NITTE MEENAKSHI INSTITUTE OF TECHNOLOGY

AN AUTONOMOUS INSTITUTION, AFFILIATED TO VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM,

APPROVED BY AICTE &GOVT. OF KARNATAKA

PRODUCT DEVELOPMENT LAB(18CSL78)

COURSE PROJECT REPORT

on

"Employability Personality Test"

Submitted in partial fulfillment of the requirement for the award of Degree of

Bachelor of Engineering

in

Computer Science and Engineering

Submitted by:

Monish K	1NT18CS100

NITTE EDUCATION TRUST

Department of Computer Science and Engineering

2021-22

Nitte Meenakshi Institute of Technology

(AN AUTONOMOUS INSTITUTION AFFILIATED TO VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM)
PB No. 6429, Yelahanka, Bangalore 560-064,
Karnataka Telephone: 080- 22167800, 22167860
Fax: 080 - 22167805

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the Course Project titled **"Employability Personality Test"**is an authentic work carried out by **Monish K (1NT18CS100),** bonafide student of **Nitte Meenakshi Institute of Technology**, Bangalore in partial fulfilment for the award of the degree of ***Bachelor of Engineering*** in COMPUTER SCIENCE AND ENGINEERING of Visvesvaraya Technological University, during the academic year ***2021-2022.***

Signature of the guide

Dr. Anil Kumar
Assistant Professor, Dept. CSE

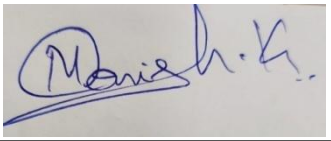
Signature of the HOD

Dr. Sarojadevi H.
Head of Dept, CSE

DECLARATION

We hereby declare that

(i) This report does not contain text, images or tables copied and pasted from the internet, unless specifically acknowledged, and the source is detailed in the report and in the References sections.
(ii) The corrections which were suggested during internal presentation have been corrected and incorporated in the report.
(iii) Content of the report has been checked for the plagiarism requirement

NAME	**USN**	**Signature**
Monish K	1NT18CS100	

Date: 31 Jan 2022

ACKNOWLEDGEMENT

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete if I don't mention the people who made it possible. Their constant guidance and encouragement helped me to achieve this success. I express our gratitude to our Principal **Dr. H. C. Nagaraj**, Nitte Meenakshi Institute of Technology for providing facilities.

I wish to thank our HoD**, Dr. Sarojadevi H** for all her support and encouragement for the successful completion of the project. I also thank her for the invaluable guidance provided which has helped in the creation of a better technical report.

I thank **Dr. Anil Kumar** for his guidance and support given while doing this presentation and preparing the report. I would also like to thank all my friends, teaching and non-teaching staff members at NMIT, Bangalore, for their help in the completion of the presentation.

Name & USN:

Monish K (1NT18CS100)

Date: 31st Jan 2022

ABSTRACT

Placements play a very important role in a student's life, as well as for experienced professionals who want to make a career transition. And to hire a desirable candidate, the hiring management has to do a lot of work from aptitude reasoning checking to multiple interview rounds. And in recent years, there has been a trend in these large Multinational companies to have psychometric testing rounds as an initial screening round or sometimes even as a final evaluation round. But the current psychometric test is a questionnaire approach where the candidate has to choose between the desired range of values, this is a drawback as the job seeker cannot express the thoughts fully. To overcome this limitation, this paper proposes a model by making use of Natural language processing with the help of deep learning technique, that is as a combination of convolution neural network (CNN) and recurrent neural network (RNN), as a multiple binary classification.

TABLE OF CONTENTS

1. INTRODUCTION

[1] Employability skills are the foundation of one's careers' building blocks, and these skills are lacking in school pass outs, graduates and those already in employment and sometimes are hidden away. While education for a student and experience for a work professional may make the person eligible to apply for a job, but to be successful in the role assigned they will need to exhibit a mix of skills called employability skills. This means that the technical skills associated with different roles may be less important than the 'soft skills' that are required to sustain in the job environment and in handling different employment sectors. For employers, getting the right people means identifying people with the right soft skills as well as technical/hard skills and qualities to fulfill the role and contribute to the organization's success.

