CERTIFICATE

This is to certify that the Seminar entitled

"AI using Cloud Computing: a Case Study of Microsoft Azure's Cognitive Services"

Submitted by

Vedant More **307B075**

Is a bonafide work carried out by him/her under the supervision of **Prof. S C Rathod** and it is approved for the partial fulfillment of the requirement for **TE Information Technology Engineering 2019** course of Savitribai Phule Pune University, Pune in the academic year 2022-23.

This Seminar report has not been earlier submitted to any other Institute or University for the award of any degree or diploma.

Prof. S. C. Rathod
Internal Guide
Department of Information Technology

Dr. S. R. Ganorkar
Head of Department
Department of Information Technology

Dr. S. D. Lokhande
Principal
Sinhgad College of Engineering

This Seminar report has been examined by us as per the Savitribai Phule Pune University, Pune requirements at Sinhgad College of Engineering, Pune-41 on . . . . . .

Internal Examiner

External Examiner

Date:

Place: Pune

ACKNOWLEDGEMENT

I feel great pleasure in expressing my deepest sense of gratitude and sincere thanks to my guide **Prof. S. C. Rathod** for their valuable guidance during the work, without which it would have been very difficult task. I have no words to express my sincere thanks for valuable guidance, extreme assistance and cooperation extended to all the Staff Members of my Department. This acknowledgement would be incomplete without expressing my special thanks to **Dr. S. R Ganorkar** Head of the Department (Information Technology) for their support during the work.

I will be failing in duty if I do not acknowledge with grateful thanks to the authors of the references and other literature referred to in this seminar. This seminar was very helpful to in giving the necessary background information and inspiration for my topic and this seminar wouldn't be possible without their useful and precise resources.

I would also like to extend my heartfelt gratitude to my Principal, **Dr. S. D. Lokhande** who provided a lot of valuable support, mostly being behind the veils of college bureaucracy. Last but not least I would like to thanks all the Teaching, Non- Teaching staff members of my department, my parent and my colleagues those who helped me directly or indirectly for completing of this work successfully.

Vedant More

Students Name & Signature

ABSTRACT

Cloud Computing provides everything like a service, with the aim of offering an infrastructure and active application platform, with is scalable and efficient in terms of cost for customers. Cloud services are quite abstract without a set of well-defined characteristics and according to user requirements, there are several solutions available on the market of Cloud computing. There are multiple cloud service provider leading the cloud industry and making a global impact of technology and innovation.

In this report we will see the detailed study of Azure Platform provided by Microsoft Corporation which is second largest cloud service platform after Amazon Web Service. In this paper we will also compare the various compute resources offered by Amazon Web Service Microsoft Azure and Google Cloud Platform. We further identify several platform features including geographic availability, security and compliance, operating system support, containers used and serverless computing support.

Comparing major cloud service providers, we found that overall, for compute resources Microsoft Azure is the preferred provider for many of the features we identify. However, this difference is really small, in reality it is difficult to find significant difference between the platforms since they are ever changing and making themselves adapt to new technology. Azure with its wide variety of services provides us to utilize best computing resources such as Virtual Machines, Azure DevOps, API management, Cosmos Database etc.

Later in Report we will study some of Azure Basic Services and detailed explanation and implementation of few services with practical demonstration using Azure Platform and later on we will also study Azure Cognitive services which include Vision, Language, Speech and Decision followed explanation of any one of Cognitive service with its working.

keywords— Windows Azure, Resources, Services, Cloud Computing, Virtual Machine, Face Detection, Face API,Language API, QnA maker, Language Understanding, Natural Language Processing.

CONTENTS

Abbreviations

Sr. No.	Abbreviation	Meaning/ Full form	Page No.
1.	IaaS	Infrastructure as a Service	9
2.	PaaS	Platform as a Service	9
3.	SaaS	Software as a Service	9
4.	API	Application Programming Interface	12
5.	EC2	Elastic Compute Cloud	12
6.	SQL	Structured Query Language	12
7.	VM	Virtual Machine	13
8.	CRM	Customer Relationship Management	14
9.	VPN	Virtual Private Network	14
10.	GUI	Graphical User Interface	15
11.	GCE	Google Compute Engine	17
12.	QnA	Question and Answer	23
13.	LUIS	Language Understanding	23
14.	NLP	Natural Language Processing	25

List of Tables

List of Figures

CHAPTER 1

INTRODUCTION

1.1 Introduction to Seminar Topic

Cloud is an abstract, virtual environment where programs and data are stored. In cloud computing power is provided by data centers, which can contain systems for data storage and many servers that have the ability to manage almost any software, and customers pay flexibly according to the resources used, based on a monthly fee. Also, in Cloud Computing users do not need to buy software or maintain expensive servers and devices for data storage, this leads to significant reduction of expenses, office space, and internal staff for IT support and increase of data security. There are three main components for cloud computing these components include Clients, Data centers and Distributed Servers. Client is defined by terminals or common computers whose benefit are small hardware costs, small IT costs, security, lower power consumption, easy repair and replacement etc. The data centers consist of collections of servers where subscription applications are hosted. These can rely on a large hall in the same building or a room of servers outside the organization and may contain virtualized servers for which the software can be installed allowing multiple instances of virtual servers that can be used. A lot of virtual servers can run on one physical server. Distributed Servers that should not be located all in the same location but in disparate geographic locations. In reality if something happens to a site, such as a power failure, the service may be accessed from another site.

Users need an efficient and adaptable infrastructure for the purpose of their business. This involves a non-stop running service, available from anywhere in the world. Data centers can have more destinations such as: transaction processing center; centers for multimedia content delivery, data center to perform complex simulations, data processing operations of enterprise type, data center for regular businesses. A vast attention has been directed towards the virtualization technology, because the cloud is largely relied upon it. With the help of virtualization, one can quickly download apps or websites, from the cloud. In order to yield the full potential of the cloud, companies should migrate all their current applications to the cloud, and in order to do that- only an internet connection is required.

