Chapter 1
Career Counselling Chatbot Using Cognitive Science and Artificial Intelligence

Godson D'Silva, Megh Jani, Vipul Jadhav, Amit Bhoir and Prithvi Amin

1 Introduction

Choosing a career can be easily defined as the biggest decision that one takes at a very young age and cannot be decided through the help of any mathematical equation. Making career choice has become much more difficult these days for youth as well as domains, etc. Still today, career choices are unfortunately made by parents, due to the vast number of option available in every stream in the form of diversifications, specializations and niche domains. Still today, the career choices are made by youths based on the advice, suggestions, experiences, stories, recommendations, news reports, etc. This is where the mistake happens. It is very important for youth to understand that not one size fits all and parents to understand that their child is different than the rest. It is high time that youth and parents considered a scientific and proven way to judge what career option will fit [2].

Considering the current scenario where unemployment in India is projected to increase from 17.7 million last year to 17.8 million in 2017 and 18 million next year. In percentage terms, the unemployment rate will remain at 3.4% in 2017–18. One of the crucial reasons for this drastic situation is due to the lack of proper career guidance. The approaches used till date are a psychometric test, which aims to provide measurable objective data that can provide a better all-round view of a youth's suitability in a career. On the basis of results obtained from the psychometric tests, related career path is prompted, but there are no ropes shown to achieve success in that career.

To overcome this issue, the need of the hour is to have a personalized career counselling for youths to help them provide guidance for such an important decision

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in their life. The energy, skills and aspirations of young people are invaluable assets that no country can afford to waste. Helping them to develop and realize their potential to the fullest is a precondition for sustainable national growth and development [1].

2 Conceptual Framework

The proposed system consists of main components such as language translation API, Emotion service API, MongoDB, data-driven documents (D3.js), E-portfolio dashboard, and bot framework integrated with Microsoft Azure services like virtual machines, blob and table storages, and application insights as illustrated in Fig. 1. Initially, the user can communicate with the system through various chatbot platforms such as Skype, Slack, and Facebook Messenger. The user can communicate with the chatbot in their preferred language through these chatbot platforms. Thereafter, the language translation API is used to translate the user preferred language into English for the chatbot to understand. After this, the psychometric tests will be conducted of the user and based on these test results the user can identify the personality and jobs suitable for them. Once this is done, the chatbot will provide training and mentoring to the users to achieve the necessary skill set for their desired jobs. All these results will be stored in MongoDB to keep the records of all these users. The chatbot will also make use of emotion service API to capture the facial and textual emotions of the user to identify the emotional state of the user as it can affect the results of the psychometric tests. The emotional state API is also used to identify whether the user is satisfied with the entire counselling procedure or not. Accordingly, based on the test results and the training and mentoring of the user an E-portfolio will be generated of the user. This E-portfolio will consist of the psychometric test results,

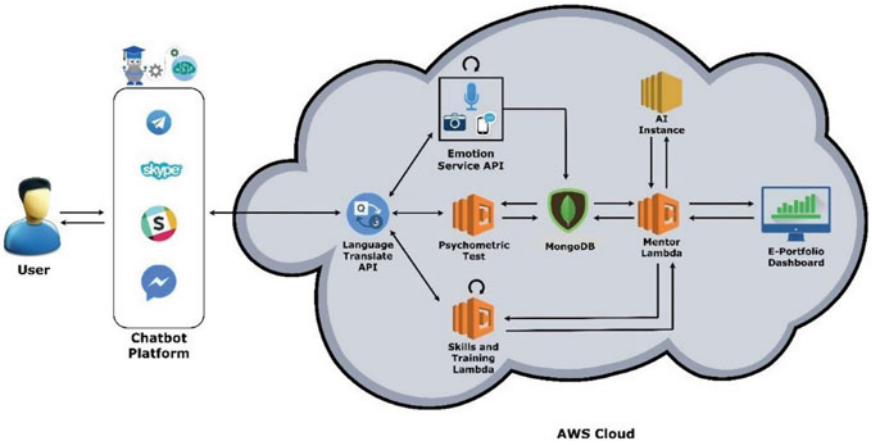

Fig. 1 System architecture

growth rate and impact of the training and mentoring phase, and also, an e-resume will be generated which can be used by the user to apply for various jobs [3].

