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EnterVu - Recruitment through Data Science and Artificial Intelligence

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Abstract: Recruiting the perfect candidate is difficult task for an organisation, as it includes huge process for interview. The concept is to determine the suitability of candidate for the job by the means of CV Analysis, Knowledge Analysis, and Qualitative Prediction using Audio analysis.

The best suitable candidate will be determined by assessing the examination performance and video answers to personality questions (uploaded by the candidate), using Data Analytics and Artificial Intelligence. The candidates will appear for the exam of their interested domains, then record and upload video answers to the defined personality questions. And this data will be analysed to determine the suitability of candidate using Data Analytics and Artificial Intelligence. Currently the recruitment process is hectic and costly.

Also, the candidates are in large numbers so there is scarcity of jobs and the candidates may have to work in a domain away from their interests.

This project will help the recruitment process to be cost effective and also the appropriate candidates will have suitable job and thus, each job will be performed by the appropriate person, which will surely contribute to enhance the progress.

Keywords: Recruitment, Artificial Intelligence, Audio Analysis, Data Analytics, Data Science, Skill-sets.

I. INTRODUCTION

India, being the epicentre of population boom and an increasing technological hub with centres like Pune, Hyderabad and Bangalore, Employment problems are one of the major issues to be solved.

We find that many of the employees are not comfortable with their job, and also sometimes, the job is not what they are interested for. This is also an issue with the employers, as in some cases the employees aren't suitable for the job. This creates imbalance in careers, business and opportunities.

reason behind this is improper allocation of jobs and improper judging of skills. Besides, the recruitment process is hectic and costly. The recruitment process is carried out in personal or video conferencing. The management of time and place constraints in the process are difficult.

Even though there are screening processes, due the large number of applicants, and a few members to judge them, the applicants may not be judged correctly. Their skill-sets may not be justified properly. Implementing a system, which would define proper skill-sets and assign suitable jobs considering the interests and personality of the applicants will solve the issue to greater extent.

II. EnterVU – THE SYSTEM

The system EnterVu, has overcome the present obstacles in recruitment process. EnterVu is a system that replaced the traditional recruitment process with an advanced process. It is a dedicated evaluating system, that focuses on the performance of candidates for evaluating their skills and predicting their personality. Paperless processes are now-a-days in use. EnterVu stores all the constraints and candidate, as well as procedural information and data to the database on Google Compute Platform and SQL Database on Google Compute Instance. Employment is a major part of our career and online recruitment systems are very popular these days. That's why the system is implemented over the web. The personality prediction paradigms are one of the trending technologies used. EnterVu, predicts the personality such that the person is judged correctly, using audio analysis paradigms. AWS EC2 provides processing power and sufficient performance for the system. AWS is cost effective and scalable, which makes it more favourable for use EnterVu system.

III. OBJECTIVES

The main objectives of EnterVu are

A. Eliminate time and place constraints from recruitment process

B. To judge applicant properly and define skills accurately

C. To implement the Recruitment process at advanced level

D. Eliminate persisting employment problems

E. To provide fair opportunities to the youth

F. To implement cost effective and efficient recruitment system.

This system can serve as HR team assistant widely used for recruitment purpose. Through this system, the candidate can achieve a suitable job as per his interests and capabilities.

IV. SYSTEM SPECIFICATIONS

A. *Requirements*

1) HTML5 compatible browser and Active internet connectivity

2) GCE or any equivalent server (4 CPUs 8gb of RAM and above)

3) A storage instance of 10 to 100GB

4) User consisting of an audible output (speakers/headset/earphones)