Windows Azure appeared in 2009 and contains the following types of services, IaaS (Infrastructure as a Service) it is a Cloud model where a provider rents a technological infrastructure, i.e., remote virtual servers, which can replace completely or partly existing IT systems within the company. IaaS includes the entire stack of infrastructure resources and facilities (electric power, cooling solutions, etc.) for hosted hardware platforms. IaaS provides a set of APIs that allow forms of management and other types of interaction with infrastructure for consumers. PaaS (Platform as a Service) is that kind of Cloud in which a supplier provides development solutions and application hosting, being used by companies to develop and host solutions on demand or provide services to other companies. IaaS PaaS is created over IaaS adding an extra level of integration with different frameworks of application development. SaaS (Software as a Service) represents a model in which a provider offers through web

services different applications that make them available to end users. Such services are generally intended to replace user-installed applications on their local systems

1.2 Motivation Behind Project Topic

In Today's world Every business is under pressure to respond more quickly to changing business conditions. Unfortunately, traditional IT processes are a poor match for today's speed. Provisioning resources commonly takes weeks or months, thereby slowing the reflexes of the business. With cloud computing, resources are available in minutes, which means companies can respond to new market developments much more rapidly. Cloud computing is not just a trendy application that people can use to store their photos and videos online. It is part of a business model that is taking the world by storm. Cloud computing not only changes how so many businesses store and access data, but it is also changing how many of these businesses operate. And this can be done using pre-build features like Artificial Intelligence and Machine Learning in Cloud Computing services. Azure is second most widely used Cloud service provider in world, it has many APIs in Azure's cognitive services which can be used to integrate with our software which is already deployed and hosted on cloud service provider.

1.3 Aim and Objective(s) of the work

The aim of this seminar is to study about Artificial Intelligence using Cloud Technologies. This seminar report gives idea on how AI and ML services can be integrated to application using pre-build codes or APIs in Cloud Service provider, here we will study about some services by using popular cloud service provider Microsoft Azure.

Artificial Intelligence has coincided with the expansion of cloud computing. Using AI in the cloud can improve cloud performance and efficiency while driving digital transformation in enterprises.AI capabilities in the cloud computing environment are crucial to making business operations more efficient, strategic, and insight-driven while also providing additional flexibility, agility, and cost savings.

Undoubtedly, AI and cloud computing have improved countless lives. For example, every day, people use digital assistants like Siri, Google Home, and Amazon's Alexa, allowing for an easy spoken command that can purchase an item, adjust a smart home temperature, or play music on a connected speaker, among many other functionalities.

AI and cloud computing are redefining business. AI and cloud computing help companies make sense of huge amounts of data, expedite complex processes, and improve product and service delivery.AI and cloud computing might help us:

- Yield excellent customer experiences
- Work more efficiently
- Get the most out of the data and insights you collect

CHAPTER 2

LITERATURE SURVEY

2.1 Cloud Computing and Windows Azure

The research paper proposed by Faculties of Computer Science for Business Management, Romanian - American University and Faculty of Informatics Titu Maiorescu University Bucharest has given a brief idea on Cloud Computing that the Cloud computing provides everything like a service, with the aim of offering an infrastructure and an active application platform, which is scalable and efficient in terms of cost for customers. Cloud services are quite abstract without a set of well-defined characteristics and according to user requirements, there are several solutions available on the market of Cloud computing.

In this paper we also get to know about different cloud types of cloud that are Public Cloud, Private Cloud and Hybrid Cloud. A public Cloud provides global services, whereas a private Cloud is a proprietary network or a Data Centre, which provides services to a limited number of people.

There are different Cloud Services providers, in this paper we see benefits of using Microsoft Azure as Cloud Service provider. Using Windows Azure applications can be developed applications in almost any language and can integrate public applications from Cloud into existing IT environment. Windows Azure includes the following features that enable customers to control access to their data and applications:

1. Organizations can synchronize identification data at headquarters with Active Directory from Windows Azure and allows single authentication to simplify user access to their cloud-based applications.
2. At any time can be achieved security reports to monitor data access and contribute to risk management.
3. Authentication can be done by several methods, which helps to prevent unauthorized access, also providing a mechanism for authentication in addition to password.

2.2 A Detailed Study of Azure Platform & Its Cognitive Services

This paper was published on International Conference on Machine Learning, Big Data, Cloud and Parallel Computing by graduates of Department of Computer Science & Engineering Manav Rachna International Institute of Research and Studies. It mainly focuses on Microsoft Azure and its Cognitive Services. Firstly, this paper gives introduction to Azure followed by cloud deployment models and types of services in cloud Computing. Azure's Cognitive services comes under Platform as a service model. We also study about Azure's storage model to show how Azure stores application's databases. Data can be saved in Windows Azure in 4 unique ways i.e.: Queues, SQL Azure Database, Tables, Blobs.

1. Blobs: These are handed-down for coordinated estimations and take after records on our troublesome drive.
2. Tables: To draw in support to work with a fact in a much increasingly basic fine-grained method, Azure storing offers tables. A table has no described graph or perhaps, properties can have forms.
3. Queues: This amassing is used to trade messages between squares of code.
4. SQL Azure Database: We are capable make utilization of SQL Azure Databases when we require social storing. SQL Azure offers a basic subset of SQL Server's accommodation, which fuses counting, as an administered cloud advantage.

Performance Analysis:

This section highlights the advantages of cloud hosting over traditional web hosting with relevant parameters. Here a comparison between three major cloud service providers that is Amazon Web Service, Microsoft Azure and Google Cloud Platform is compared.

Feature	**Amazon EC2**	**Google App Engine**	**Microsoft Engine**
Cloud Service Area	IaaS	Paas	IaaS and PaaS
Development Tools	To create images of server platform, provides only virtual machine.	Provides editing, simulation and deployment tools.	Visual Studio provides best development platform for developers to build Azure applications.
Platform Services	Not available	Google Services	Windows Azure App Fabric Services-Service Bus Access Control.
Programming Language Support	Supports oracle ,.NET	Python and Django	.NET, JAVA, Apache, Ruby, PHP, C, C++,

Table 2.1. Comparison of Services with Azure's Services

2.3 Developing and Deploying Applications for Highly Available Storage of Cloud Service

By Studying this research paper, we get a lot of useful information. This information consists of various cloud computing services, features and current issues related to such systems, possibility to proceed further with different solutions to the existing problems. Hence it helps a lot to enhance and overcome issues of existing methodology in future. This paper explains more about storage models and detailed information on Azure Development cycle.

Azure Development cycle consists of two phases first is Development Phase and Second is Deployment Phase. In Development phase Construction of application code is done locally on a developer's workstation. Commonly used workstation for these visual studio servers these are best development platform for developers to build Windows Azure Application. Hence, Windows Azure Application are developed in Visual Studio IDE. Followed by Construction testing of a software is done using Visual Studio suite of testing tools such as unit test, integration test etc. unit testing of code is done by the developer locally. After both constructing and testing an application, it is time for Deploying it to cloud. Deployment is carried in two stages: Staging and Production. The application is first uploaded into Staging which provides testing environment where it is tested using various tests. Once the applications run without any error in this stage then it is promoted to production which is made accessible to public using a user-friendly URL.

2.4 Using Cloud Computing as an Infrastructure Case Study- Microsoft Azure

Published on Technium this paper gives idea on not only Cloud Computing Services but also on Microsoft Azure's specialized Services. Microsoft platform that offers a wide range of different services, Windows Azure can build, deploy, and manage solutions for virtually every imaginable goal. The Cloud-based Windows Azure Services include Computer services, Network Services, Data services, Application Services. Also, this paper mainly focuses on Azure's Virtual Machines.