[2] The traditional recruitment process is taxing on companies in the sense that it demands extensive resources, both in person and processes. The proposed automated system for simplified recruitment is to aim for streamlining the recruitment process. A systematic mode of descriptive tests coupled with a robust Psychometric Testing System will serve to create a shortlist of candidates. This shortlist will enable the potential recruiters to get in touch with the employment process to the best of their abilities. The goal of this application is to ensure that the skills and intellect of candidates combined with the right bent of mind for a job will provide a wholesome mechanism to employ them.

To achieve a complete un-bounded as well as high confidence in personality traits classification, I try to make use of MBTI personality traits indicator, which indicates a person's personality on how they see and think about the world. It is 16 different personality classifications which operate on 4 domain traits of classification, namely:

1. Favorite world – Introvert or Extrovert
2. Information – Sensing or Intuition
3. Decision – Thinking or Feeling
4. Structure – Judging or Perceiving

2. BACKGROUND AND MOTIVATION

2.1 Natural Language Processing

Natural language processing (NLP), is an emerging branch as well as a crucial branch of artificial intelligence for Human language to machine translation in the machine learning domain. NLP is a composition of multiple disciplines like computer science, computational linguistics etc. It is in the pursuit to fill the gap between human communication and computer understanding.

There are two main factors that drive the motivation for NLP:

1. Large volume of textual data
2. Converting a highly unstructured data to structured format

NLP, itself is a combination of multiple techniques, such as sentence cleaning, stemming of the words, removal of stop words or unnecessary words, tokenization, vectoring, etc.

2.2 Deep Learning

Deep learning is a subset of Artificial intelligence, which is essentially a neural network with three or more layers. These neural networks attempt to simulate the behavior of the human brain, with the concept of weight of features, allowing it to learn from large amounts of data. While a neural network with a single layer like perceptron can still make approximate predictions, additional hidden layers can be helpful with more optimized accuracy..

There are many form of deep learning, this paper focus on two most widely used techniques:

1. Convolution Neural Network (CNN): It is the most widely used class of deep learning technique, which has become dominant in various graphics related tasks and is attracting interest across a variety of domains. It is a composition of many building blocks, such as convolution layers, pooling layers, and fully connected layers, and is designed to automatically and adaptively learn spatial hierarchies of features through a back propagation algorithm.

2. Recurrent Neural Network (RNN): It is the most robust type of neural network in use because it is the only one with a memory component and not just bais and weight unlike other deep learning algorithms. Because of the memory component working on probabilistic logic, it can remember important things about the input it received, which allows it to be very precise in predicting future features. RNN has two main problems in terms of optimization, which are exploding gradients and vanishing gradients. To overcome this, there are many models and techniques which operate over the RNNs. In this paper I have used LSTM, which is short for Long Short Term Memory. LSTMs are the class of RNN, which are an extension of RNN that extends the memory. LSTMs assign data weights which helps them to either let new information in, forget information or give it importance enough to impact the output which comprises both activation unit and memory unit.

2.3 Tkinter

It is a python built-in package which is the primary module used for designing Graphical User Interface or GUI for short. It has many utility functions which can be directed accessible through class objects. It is basically written using C++ language, which makes it platform independent. To improve over it, there have been utilized J-python which access Java GUI libraries like Swing and AWT. To run a script of Tkinter, Java JDK is not necessary, but it is encouraged to have a version 1.8 or later, as it helps to give more utility functions like in Java GUI.

3. LITERATURE SURVEY AND OBJECTIVES

[3] This paper briefs on the use of CEDAR dataset and techniques like MLPNN which is over a handwritten analysis attached to personality based features. It works mostly on character recognition using methodologies like image processing, creation and extraction of feature subset and a classifier algorithm using Artificial neural networks.

[4] Handwritten analysis of human behavior with a related case study of optimizing the module implementation, it consists of neural network classification, namely BPNN, which they have analyzed over their personal dataset.

[5] By making use of KNN and ANN, this paper focused on polyonization, thresholding and template matching. It is Margin trait analysis, which was trained and tested by a professional dataset.

[6] This paper focuses on MBTI personality traits identification, which is done over multiple levels of feature extraction. The final value is a 4 combination of domains, which is among 16 class labels. The proposed system is a MCQ response, where there were 60 questions to be answered within the given response options. That is from “Highly agree” to “Highly disagree”, to which they had given scoring for each response from +10 to -10. The paper objective was to work as a theoretical proof for job recommendation.