5) User consisting of web-cam or video recording device

6) User consisting of a microphone or any other voice recording device

B. *Analysis Model: Incremental Model*

The incremental build model is a method of software development where the product is designed, implemented and tested incrementally (a little more is added each time) until the product is finished. It involves both development and maintenance. The product is defined as finished when it satisfies all of its requirements. This model combines the elements of the waterfall model with the iterative philosophy of prototyping. EnterVu system needs to be developed incrementally. As there are major components that may needed to be altered while the development process. Incremental Model enables to do this, and adding some features each time will enable us to decide the exact feature and hep in adding more features. Thus, we are using INCREMENTAL MODEL for the development of this project.
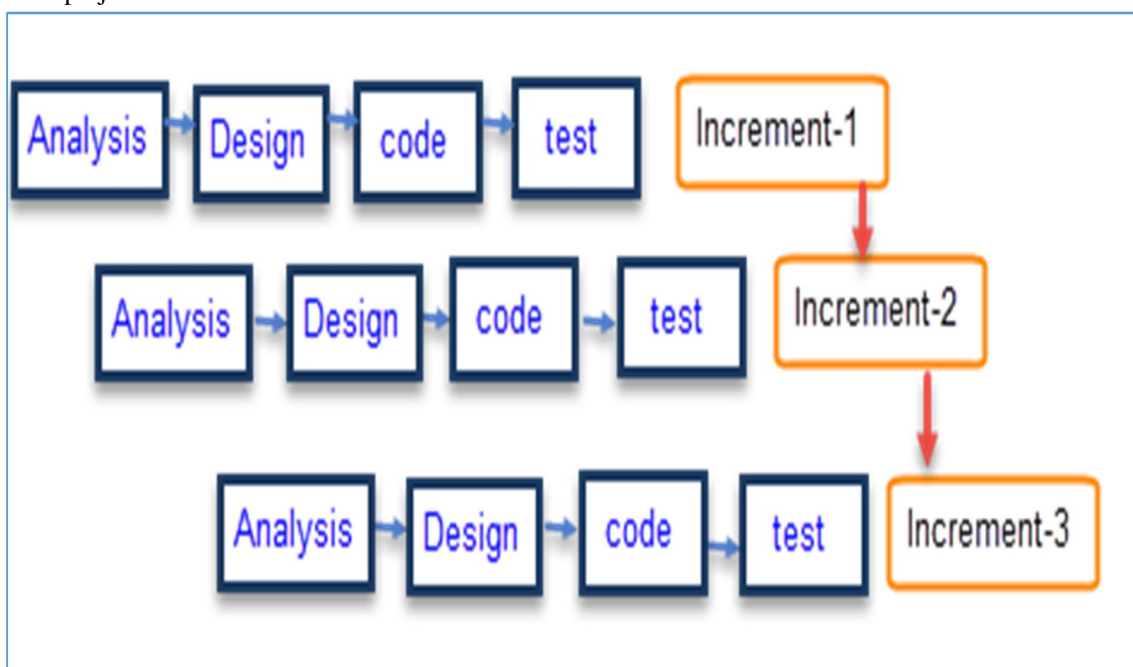
Incremental Model

V. SYSTEM ARCHITECTURE

The overall system design consists of following modules:

A. Storing Candidate Registration details
B. Creating Login profile.
C. Managing Portal for news updates, etc.
D. Conduct Examination.
E. Preparing question set as per interests of the candidate.
F. Evaluate the next question to be asked based on previous questions.
G. Analysing test results.
H. Define skill-sets based on the analysis- Report 1.
I. Video answer recording for personality questions.
J. Extract audio from the video for Audio analysis.
K. Perform Audio Analysis.
L. Store Audio analysis outcomes Report 2.
M. Generate combined report.
N. Submit combined report to HR team.
O. Notify the candidate.
P. Ranking of the candidates to be formed.
Q. Suitable candidates will receive notification.
R. Data can be managed by Admin only.