Azure's Virtual Machines (VMs) are one of the major functions of Azure's IaaS capabilities along with Virtual Networks. Virtual Machines support the use of a Windows or Linux server in the Microsoft Azure database. There is full control of VM configuration here. Like other virtual machines an VM in Azure has an operating system, storage system and network capabilities and can run a variety of applications. If we want to store an image, we can use one provided by Azure or one of our own. Azure Virtual Machines allow the creation and use of virtual machines in the cloud. virtual machine technology can be used in various ways including:

- Virtual development and testing machines
- Executing cloud applications
- Expanding the cloud data center
- Treatment of critical data in case of disaster in business

CHAPTER 3

Cloud Computing and Microsoft Azure

3.1 What is Cloud

Before Understanding Cloud Computing we need to understand what is cloud. Cloud The cloud is not a physical entity, but instead is a vast network of remote servers around the globe which are hooked together and meant to operate as a single ecosystem. Cloud can provide services over network, i.e., on public networks or on private networks, i.e., WAN, LAN or VPN. Applications such as e-mail, web conferencing, customer relationship management (CRM), all run in cloud. All infrastructure, platforms, or software that are hosted by third-party providers and made available to users through the internet.

3.2 Cloud Computing

Cloud computing is the delivery of computing services like servers, storage, databases, networking, software, analytics, and intelligence over the Internet or the cloud, to offer faster innovation, flexible resources, and economies of scale. It is manipulating, configuring, and accessing the applications online. It offers online data storage, infrastructure and application. Cloud Computing is both a combination of software and hardware-based computing resources delivered as a network service. It mainly involves manipulating, configuring, and accessing the applications online. It is both a combination of software and hardware-based computing resources delivered as a network service.

Cloud Computing Architecture:

Cloud computing architecture is divided into the following two parts -

1. Front End
2. Back End

1.Front End: The front end is used by the client. It contains client-side interfaces and applications that are required to access the cloud computing platforms. The front end includes web servers (including Chrome, Firefox, internet explorer, etc.), thin & fat clients, tablets, and mobile devices.

2.Back End: The back end is used by the service provider. It manages all the resources that are required to provide cloud computing services. It includes a huge amount of data storage, security mechanism, virtual machines, deploying models, servers, traffic control mechanisms, etc.

Both front end and back end are connected to others through a network, generally using the internet connection.

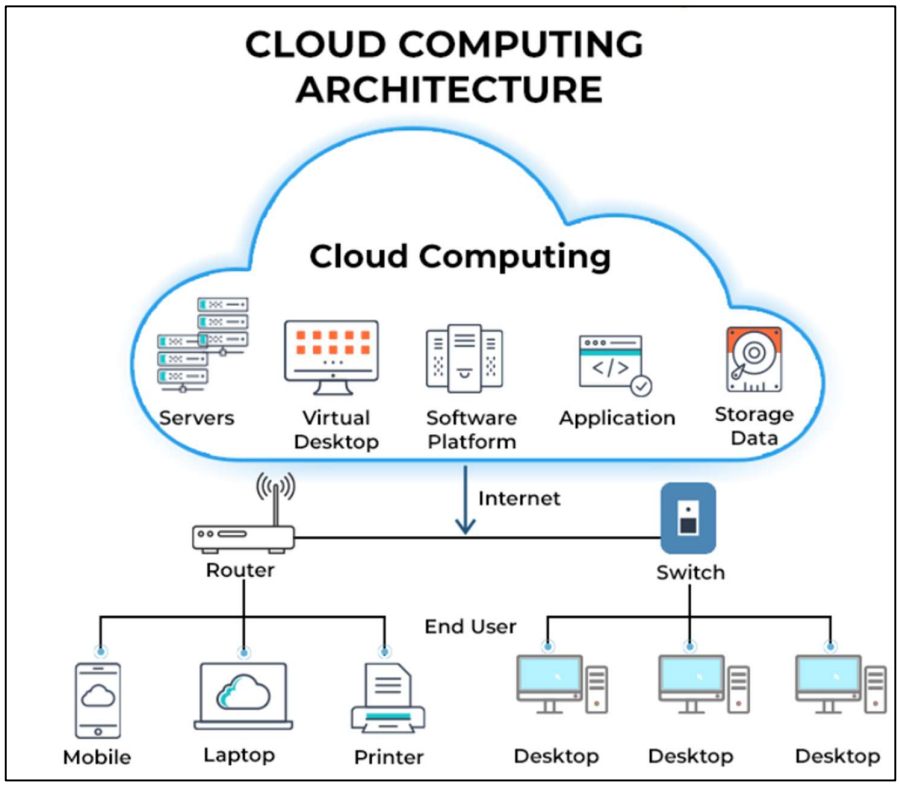

Fig.3.1: Cloud Computing Architecture

Components of Cloud Computing Architecture

There are the following components of cloud computing architecture -

1. **Client Infrastructure**

   Client Infrastructure is a Front-end component. It provides GUI (Graphical User Interface) to interact with the cloud. It is group of multi-layer hardware support for various devices.

2. **Application**

   The application may be any software or platform that a client wants to access. It is a computer software package that performs a specific function for an end user or another application based on carefully designed features

3. **Service**

   A Cloud Services manages that which type of service you access according to the client's requirement. They are wide range of services delivered on demand to companies and customers over the internet. These services are designed to provide easy, affordable access to applications and resources, without the need for internal infrastructure or hardware.

There are certain services and models working behind the scene making the cloud computing feasible and accessible to end users.

Following are the working models for cloud computing:

1. Deployment Models
2. Service Models

3.2.1. Deployment Models:

Deployment models define the type of access to the cloud, i.e., how the cloud is located? It specifies how your cloud infrastructure will look, what you can change, and whether you will be given services or will have to create everything yourself. The cloud deployment model identifies the specific type of cloud environment based on ownership, scale, and access, as well as the cloud's nature and purpose. The location of the servers you're utilizing and who controls them are defined by a cloud deployment model. Relationships between the infrastructure and your users are also defined by cloud deployment types. Cloud can have any of the four types of access: Public, Private, Hybrid and Community.