[7] This paper helps to find jobs for job desires as well as the HR team to hire the right person. The algorithm of this Artificial neural network is a two layer feed forward network that used Levenberg-Marquardt back propagation technique. For future research on Human Resources Management, it is necessary that social networks oriented to employment collect data from its application or platform and try to make the user's profile and job offer posts as complete as possible, in order to have the right parameters to develop recommendations and create effective matching between candidates and job positions.

OBJECTIVES

1. To build an unbounded Personality test model.
2. Utilization of MBTI as the standard for personality traits calculation, by making use of Deep Learning techniques.
3. Helping Companies and Hiring Managers to find the right candidate for the specific job role to get in touch for the next process in employment.
4. Platform for job-seekers to apply for multiple roles at a single time of profile screening.

4. System Requirements

The proposed model is a combination of GPU accelerated program as well as desktop GUI interactive. The model requires some hardware and software requirements to run efficiently.

4.1 Hardware Requirements:

1. CPU - intel i3 or later
2. GPU – intel 6000 FHD or later, NVidia 800 or later
3. RAM - 2GB or more
4. ROM - 10GB or more

4.2 Software Requirements:

1. Python 3.6 or later
2. Tensorflow and NLTK for modelling
3. Tkinter for GUI

5. Model Architecture

The proposed model, is a combination of Tensorflow backend with SQLite database while running the execution is a desktop interactive GUI built using Tkinter.

The model can be divided into two main parts:

1. Back-end Tensorflow deep learning model
2. Front-end interaction with database

5.1 Deep learning model

The deep learning model for the classification is a combination of convoluted neural network and recurrent neural network. The model architecture is composed in a way such that, after the word index dictionary which is of size 100000 words, which have been fed for word embedding layer. The main learning layers are a convoluted layer of maxpool and kernel . Which is succeeded by a sequential recurrent network with the technique of LSTM.