The system consists of three subsystems: Front-end(web-app), processing unit (Google Cloud Compute Engine) and database (Google Cloud Storage, MySQL Google Cloud Instance). The structured database is in MySQL. We use python language for the implementation of all the processing modules concerned with Data Science. The web-app is the interactive end for users, where users will perform all their activities. The examination will be carried out through web-app and the results will be stored to database, from here the results will be analysed using Data Analytics paradigms. The analysis outcomes will be used for defining skill-sets, strong weak concepts, etc. After this, the video answers will be stored to the database. The audio extracted from video will be analysed. The analysis of audio will yield Confidence, Fluency, Grammar, communication skills of the candidate. Finally, the combined report of result analysis and audio analysis will be submitted to the HR team.
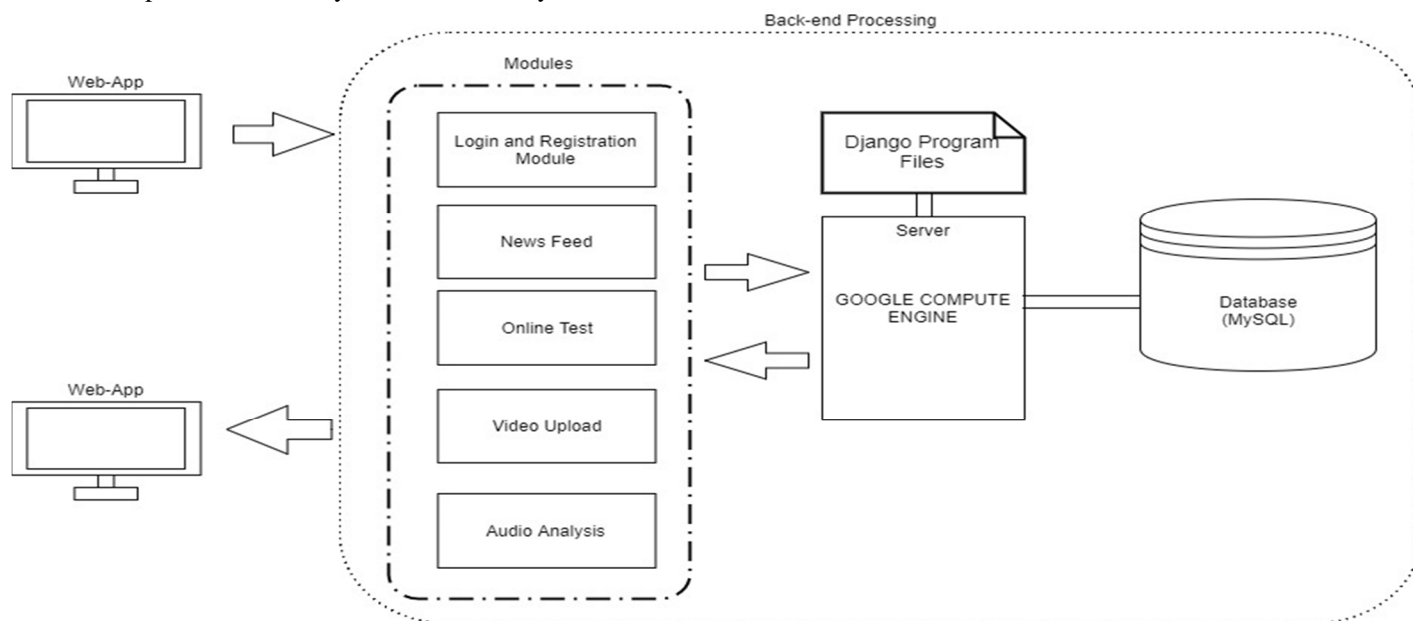

Figure 1. SYSTEM ARCHICTURE

VI.   SYSTEM IMPLEMENTATION

A.   The Flow

The multiple-choice question test defines the skillset of the user whether person is skilled in a particular subject or not. The web-app that will keep the track of the user whether the user is skilled enough to progress through the video record round. The admin will get the record of each so that the record will be sent to the company according to their requirements. The Audio will help to recognize the person how does person talks the way of giving answers. By the audio recording the system will predict whether the person is fluent or is there is a communication problem so that the perfect candidate will be chosen for the job. The profile will show the candidates skills and previous records.

