find Answers to Questions

Question Answer System



Sentiment Analysis



Sentiment Analysis

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Open 

The lecture was very good.

The lecture was bad.

I did not understand anything.

I liked the lecture.

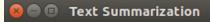
The lecture was boring.

The lecture was excellent.

The lecture was not interactive.
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1 Total no of Student Feedbacks : 7
2 Total no of Positive Student Feedbacks : 3
3 Total no of Negative Student Feedbacks : 4
4
5 *****Positive Student Feedbacks*****
6
7 The lecture was very good.
8 I liked the lecture.
9 The lecture was excellent.
10
11 *****Negative Student Feedbacks*****
12
13 The lecture was bad.
14 I did not understand anything.
15 The lecture was not interactive.
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Text Summarization



Text Summarization

Text summarization is the process of distilling the most important information from a text to produce an abridged version for a particular task and user.

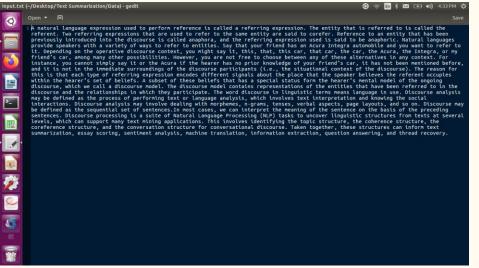
The simplest kind of summary, an extract, is formed by selecting (extracting) phrases or sentences from the document to be summarized and pasting them together.

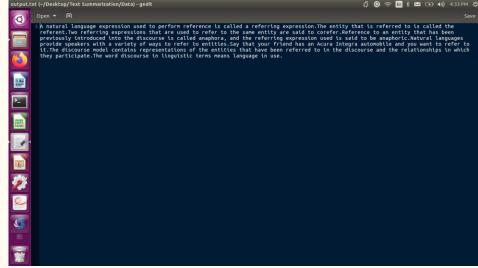
Important kinds of summaries are:

- 1) Outlines of any document
- 2) Extracts of a scientific article
- 3) Headlines of a news article
- 4) Summaries of email threads
- 5) Action items or other summaries of a (spoken) business meeting
- 6) Snippets summarizing a web page on a search engine results page
- 7) Compressed sentences for producing simplified or compressed text
- 8) Answers to complex questions, constructed by summarizing multiple documents

Summarize Text

Text Summarization





2.7 References

- 1) Digital Image Processing by Rafel C. Gonzalez and Richard E. Woods
- 2) Digital Image Processing by S. Sridhar
- 3) Speech and Language Processing by Daniel Jurafsky and James H. Martin
- 4) Foundations of Statistical Natural Language Processing by Christopher Manning and Hinrich Schutze
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- 8) Artificial Intelligence and Intelligent Systems, N.P.Padhy
- 9) Artificial Intelligence, Elaine Rich and Kevin Knight
- 10 Tom M.Mitchell "Machine Learning" McGraw Hill
- 11) Fuzzy Set Theory and its Applications, Zimmermann
- 12) Introduction to soft computing, Samir Roy and Chakraborty
- 13) Principles of Soft Computing, S.N.Sivanandam, S.N.Deepa

Thank You