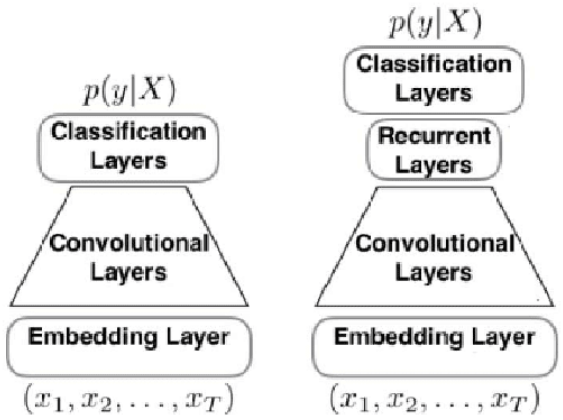


Fig 5.1 CNN model and CNN with LSTM

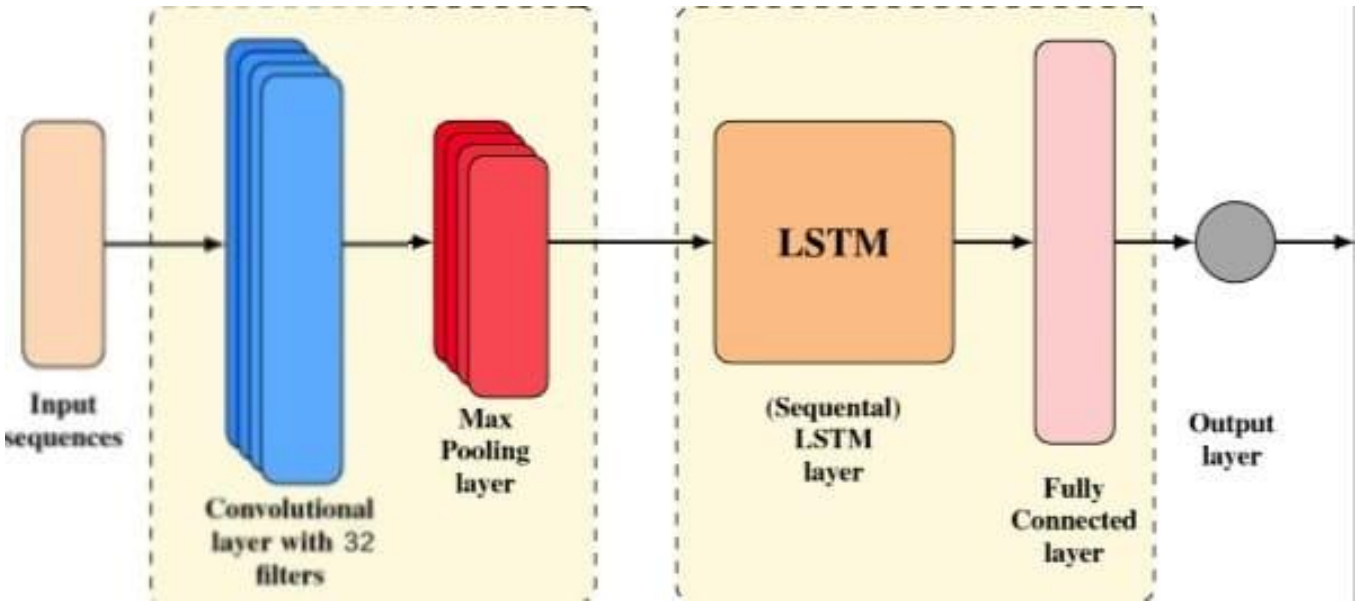


Fig 5.2 CNN with LSTM

The model makes use of the Relu function in the convolution stage and sigmoid function at the fully connected dense layer at the end. The optimization of the learning is done using the ADAM optimizer, over the loss of 'Binary Cross Entropy'

5.2 Front End with Dataset

The working model is a full end to end application where the end user can make practical use of the trained neural network model. The front end production is not limited by OS constraint or requires any special package. But to have smooth functionality, I suggest you have a Java JDK 1.8 or later to be installed. The whole GUI is built using the python in-built TKinter library. For the persistence of the data, I have implemented a loosely coupled SQLite database, consisting of 3 tables over unique primary key and foreign key constraints.