B.   Steps

1) Register / Login
2) Visit Profile
3) Manage profile (if needed)
4) Latest Job News Feed (view only)
5) Previous test results
6) Take new test
7) Select interests
8) Examination
9) Video Answering (upload not allowed)
10) Submit and wait for results
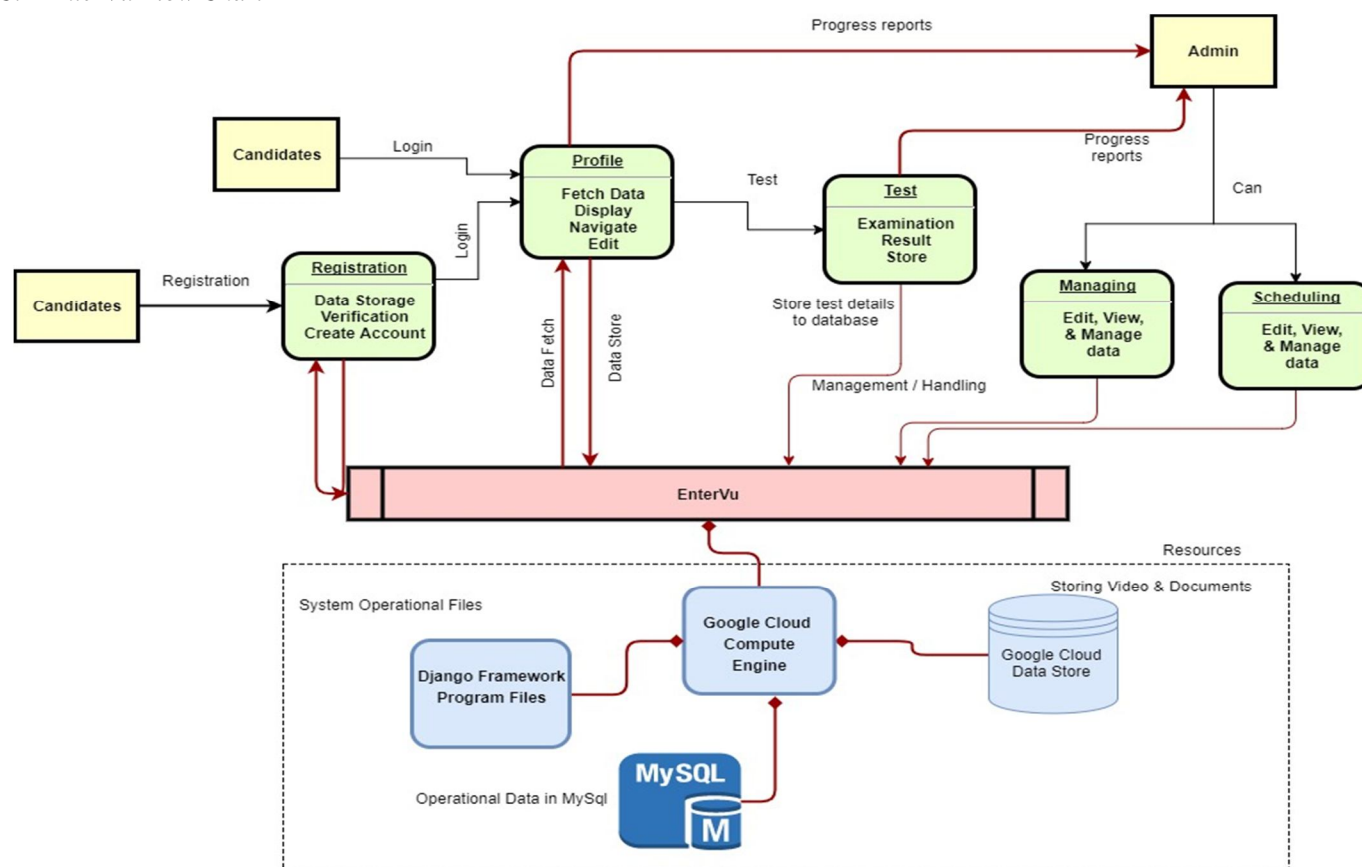11) System will notify
12) Log Out