- **Public Cloud**: The Public Cloud allows systems and services to be easily accessible to the general public. Public cloud may be less secure because of its openness, e.g.-mail. The public cloud makes it possible for anybody to access systems and services. The public cloud may be less secure as it is open for everyone. The public cloud is one in which cloud infrastructure services are provided over the internet to the general people or major industry groups.
- **Private Cloud**: The Private Cloud allows systems and services to be accessible within an organization. It offers increased security because of its private nature. The private cloud deployment model is the exact opposite of the public cloud deployment model. It's a one-on-one environment for a single user (customer).
- **Community Cloud**: The Community Cloud allows systems and services to be accessible by group of organizations. It allows systems and services to be accessible by a group of organizations. It is a distributed system that is created by integrating the services of different clouds to address the specific needs of a community, industry, or business.
- **Hybrid Cloud**: The Hybrid Cloud is mixture of public and private cloud. However, the critical activities are performed using private cloud while the non-critical activities are performed using public cloud. Organizations can move data and applications between different clouds using a combination of two or more cloud deployment methods, depending on their needs.

3.2.2. Service Models:

Service Models are the reference models on which the Cloud Computing is based. These can be categorized into three basic service models as listed below:

- **Infrastructure as a Service:** IaaS is the delivery of technology infrastructure as an on demand scalable service. It is a computing infrastructure managed over the internet. The main advantage of using IaaS is that it helps users to avoid the cost and complexity of purchasing and managing the physical servers. IaaS provides access to fundamental resources such as physical machines, virtual machines, virtual storage, etc. DigitalOcean, Linode, Amazon Web Services (AWS), Microsoft Azure, Google Compute Engine (GCE), Rackspace, and Cisco Meta cloud are some examples of IaaS.
    - Usually billed based on usage
    - Usually, multi-tenant virtualized environment
    - GUI and API-based access
    - Can be coupled with Managed Services for OS and application support

- **Platform as a Service:** PaaS provides the runtime environment for applications, development & deployment tools, etc. PaaS provides all of the facilities required to support the complete life cycle of building and delivering web applications and services entirely from the Internet. Typically, applications must be developed with a particular platform in mind. AWS Elastic Beanstalk, Windows Azure, Heroku, Force.com, Google App Engine, are some examples of IaaS.
    - Multi-tenant environments
    - Highly scalable multi-tier architecture
    - Support multiple languages and frameworks
    - Accessible to various users via the same development application.

- **Software as a Service:** SaaS model allows to use software applications as a service to end users. Users can access these applications with the help of internet connection and web browser. SaaS is a software delivery methodology that provides licensed multi-tenant access to software and its functions remotely as a Web-based service. Google Apps, Salesforce Dropbox, Slack, HubSpot, Cisco WebEx are examples of SaaS.
    - Usually billed based on usage
    - Hosted on a remote server
    - Managed from a central location
    - Usually, multi-tenant environment
    - Highly scalable architecture

3.3 Microsoft Azure:

Microsoft Windows Azure is a cloud computing platform released on 1stFebruary 2010 and created by Microsoft. It helps to build, deploy and manage application and services through a global network of Microsoft-managed data centers. It provides both PaaS and IaaS services. Paper provides detail introduction of Microsoft Azure and highlights all the services and features offered by Azure. It also describes the steps involved in developing and deploying applications securely on Azure cloud. The aim of Microsoft Azure is to build a web application that runs and stores its data in Microsoft datacenters. It stores data while the applications that consume this data run on premise. The aim of this concept is to minimize the need for managing these resources by providing automated services for easily provisioning scalable, cheaper sources in a timely manner. Main focus of Windows Azure is on development not the infrastructure and it develops massively scalable applications with many users. Microsoft has a huge contribution in the development of data centers for public cloud infrastructure known as Microsoft Windows Azure which serves the need for scientific community. A variety of cloud service is provided by Microsoft Azure which enables you to select right combination that meet your needs from setting up a community website to document. The paper deals with a brief introduction about Microsoft Azure, its services, features and developing and deploying applications securely on the cloud.

Microsoft Azure, formerly Windows Azure, is Microsoft's cloud computing platform and infrastructure. It also enables quick build, deployment and management of applications across the global network of Microsoft datacenters, as well as easy application scaling and support to any chosen language, framework or tool for application development. Features and services are exposed using open REST protocols. The selection of services includes the following list:

- **Compute:** on-demand infrastructure that scales and adapts to changing business needs, including reliable infrastructure for web application deployment and a scalable back-end for mobile solutions (Virtual Machines, cloud Services, Web Sites, Mobile Services).

- **Data Services:** scalable and durable cloud storage, backup and recovery solutions for any data, including cache super-fast access, Hadoop solution and relational databases (Blob, Table, Queue and Drive Storage, SQ Database, Backup, Cache, HDInsight, Hyper-V Recovery Manager).

3.4 Azure Services

Computer services, Network Services, Data services and Application Services are Cloud-based Microsoft's Azure Services. Windows Azure Computer Services provide the power needed to process applications that will run on the cloud. Windows Azure currently offers four different services:

- Virtual machines - This service provides a general-purpose environment that allows to create, deploy, and manage virtual machines in the Windows Azure cloud.
- Web sites - This service provides a managed network environment that can be used to create new web pages or to send existing business clouds to your site.
- Cloud services - This service enables building and deploying low-cost administration applications using almost any programming language.
- Mobile services - This service provides a solution for building and deploying applications and storing data on mobile devices.