3 Implementation

3.1 Conducting Psychometric Tests and Storing the Data in MongoDB

This operation is as illustrated in Fig. 2.

1. Initially, the user can communicate with the chatbot through various platforms like Skype, Slack, Facebook Messenger, etc.
2. The chatbot will ask the user to take the psychometric tests, and this request will reflect in the psychometric test Azure function.
3. While the user is appearing for the test, the chatbot will capture the facial and textual emotions of the user at regular intervals.
4. The results of the psychometric tests will be saved in MongoDB.
5. These results will also be displayed to the users, to let them know about their personality and job traits and the areas in which they are lacking and might need mentoring.

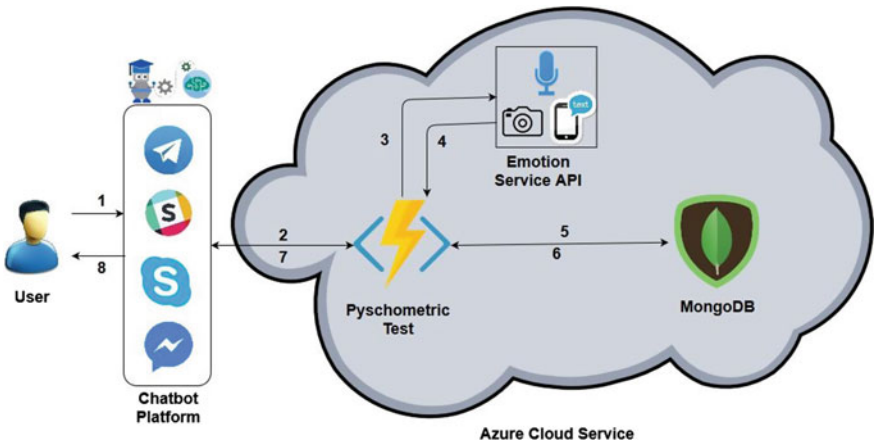

Fig. 2 Conducting psychometric tests and storing the data in MongoDB

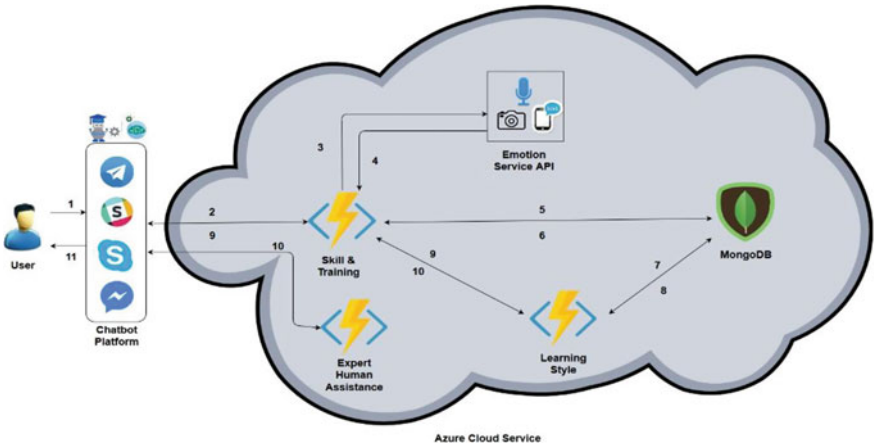

Fig. 3 Identifying the learning style of each individual and perform mentoring

3.2 Identifying the Learning Style of Each Individual and Perform Mentoring

This operation is as illustrated in Fig. 3. The process of identifying the learning style and mentoring procedure is given.