C.   EnterVu Flow Chart

Figure 2. SYSTEM FLOW
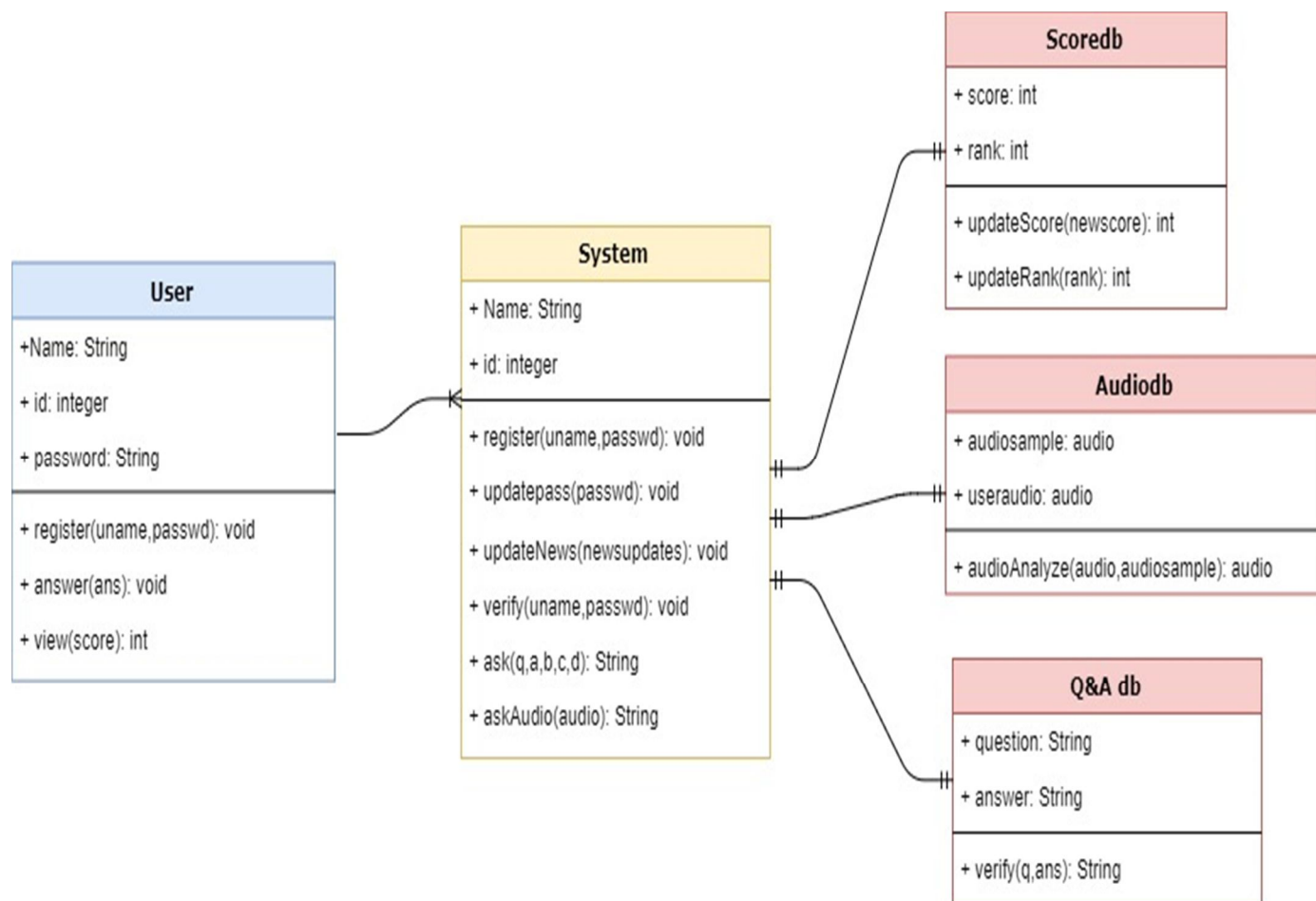
VII. CLASS DESIGN

Figure 3. CLASS DESIGN

VIII. TECHNOLOGIES USED

A. Cloud Computing

Cloud computing is the use of various services, such as software development platforms, servers, storage and software, over the internet, often referred to as the "cloud."

In general, there are three cloud computing characteristics that are common among all cloud-computing vendors:

1) The back-end of the application (especially hardware) is completely managed by a cloud vendor.
2) A user only pays for services used (memory, processing time and bandwidth, etc.).
3) Services are scalable

Many cloud computing advancements are closely related to virtualization. The ability to pay on demand and scale quickly is largely a result of cloud computing vendors being able to pool resources that may be divided among multiple clients.

B. Google Cloud Platform

Google Cloud Platform is a suite of public cloud computing services offered by Google. The platform includes range of hosted services for compute, storage and application development that run on Google hardware. Google Cloud Platform services can be accessed by software developers, cloud administrators and other enterprise IT professionals over the public internet or through a dedicated network connection.

Google Cloud Platform offers services for compute, storage, networking, big data, machine learning and the internet of things (IoT), as well as cloud management, security and developer tools. The core cloud computing products in Google Cloud Platform include:

1) Google Compute Engine, which is an infrastructure-as-a-service (IaaS) offering that provides users with virtual machine instances for workload hosting.
2) Google App Engine, which is a platform-as-a-service (PaaS) offering that gives software developers access to Google's scalable hosting. Developers can also use a software developer kit (SDK) to develop software products that run on App Engine.
3) Google Cloud Storage, which is a cloud storage platform designed to store large, unstructured data sets. Google also offers database storage options, including Cloud Datastore for NoSQL nonrelational storage, Cloud SQL for MySQL fully relational storage and Google's native Cloud Bigtable database.
4) Google Container Engine, which is a management and orchestration system for Docker containers that runs within Google's public cloud. Google Container Engine is based on the Google Kubernetes container orchestration engine.