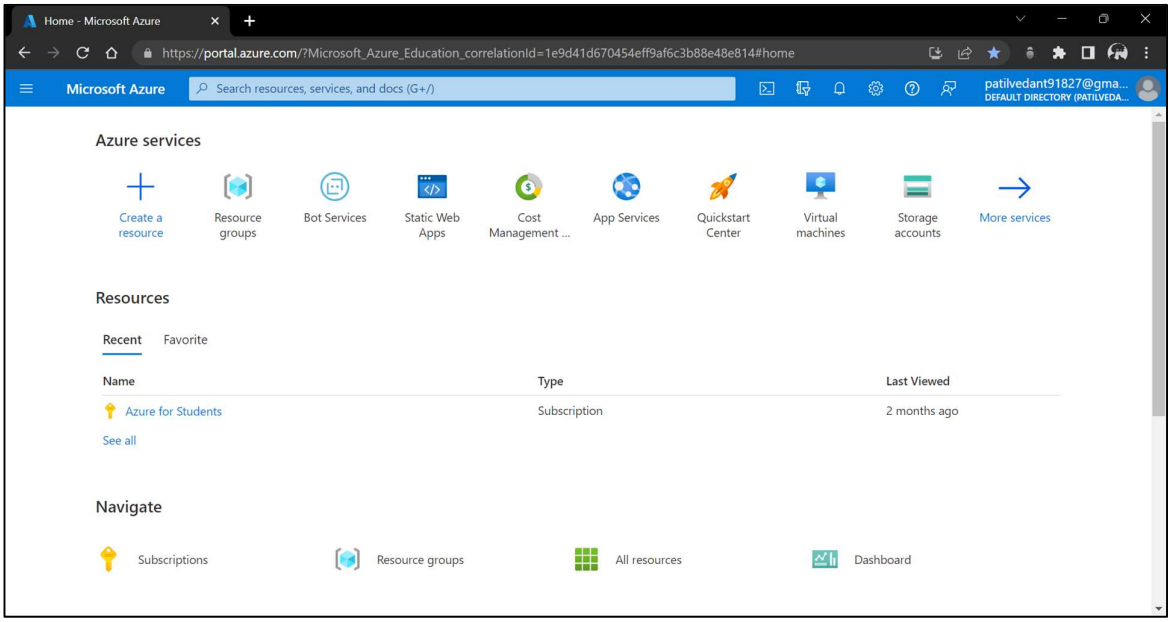

Fig 3.4.1. Azure's Services in Console

3.4.1 Comparison of Microsoft Azure with Other Cloud Service Providers

Cloud service providers are companies that establish public clouds, manage private clouds, or offer on-demand cloud computing components (also known as cloud computing services. Cloud services can reduce business process costs when compared to on-premise IT. Cloud computing services aim to improve the overall performance of businesses in all aspects. They help to save money, boost security and maintain a high quality of service. There are many cloud service providers, between all of them three of them are leading. Those three are Amazon Web Service, Microsoft Azure, Google Cloud Platform. Comparison of features of all three major cloud services providers are shown in table, based on that Microsoft azure is widely recommended for commonly used services.

Feature	AWS	Azure	GCP
Geographic Availability		X	
Security and Compliance		X	
Operating System Support (Windows)	X	X	
Operating System Support (Linux-variants)	X		X
Containers (hybrid cloud environments)	X	X	
Containers (machine learning)	X		
Containers (web applications)		X	
Persistent Functions	X	X	
Final Recommendation		**X**	

Table.3.4.2: Comparison based on Features

CHAPTER 4

TECHNOLOGY

4.1 Azure Static Web Apps

Azure Static Web Apps is a service that automatically builds and deploys full stack web apps to Azure from a code repository. When we create an Azure Static Web Apps resource, Azure interacts directly with GitHub or Azure DevOps to monitor a branch of your choice. Every time you push commits or accept pull requests into the watched branch, a build automatically runs and your app and API is deployed to Azure.

Static web apps are commonly built using libraries and web frameworks like Angular, React, Svelte, Vue, or Blazor where server-side rendering isn't required. These apps include HTML, CSS, JavaScript, and image assets that make up the application. With Static Web Apps, static assets are separated from a traditional web server and are instead served from points geographically distributed around the world. This distribution makes serving files much faster as files are physically closer to end users.

Key features of Azure Static Web App Service:

- Web hosting for static content like HTML, CSS, JavaScript, and images.
- Integrated API support provided by Azure Functions with the option to link an existing Azure Functions app using a standard account.
- First-class GitHub and Azure DevOps integration where repository changes trigger builds and deployments.
- Globally distributed static content, putting content closer to your users.
- Free SSL certificates, which are automatically renewed.
- Custom domains to provide branded customizations to your app.
- Seamless security model with a reverse-proxy when calling APIs, which requires no CORS configuration.
- Authentication provider integrations with Azure Active Directory, GitHub, and Twitter.
- Customizable authorization role definition and assignments.
- Back-end routing rules enabling full control over the content and routes you serve.
- Generated staging versions powered by pull requests enabling preview versions of your site before publishing.