6. FLOW CHART AND USE CASE DIAGRAM

Flow Chart

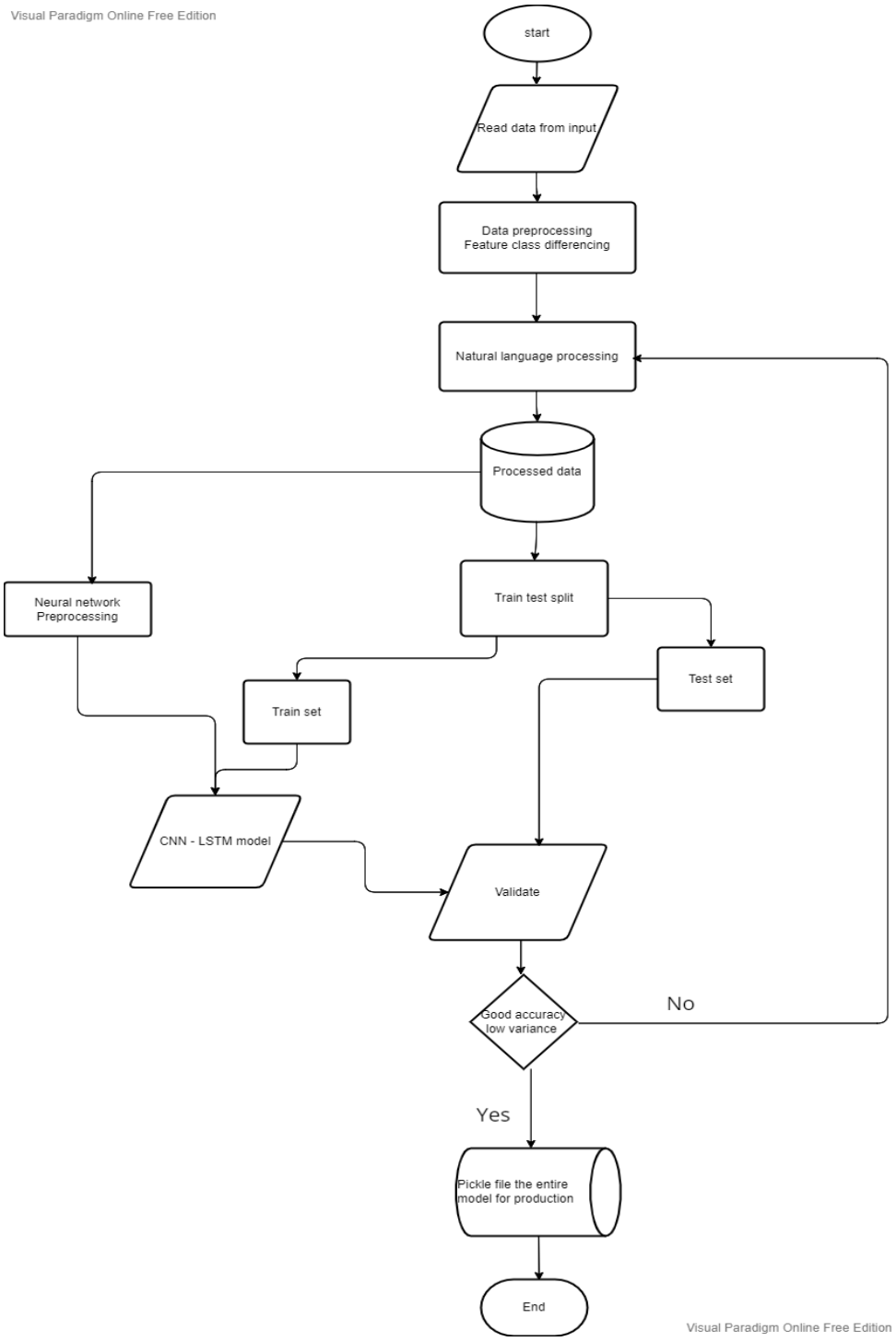


Fig 6.1 Flow chart of model building