1. In this, the process will start in the skills and training phase where the user will have to select a course for training.
2. While this is done, the emotion analysis will be done to identify the user interests.
3. Once the user has chosen a content, it will be fetched from the MongoDB by the chatbot along with specific Q&A's.
4. The content will include different learning styles which will be displayed randomly to identify the users' learning style throughout the entire course.
5. The chatbot will further train the user based on the learning style.
6. Moreover, if the user is still unsatisfied, the chatbot will provide a feature of live assist where the user can speak to an actual mentor and get their doubts cleared.

3.3 Building an E-portfolio Based on Test Results

In this phase, the E-portfolio of the user is built as shown in Fig. 4.

1. The test results of the user are saved in the database.
2. Similarly, the data of learning styles is also stored in the database.
3. Based on these data, E-portfolio of the user is generated.
4. This E-portfolio contains all the results of the user. The chatbot will also generate a professional resume for the user.

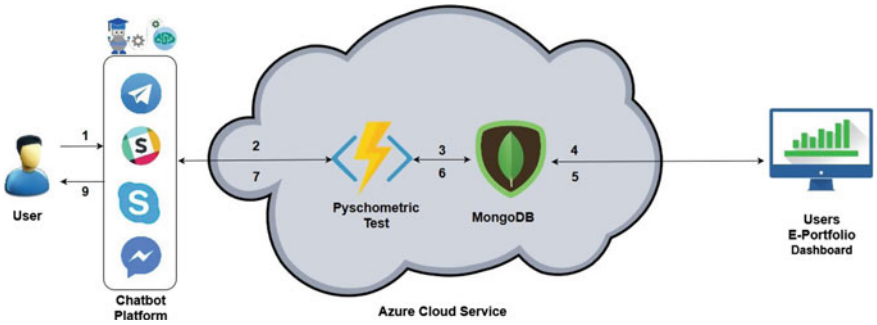

Fig. 4 Generated E-portfolio

4 Results

In this paper, a highly robust, multi-modal and scalable faster architecture is proposed which tries to solve the issues of traditional transport system by integration of MongoDB and d3.js and deploying it on Amazon public cloud.

4.1 Conducting Psychometric Tests to Identify Users' Personality and Suitable Jobs

Initially, the chatbot starts by taking two types of psychometric tests of the users, namely 'big 5 test' and 'holland code test' to identify the personality of the user and the jobs suitable for them, respectively. The test results will depict the personality of the users, and also, a list of suitable jobs will be displayed. The user can also know whether his/her personality matches with the job recommended to them through the holland code test. With the help of these psychometric tests, the user will have various career options to choose from. The users can also visualize the big 5 and holland code test results by referring to the pie charts shown in Fig. 5 [1].

4.2 Training and Mentoring the User for Their Desired Job

Once the psychometric tests are done, the next step is to train and mentor the user to improve their skill sets for their desired jobs. Various methods of learning such as visual images, videos or articles will be given to the user to train them and identify their learning styles. Moreover, integrating natural language processing with chatbot can help the bot learn better and add more human touch to it [4]. If the user is still unsatisfied with the teaching methods of the chatbot, a live assist feature is provided by the chatbot where in a user can communicate with an actual mentor in their