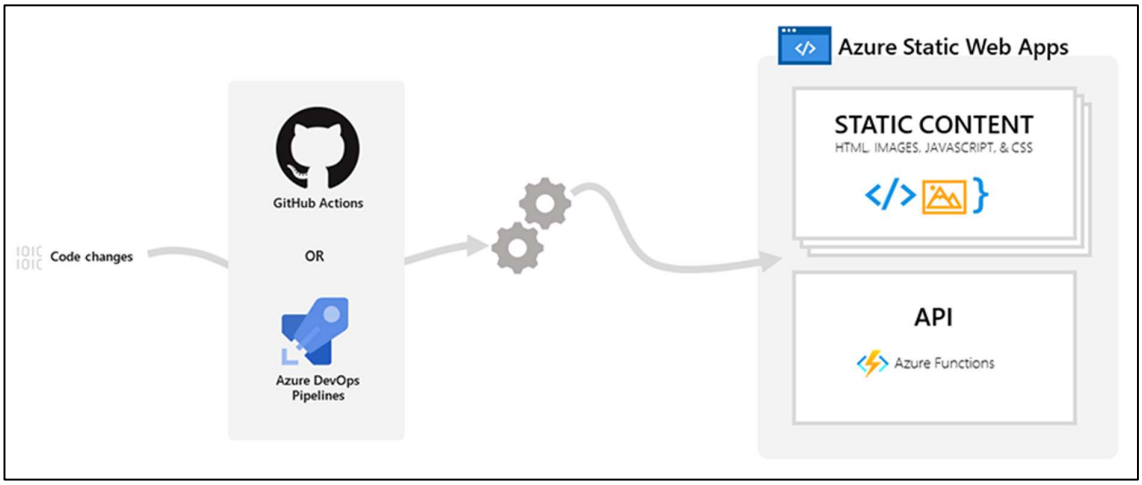

Fig.4.1.1. : Workflow of Azure Static Web App Service

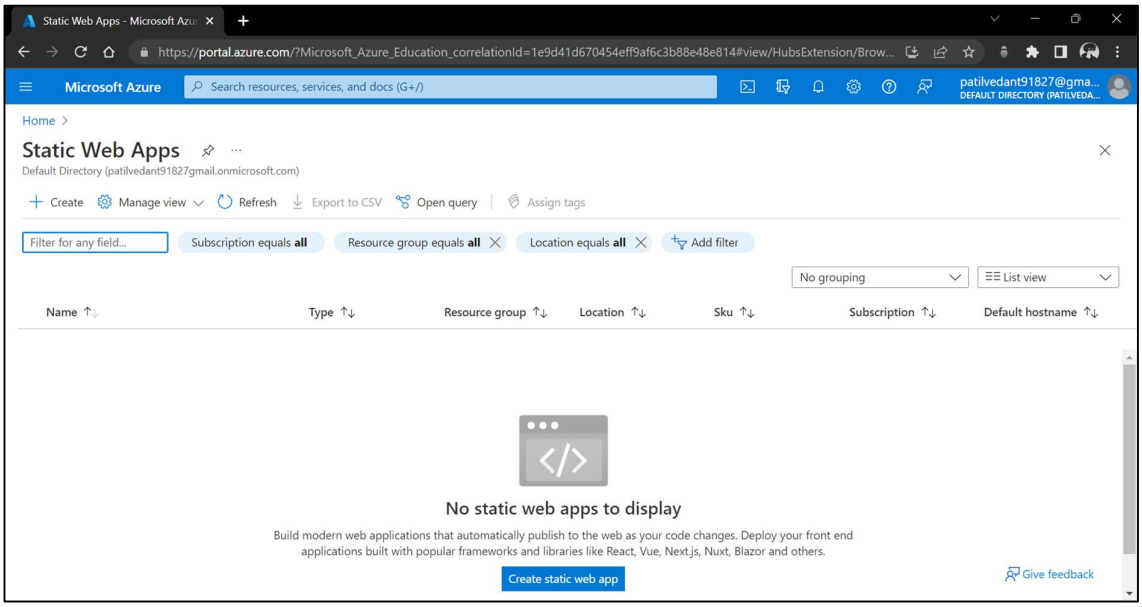

Fig.4.1.2 : Azure Static Web Apps on Cloud Console

AI using Cloud Computing

4.2 Azure Cognitive Services

Azure Cognitive Services are cloud-based artificial intelligence (AI) services that help developers build cognitive intelligence into applications without having direct AI or data science skills or knowledge. They are available through REST APIs and client library SDKs in popular development languages. Azure Cognitive Services enables developers to easily add cognitive features into their applications with cognitive solutions that can see, hear, speak, and analyze. Cognitive Services brings AI within reach of every developer and data scientist. With leading models, a variety of use cases can be unlocked. All it takes is an API call to embed the ability to see, hear, speak, search, understand, and accelerate advanced decision-making into your apps. Enable developers and data scientists of all skill levels to easily add AI capabilities to their apps.

Cognitive Services can be categorized into four main pillars:

- Vision
- Language
- Speech
- Decision

4.2.1 Vision

Service Name	Service Description
Computer Vision	The Computer Vision service provides you with access to advanced cognitive algorithms for processing images and returning information.
Custom Vision	The Custom Vision Service lets you build, deploy, and improve your own image classifiers. An image classifier is an AI service that applies labels to images, based on their visual characteristics.
Face	The Face service provides access to advanced face algorithms, enabling face attribute detection and recognition.

Table. 4.2.1 Vision API

4.2.2 Language

Service Name	Service Description
QnA Maker	Azure Language service provides several Natural Language Processing (NLP) features to understand and analyze text.
Language service	Translator provides machine-based text translation in near real time.
Translator	Language Understanding (LUIS) is a cloud-based conversational AI service that applies custom machine-learning intelligence to a user's conversational or natural language text to predict overall meaning and pull-out relevant information.
Language Understanding LUIS	QnA Maker allows you to build a question-and-answer service from your semi-structured content.

Table. 4.2.2 Language API

4.2.3 Speech

Service Name	Service Description
Speech service	Speech service adds speech-enabled features to applications. Speech service includes various capabilities like speech-to-text, text-to-speech, speech translation, and many more.

Table. 4.2.3 Speech API

4.2.4 Decision

Service Name	Service Description
Anomaly Detector	Anomaly Detector allows you to monitor and detect abnormalities in your time series data.
Content Moderator	Content Moderator provides monitoring for possible offensive, undesirable, and risky content.
Personalizer	Personalizer allows you to choose the best experience to show to your users, learning from their real-time behavior.

Table. 4.2.4 Decision API

Use Cognitive Services in different development environments

With Azure and Cognitive Services, you have access to several development options, such as:

- Automation and integration tools like Logic Apps and Power Automate.
- Deployment options such as Azure Functions and the App Service.
- Cognitive Services Docker containers for secure access.
- Tools like Apache Spark, Azure Databricks, Azure Synapse Analytics, and Azure Kubernetes Service for big data scenarios.

4.3 Language Service:

Azure Cognitive Service for Language is a cloud-based service that provides Natural Language Processing (NLP) features for understanding and analyzing text. Use this service to help build intelligent applications using the web-based Language Studio, REST APIs, and client libraries.

Available features

This Language service unifies Text Analytics, QnA Maker, and LUIS and provides several new features as well. These features can either be:

- Pre-configured, which means the AI models that the feature uses are not customizable. You just send your data, and use the feature's output in your applications.
- Customizable, which means you'll train an AI model using our tools to fit your data specifically.

4.3.1 Azure Bot Service & QnA Maker

Azure Bot Service provides an integrated development environment for bot building. Its integration with Power Virtual Agents, a fully hosted low-code platform, enables developers of all technical abilities build conversational AI bots with or without any code needed.

QnA Maker is a cloud-based Natural Language Processing (NLP) service that allows us to create a natural conversational layer over your data. It is used to find the most appropriate answer for any input from your custom knowledge base (KB) of information. QnA Maker is commonly used to build conversational client applications, which include social media applications, chat bots, and speech-enabled desktop applications.

Knowledge Base:

QnA Maker imports your content into a knowledge base of question-and-answer pairs. The import process extracts information about the relationship between the parts of our structured and semi-structured content to imply relationships between the question-and-answer pairs. us can edit these question-and-answer pairs or add new pairs. After we publish your knowledge base, a client application sends a user's question to your endpoint. Your QnA Maker service processes the question and responds with the best answer.

The content of the question-and-answer pair includes:

- All the alternate forms of the question
- Metadata tags used to filter answer choices during the search
- Follow-up prompts to continue the search refinement

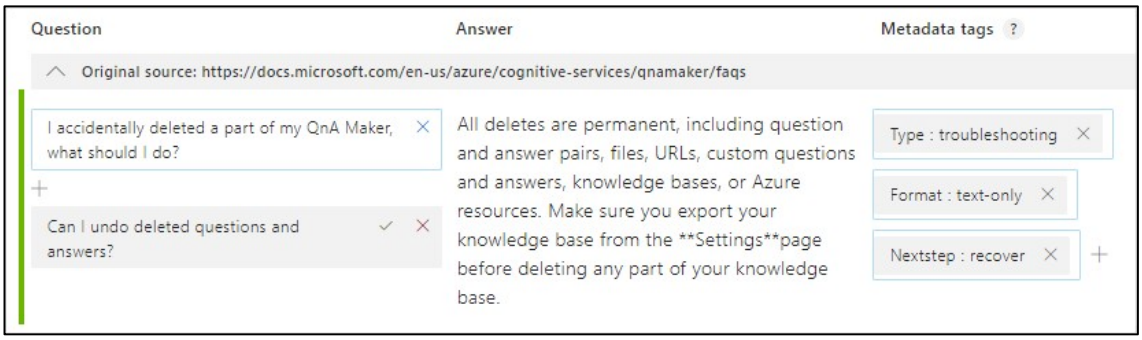

Fig 4.3.1: Knowledge Base of Chat-Bot

4.3.2 Language Detection:

Language detection is one of the features offered by Azure Cognitive Service for Language, a collection of machine learning and AI algorithms in the cloud for developing intelligent applications that involve written language. Language detection can detect the language a document is written in, and returns a language code for a wide range of languages, variants, dialects, and some regional/cultural languages.