USE CASE DIAGRAM

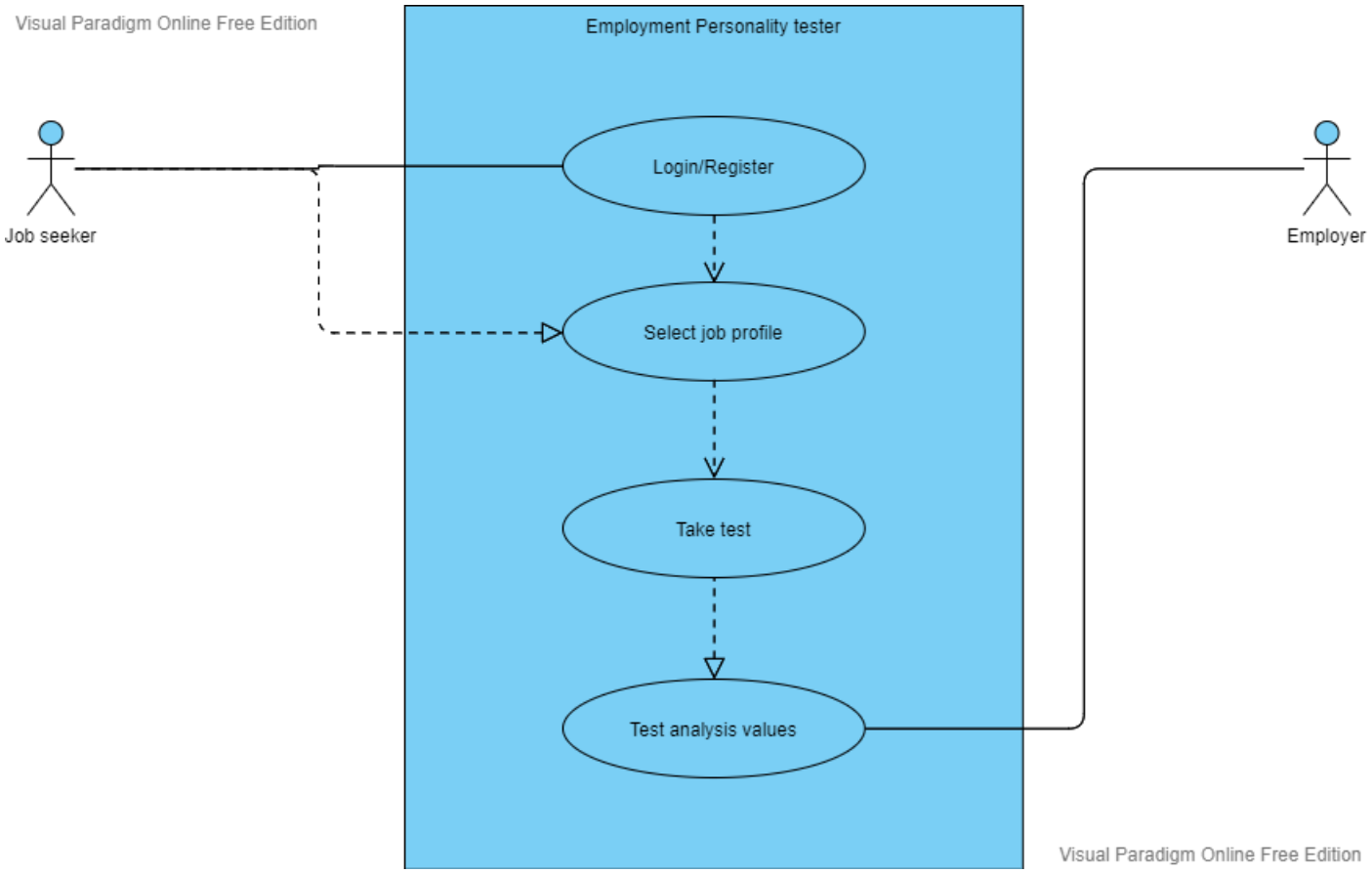


Fig 6.2 Use Case Diagram

7. Results

Fig 7.1 Login screen

Fig 7.2 Register window