C. Django

Django came into the scene right as the first big wave of Rails hype was ramping up, and so it was immediately positioned as Python's answer to Rails and thus grabbing eyeballs almost from the start. Today, one of the most significant advantages of learning Python is the ability it gives you to use Django. What with tech start-ups being so hot right now, it's never been easier or more fun to build your own web application. Django just might be your answer. It has been rapidly gaining popularity for its pragmatic design and ease of use.

Django is a high-level Python Web framework encouraging rapid development and pragmatic, clean design. A web application framework is a toolkit of components all web applications need. The goal here is to allow developers to instead of implementing the same solutions over and over again, focus on the parts of their application that are new and unique to their project. In fact, Django is much more fully featured than many other frameworks out there. It takes care of a lot of the hassle of Web development, letting you focus on writing your application without any need to reinvent the wheel. It's free and open source. Additionally, the Django framework enables you to model your domain and code classes, and before you know it, you already have an ORM.

D. NLP – Natural Language Processing

Natural language processing (NLP) is the ability of a computer program to understand human language as it is spoken. NLP is a component of artificial intelligence (AI). NLP can be used to interpret free text and make it analysable. There is a tremendous amount of information stored in free text files, like patients' medical records, for example. Prior to deep learning-based NLP models, this information was inaccessible to computer-assisted analysis and could not be analysed in any kind of systematic way. But NLP allows analysts to sift through massive troves of free text to find relevant information in the files.

Sentiment analysis is another primary use case for NLP. Using sentiment analysis, data scientists can assess comments on social media to see how their business's brand is performing, for example, or review notes from customer service teams to identify areas where people want the business to perform better. Current approaches to NLP are based on deep learning, a type of AI that examines and uses patterns in data to improve a program's understanding. Deep learning models require massive amounts of labelled data to train on and identify relevant correlations, and assembling this kind of big data set is one of the main hurdles to NLP currently.

E. LIBRARIES & API's:

1) NumPy
2) Django.imports
3) Django.auth
4) HTTP Request Response
5) PyAudio
6) OpenCV
7) MoviePy
8) MySQL-python
9) MySQL-client
10) FFMPEG.exe
11) NLTK

EnterVu is the resultant system of the smart integration of the above technologies, to implement an advanced recruitment process and add a contribution to the development standards.

IX. TEST CASES

| Test Id	Test Step	Test Data	Expected Result	Actual Result	Status fail/pass
01	Display the Login page	Application login page	Login page should be displayed	Login page displayed	PASS
02	Provide valid username	srd1997@outlook.com	Should enter valid username	Username is valid	PASS
03	Provide valid password	srd@entervu	Should enter valid password	Password is valid	PASS
04	Click on the login button	Display Login button	User should be logged in	User logged in to profile page	PASS
05	Display the record of user on to profile	User data	User data should be displayed on the profile	User data displayed on user profile	PASS
06	Click on the test button	Display test button	Rules page should be displayed	Rules page is displayed	PASS
07	Click on the I Agree and continue	Display I Agree Radio button and continue button	Choose subject page should be displayed	Choose subject page displayed	PASS
08	Chose subject and click on next	Display Checkbox subject and next button	Test page should be displayed	Test page is displayed	PASS
09	See question and Choose answer	Display question and option radio button	Radio buttons should be selected	Radio buttons are selected	PASS
10	Click next	Display next button	Next question and its options should be displayed	Next question and its options are displayed	PASS
11	Click submit	Display submit button	Test should get completed and marks will be displayed	Test is completed and marks are displayed	PASS
12	On profile click on record interview	Display record interview button	Record page should be displayed	Record page is displayed	PASS
13	Click on record button	Display record button	Recording should be started	Recording is started	PASS
14	Click on stop record button	Display stop record button	Recording should be stopped	Recording is stopped	PASS
15	Click back to profile	Display back to profile page	User should be back to the profile page	User is back on the profile page	PASS
16	Click on logout button	Display log out button	User should be logged out and back to login page	User logged out and is back on login page	PASS