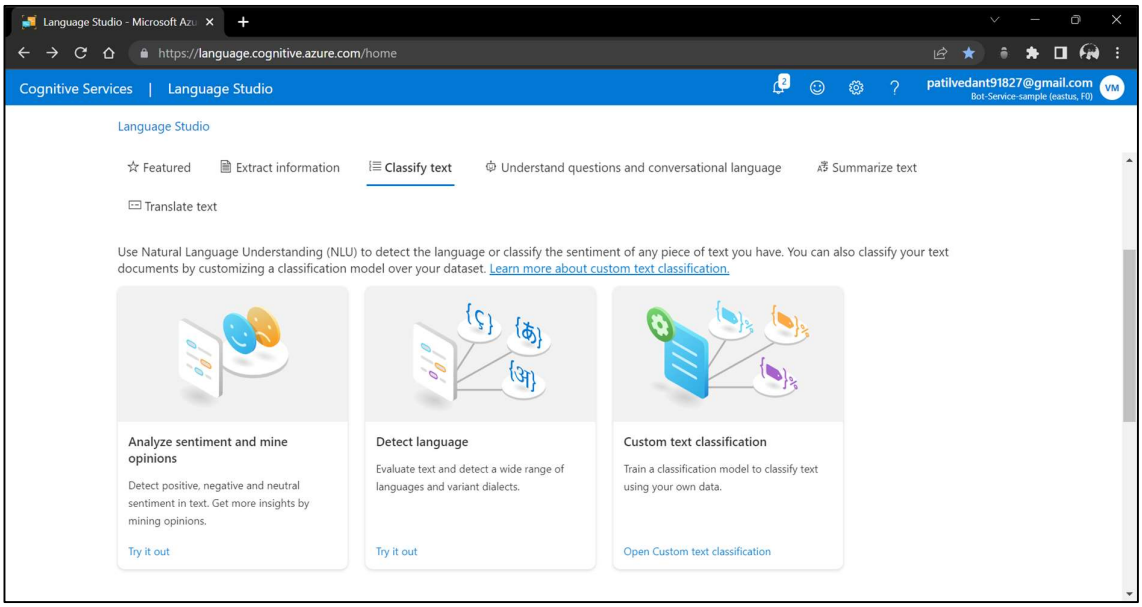

Fig 4.3.2 Language Detection in Azure Console

4.3.3 Text Summarization:

Document summarization uses natural language processing techniques to generate a summary for documents. There are two general approaches to automatic summarization, both of which are supported by the API: extractive and abstractive.

Extractive summarization extracts sentences that collectively represent the most important or relevant information within the original content. Abstractive summarization generates a summary with concise, coherent sentences or words which are not simply extract sentences from the original document. These features are designed to shorten content that could be considered too long to read.

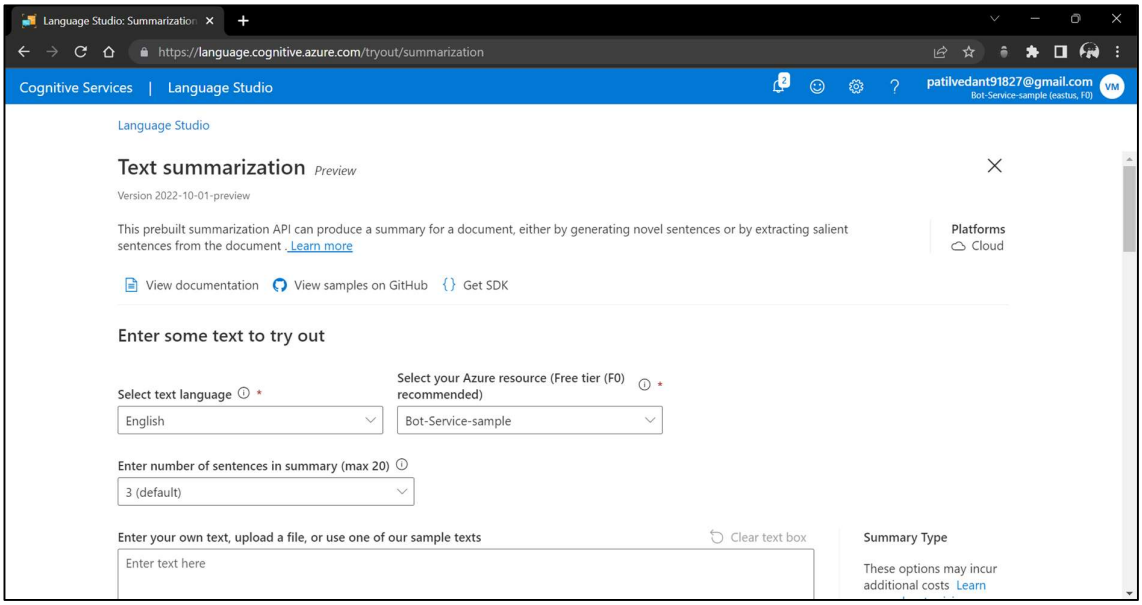

Fig 4.3.3 Text Summarization in Console

4.4 Face Detection using Face API:

The Face API Service, a cloud-based organization that gives the most dynamic face computations. It is a biometric programming application arranged to do especially perceiving or checking a man by differentiating and examining structures subject to the person's facial structures. It perceives some places around one human faces in a photograph and get returned go up against rectangular shapes for where inside the photograph the appearances are, close-by defy characteristics which join M.L-ground needs for gesture highlights. The defy property features accessible are Age, Feeling, Sexual introduction, Posture, Grin and Facial Hair adjacent 27 markers for each stands up to inside the image. The Face API sees up to 64 personal appearances with higher accuracy oppose an area in a picture. In like manner, the picture can be appeared by the record in bytes or huge URL. Face square shape (left, best, width, and stature) exhibiting the face district in the picture is returned adjacent each perceived face. On the other hand, defy area expels a movement of face-related properties, for instance, present, sex, age, head present, facial hair, and glasses.

