A Project Synopsis on

Teaching Assistant using Artificial Intelligence

by

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Scope :

The performance requirements of the application have continuously increased the computing power of implementation platforms, especially when they are executed under real time constraints.

The real time applications may consist of different standards,or different algorithms used at different stages of the processing chain.

The computing paradigm using reconfigurable architectures promises an itermediate trade-off between flexibility and performance.

Emphasis on basic grammar and writung skills : the rules and priniciples of clear,concise and accurate writing that are necessary for producing effective workplace documents and technical reports.

Technology Stack :

1) Python

Python is an interpreted, high-level, general-purpose programming language. Created by Guido van Rossum and first released in 1991, Python's design philosophy emphasizes code readability with its notable use of significant whitespace. Its language constructs and object-oriented approach aim to help programmers write clear, logical code for small and large-scale projects.

2) Colab

Colab Notebooks : Colaboratory is a Google research project created to help disseminate machine learning education and research. It's a Jupyter notebook environment that requires no setup to use and runs entirely in the cloud.

Colab is a Google internal research tool for data science. They have released the tool sometime earlier to the general public with a noble goal of dissemination of machine learning education and research. Although it's been for quite a while there is a new feature that will interest a lot of people.

3) Open CV

OpenCV (Open source computer vision) is a library of programming functions mainly aimed at real time computer vision. Originally developed by Intel, it was later supported by Willow Garage then Itseez (which was later acquired by Intel). The library is cross-platform and free for use under the open source BSD license.

4) Tensor Flow

TensorFlow allows developers to create dataflow graphs—structures that describe how data moves through a graph, or a series of processing nodes. ... TensorFlow applications can be run on most any target that's convenient: a local machine, a cluster in the cloud, iOS and Android devices, CPUs or GPUs.

It is an open source artificial intelligence library, using data flow graphs to build models. It allows developers to create large-scale neural networks with many layers. TensorFlow is mainly used for: Classification, Perception, Understanding, Discovering, Prediction and Creation.

Algorithms Used :

1) Discrete Fourier Transform

Discrete-time Fourier transform (DTFT) is a method of representing a discrete-time signal in frequency domain. It is popular for digital signal processing because using this the complicated convolution operation of two sequences in time domain can be converted into a much simpler operation of multiplication in frequency domain.

2) Fast Fourier Transform

Fast Fourier Transform (FFT), a method developed by Cooley and Turkey is an algorithm for computing the DFT efficiently. The efficiency is achieved by adopting a divide and conquer approach which is based on decomposition of an N-point DFT into successively smaller DFTs and then combining them to give total transform.

3) Image Enhancement

Image enhancement is the process of manipulating an image so that the result is more suitable than the original for a specific application.

Gray Level Transformations
Zero Memory Point Operations
Histogram Processing
Histogram equalization
Neighborhood Processing
Spatial Filtering
Smoothing and Sharpening Filters
Median Filter

4) Image Segmentation

Image segmentation is the process of partitioning an image into regions or objects.

Segmentation procedures partition an image into its constituent parts or objects.

Robert Algorithm
Sobel Algorithm
Previtt masks Algorithm
Laplacian Mask Algorithm

5) Artificial Neural Network

Machine learning systems often use neural networks. Machine learning systems are artificial intelligence systems that learn from data. For instance, a machine learning system can be trained on email messages to learn to distinguish between spam and nonspam messages.

After learning, the system can then be used to classify new e-mail messages into spam and nonspam folders.

6) Fuzzy Logic

Fuzzy logic provides a technique to deal with imprecision and informacion granularity. In general, fuzzy logic provides an inference structure that enables appropriate human reasoning capabilities.

Fuzzy logic is a form of multi valued logic to deal with reasoning that is approximate rather than precise. This is in contradiction with "crisp logic" that deals with precise values. Fuzzy logic variables may have a truth value that ranges between 0 and 1 and is not constrained to the two trurh values of classic propositional logic. Also, as linguistic variables are used in fuzzy logic, these degrees have to be managed by specific functions.

7) Expert System

Expert systems (ESs) are computer systems that attempt to mimic human experts by applying expertise in a specific domain. Expert systems can either support decision makers or completely replace them. Expert systems are the most widely applied and commercially successful intelligent systems. A fascinating example of an expert system is IBM's Watson

Benefits for Environment :

Thanks to the advancement of modern software, hardware, and Internet networking, the paperless office trend is growing in popularity.

Doing away with paperwork does sound enticing, especially for colleges that are more environmentally conscious. It's better than using reams of paper, but it also cuts down overhead expenses.

Advantages :
1) Reduced Carbon Footprint
2) Access to Documents from Everywhere
3) Keeps Things Simple
4) Increased Accessibility
5) Security
6) Reduced Costs

Benefits for Society :

1) Increased output and productivity

2) Increased quality

The software can provide consistent advice and reduce error rates.

3) Reliability

Software does not become tired or bored, call in sick, or go on strike. They consistently pay attention to details.

4) Ability to work with incomplete or uncertain information

5) Enhancement of decision-making and problem-solving capabilities

Allow the integration of expert judgment into analysis.

6) Decreased decision-making time

Usually can make faster decisions than humans working alone.

Applications :

1) Record voice and perform signal processing on it like sampling , reconstruction , signal manipulation (shifting, reversal, scaling, addition, multiplication) , convolution , discrete fourier transform , fast fourier transform.

2) Record voice and convert to text.
3) Image Enhancement
4) Image Segmentaion
5) Face Detection using Artificial Neural Networks.
6) Face Recognition

7) Fuzzy Logic

A computer programmed to use fuzzy logic precisely defines subjective concepts that humans do not define precisely.

For example, for the concept "Student Performance," descriptive terms such as "high" and "moderate" are subjective and imprecise. Using fuzzy logic, however, a computer could define "high" performance, and "moderate" performance. A professor at a college might then use these values when considering a application.

8) Expert System

Expert systems (ESs) are computer systems that attempt to mimic human experts by applying expertise in a specific domain. Expert systems can either support decision makers or completely replace them.

When a professor has to make a complex decision or solve a problem, it often turns to experts for advice. These experts possess specific knowledge and experience in the problem area. They can offer alternative solutions and predict whether the proposed solutions will succeed. At the same time, they can calculate the costs that the professor may incur if it does not resolve the problem.