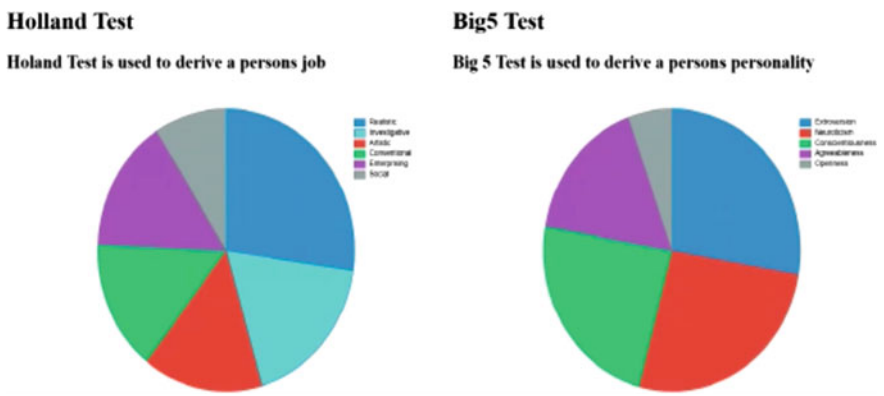

Fig. 5 Pie charts of Big 5 and Holland code tests

Fig. 6 Spider chart of progress report

preferred language. The users can also visualize their progress by referring to the spider charts shown in Fig. 6.

4.3 Generation of Professional Resume and List of Companies

After the mentoring process is done, the user now has the required skill set for a particular job. So, the chatbot will provide additional features to the user where a professional resume will be generated. All the user has to do is to upload his/her SSC and other qualification mark sheets, and the chatbot will be trained enough to extract all the data from those mark sheets and automatically build a professional resume.

Fig. 7 Generated professional resume

Moreover, the chatbot will also have provisions where a list of companies with job openings will be displayed. This list of jobs will also consist of appropriate website links of these companies for the user to not only look into the companies' profile but also apply for those companies. The resume is shown in Fig. 7 [5].

4.4 Data Visualization of the Big 5 and Holland Codes Generated

The code generated from the big 5 test and holland code test can be visualized given in Fig. 8. The figure consists of a circle with many different layers. The innermost layer of the circle is divided into five partitions in which each and every partition depict the five personality traits of the big 5 test. Also, all the personality traits are assigned a specific colour. Similarly, the next layer consists of further partitioning of these colours into six sections which show the attributes of the holland code test. The aim of this figure is to show various jobs that are available for a user based on the fusion of their big 5 test and holland code test.

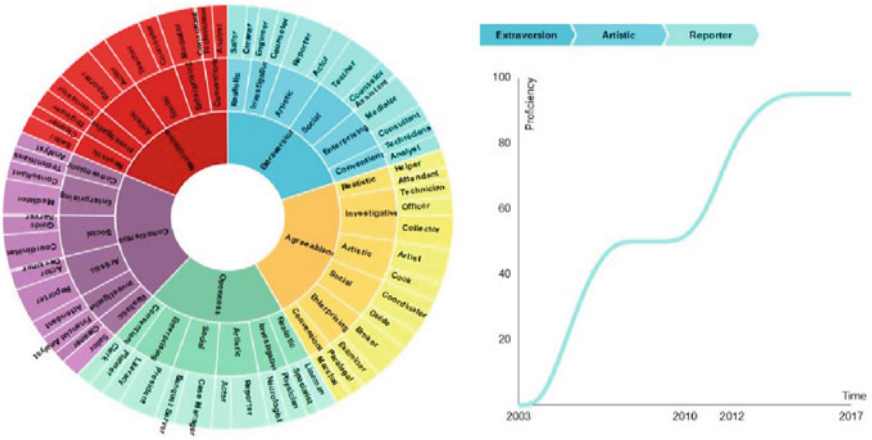

Fig. 8 Data visualization

5 Conclusion

Career counselling helps the students to know the pros and cons of the different streams, courses and educational options and the career path it offers thus, the students can make an informed choice, and get a career assessment that helps avoid the risk of change in career path later in life. The introduction of this career counselling chatbot will help an individual with all these aspects of choosing an appropriate career and help students grow in their respective career fields. The chatbot ticks all the boxes by not only providing mentoring but also generates professional resume and E-portfolios which can help users with suitable jobs. This system will just be one of its kinds which will felicitate appropriate career counselling for an individual. Moreover, the amalgamation of Microsoft Azure cloud services with open-source technologies like MongoDB and d3.js will help the system to be more robust, reliable and user-friendly.

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