X. DEPLOYMENT
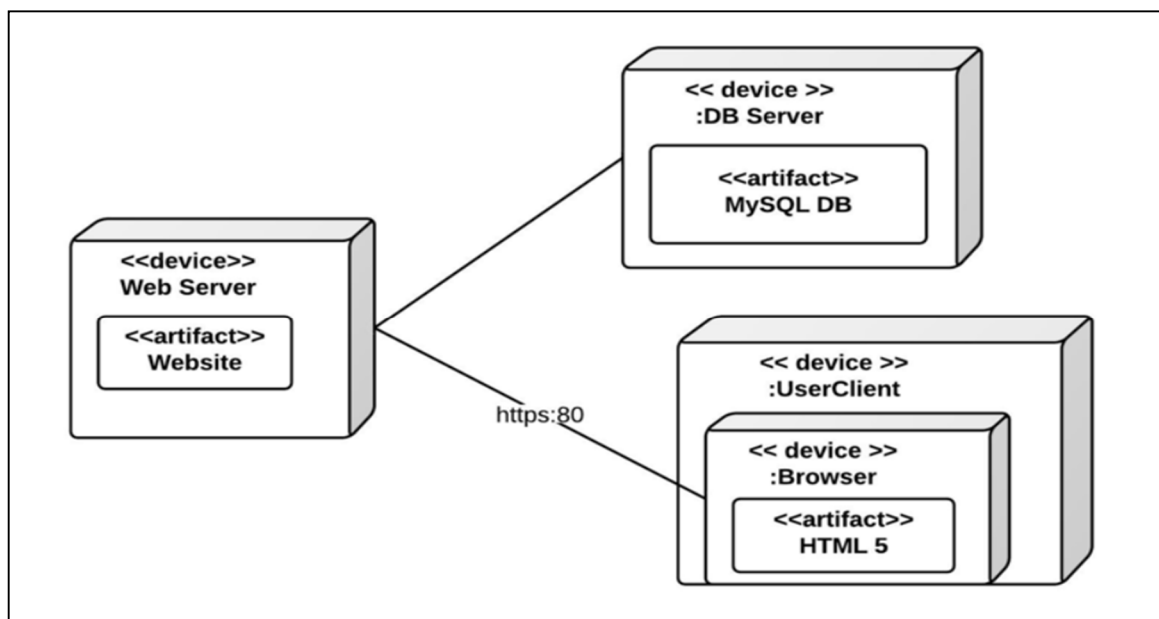
Figure 4. Deployment Diagram

A. Overview of Deployment

1) Django framework and all the dependencies along with the libraries are installed on Google Cloud Instance, which is the webserver for hosting the system.
2) All the computational and executional programs for handling and providing service to the system are in here.
3) The programs are scripted in Python which requires Python 3.7 installed.
4) Login, Registration, Profile, Results, Exam essentials, etc. are structured in MySQL instance.
5) Video, Audio, Documents, etc. are stored on Google Cloud Storage.

XI. PROS AND CONS

A. Pros

1) Data Science is best for analyzing properties from given data.
2) AWS from Amazon is regarded as one the best cloud computing platforms.
3) Data Analytics yields efficient outcomes.
4) Audio Analysis is advanced technology and accuracy is high.
5) Cost effective.
6) Reduced human intervention and human dependency.

B. Cons

1) Latency may be introduced in Audio Analysis.
2) Server Failures may occur.
3) Complete Personality analysis is not possible.
4) May take substantial time to train and implement.

XII. FUTURE SCOPE & AIMS

The system implemented now is based on analysis of exam results and audio or voice. The video can be analysed for prediction of personality and other constraints such as expressions, manners, etiquette, etc. The system can be integrated with other profile portals such as LinkedIn, Naukri.com, etc. The system also aims to present HR interview questions based on the previous answers by implementing pure AI along Data Science.

XIII. CONCLUSION

Upon addressing the employment problems that persists, it is quite interesting to see how the project can be implemented and have potential to take the recruitment process to advanced level and solve many of the problems regarding employment and the process. EnterVu is an approach towards advancement of traditional systems to help overcome the persisting obstacles and enhance the growth and development.

XIV. ACKNOWLEDGMENT

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