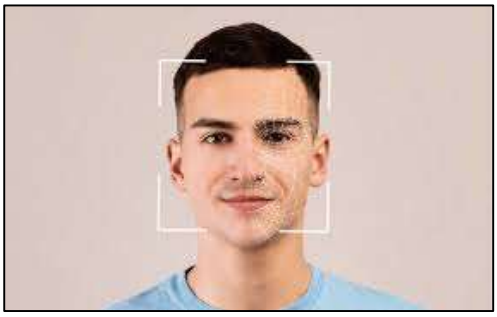

Fig.4.4.1 Example of Face Detection

Detection result :

JSON:

[
{
"faceId":"2090b697-46a0-497b-95d0-4a965f6dfffd",
"Rectangleface": {
"top": 184,
"left": 358,
"width": 157,
"height": 157
},"hair": {
"bald": 0.06,
"invisible": false,
"hairColor": [
{
"color": "brown",
"confidence": 1.0
},
{
"color": "black",
},
"eyebrowLeftInner": {
"x": 432.8,
"y": 210.6
},
"eyeLeftOuter": {
"x": 392.7,
"exposure": {
"exposureLevel": "goodExposure",
"value": 0.57
},
"noise": {
"noiseLevel": "low",
"value": 0.29
}
},
"faceLandmarks": {
"pupilLeft": {
"x": 405.7,
"y": 220.9
},
"pupilRight": {
"x": 477.4,
"y": 237.3
},
"noseTip": {
"x": 439.9,
"y": 271.3
},
},
"mouthLeft": {
"x": 394.1,
"y": 287.8
},
"mouthRight": {
"x": 463.9,
"y": 304.6
"eyebrowLeftOuter": {
"x": 378.2,
"y": 198.9
},
},
"noseRightAlarOutTip": {
"x": 465.0,
"y": 277.2
},
"eyeRightBottom": {

"y": 219.4
},
"eyeLeftTop": {
"x": 408.0,
"y": 217.8
},
"eyeLeftBottom": {
"x": 404.0,
"y": 227.2
},
"eyeLeftInner": {
"x": 418.9,
"y": 226.2
},
"eyebrowRightInner": {
"x": 467.8,
"y": 219.6
},
"eyebrowRightOuter": {
"x": 509.9,
"y": 227.0
},
"eyeRightInner": {
"x": 467.0,
"y": 237.6
},
"eyeRightTop": {
"x": 483.1,
"y": 234.0
},
"x": 479.8,
"y": 245.1
},
"noseLeftAlarOutTip": {
"x": 413.7,
"y": 265.0

"upperLipTop": {
"x": 433.8,
"y": 291.3
},
"upperLipBottom": {
"x": 432.0,
"y": 297.4
},
"underLipTop": {
"x": 426.4,
"y": 309.5
},
"underLipBottom": {
"x": 423.2,
"y": 321.7
}
}
}
]

4.4.1 Face and Emotion Recognition:

Face affirmation is extensively used in various circumstances including security, regular UI, picture content examination and organization, convenient applications, and apply self-rule. Four face affirmation limits are given: defy affirmation, finding equivalent appearances, stand up to the social event, and individual recognizing proof. The Face API as of now additionally organizes feeling affirmation, reestablishing the sureness over a relationship of affections for each face in the image, for instance, shock, disdain, irritate, fear, euphoria, neutral, pain and surprise. These feelings are grasped to be differently and all around talked with exact outward appearances. For Example:

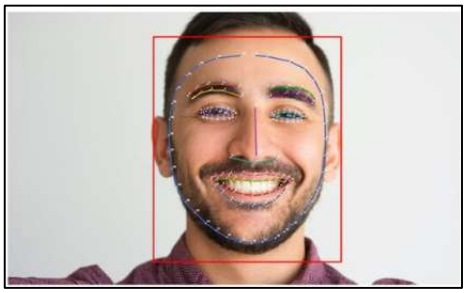

Fig.4.4.1 Example of Face Recognition

Detection result :

1 face detected

JSON:


```
[
 {
 "faceRectangle": {
 "top": 56,
 "left": 123,
 "width": 59,
 "height": 59
 },
 "scores": {
 "anger": 6.932031E-08,
 "contempt": 1.34474765E-09,
 "disgust": 9.843048E-08,
 "fear": 1.65876812E-10,
 "happiness": 0.9999997,
 "neutral": 4.23310347E-08,
 "sadness": 2.851677E-10,
 "surprise": 1.01985542E-07
 }
 }
]
```

CHAPTER 5

CONCLUSION

Computing in cloud computing makes it a reality. Organizations can currently only pay for what they use. This enables a reduction in investment in IT and leads to more efficient use of the Service Microsoft Azure provides the necessary cloud platform that reduces not only the time to discovery, but also the cost of discovery. It minimized the need for managing these resources and provided automated services for easily provisioning scalable, cheap resources in a timely manner. Future work will be oriented towards comparing performance of various cloud service provider in terms of providing effective support to the deployed web application. Computing in cloud computing makes it a reality. Organizations can currently only pay for what they use. This enables a reduction in investment in IT and leads to more efficient use of the data center. However, the economic benefits of using cloud services are attracting organizations where their current systems need improvements.

Microsoft's Windows Azure make with its foundation and stages affiliations will help & steer the improvement culture move from on-begin application makers to cloud engineers. Azure gives an orchestrating and constraint condition inside the distributor. SQL Azure gives a social DBMS inside the cloud, adjoining sorting out and information synchronization. The Windows Azure programming show can be obliging for anyone who should make less unpredictable to immediate, increasingly accessible, and progressively flexible applications. As Microsoft Azure gives a phase to develop any of its organizations. Henceforth in the wake of inquisitive about on Azure, we will furthermore get significant into the emotional organizations i.e., Face Application Program Interface (API) Service, Language Services such as Text Summarization, QnA maker for chat-bot, Language Detection etc.

6. REFERENCES

1. A Detailed Study of Azure Platform & Its Cognitive Services Ankit Verma, Dhutima Malla, Amrit Kaur Choudhary, Vasudha Arora Department of Computer Science & Engineering Manav Rachna International Institute of Research and Studies Faridabad, India
2. Cloud Computing and Windows Azure ECAI 2016 - G. CARUTASU1 , M. A. BOTEZATU1 , C. BOTEZATU1 1 Faculty of Computer Science for Business Management, Romanian - American University International Conference – 8th Edition Electronics, Computers and Artificial Intelligence 30 June - 02 July, 2016, Ploiesti, ROMÂNIA
3. Semantic Representation of Cloud Services: a Case Study for Microsoft Windows Azure Beniamino Di Martino, Giuseppina Cretella, Antonio Esposito and Raffaele Giulio Sperandeo Department of Industrial and Information Engineering.
4. Developing and Deploying Applications for Highly Available Storage of Cloud Service through Secured Channels Pratiksha P. Nikam (Author) Ranjeetsingh S. Suryawanshi (Author) Department of Computer Engineering Department of Computer Engineering.
5. Using Cloud Computing as an Infrastructure Case Study- Microsoft Azure Prof.Ass. Dr Jusuf Qarkaxhija AAB College, Kosovo Technium Vol. 2, Issue 3 pp.93-100 (2020) ISSN: 2668-778X www.techniumscience.com.
6. https://learn.microsoft.com/en-us/azure/cognitive-services/what-are-cognitive-services