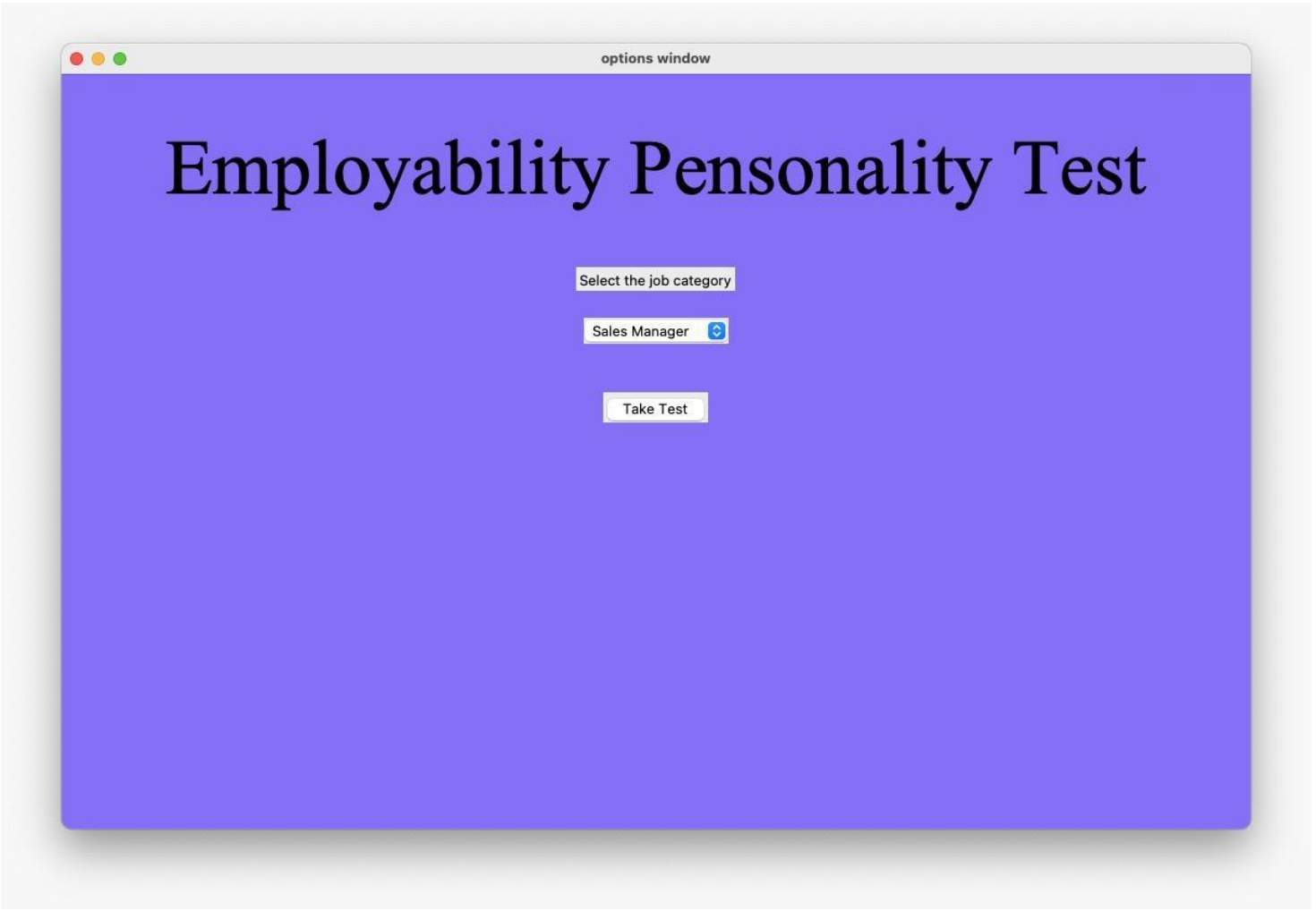


Fig 7.3 Home options window

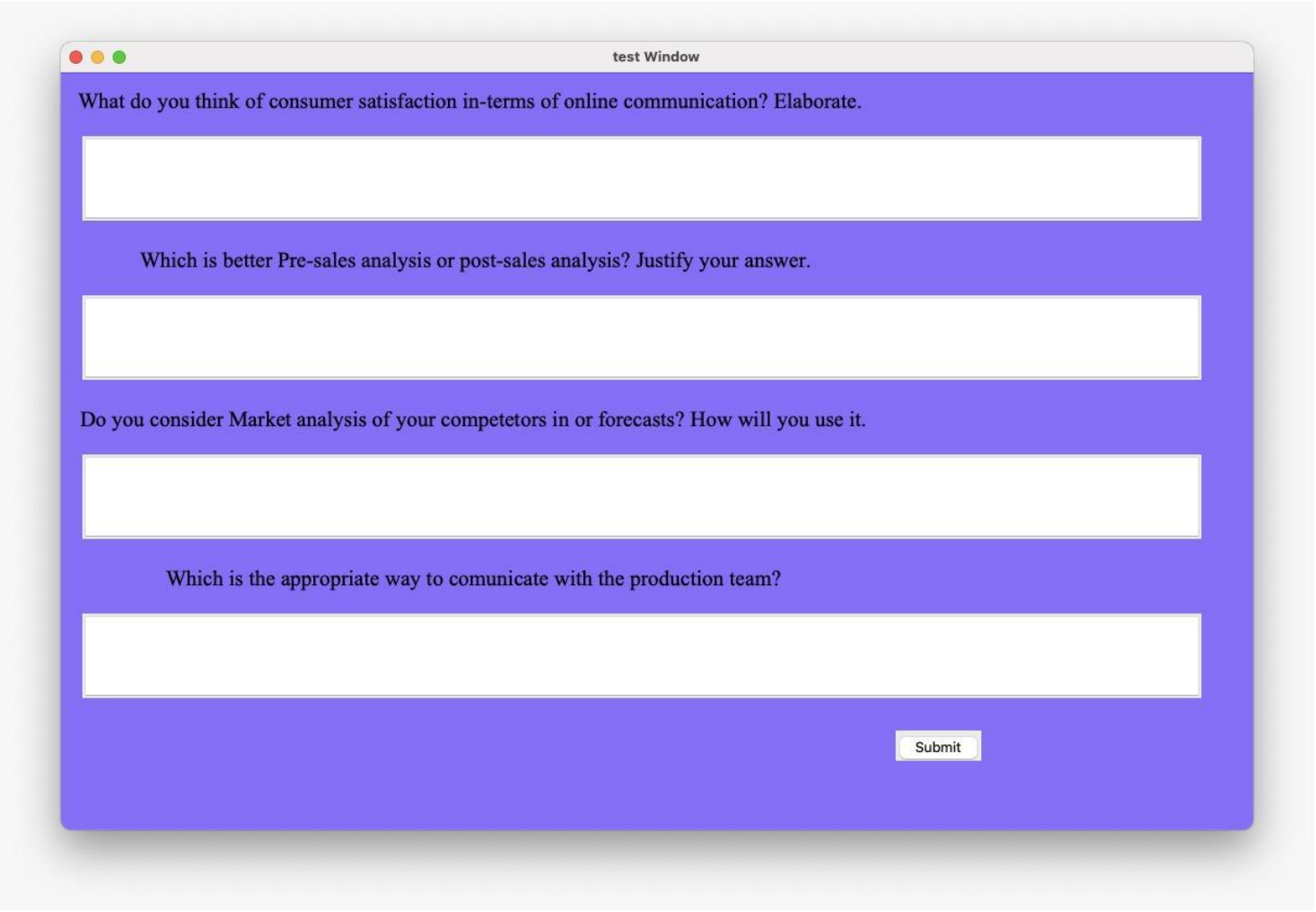


Fig 7.4 Test window

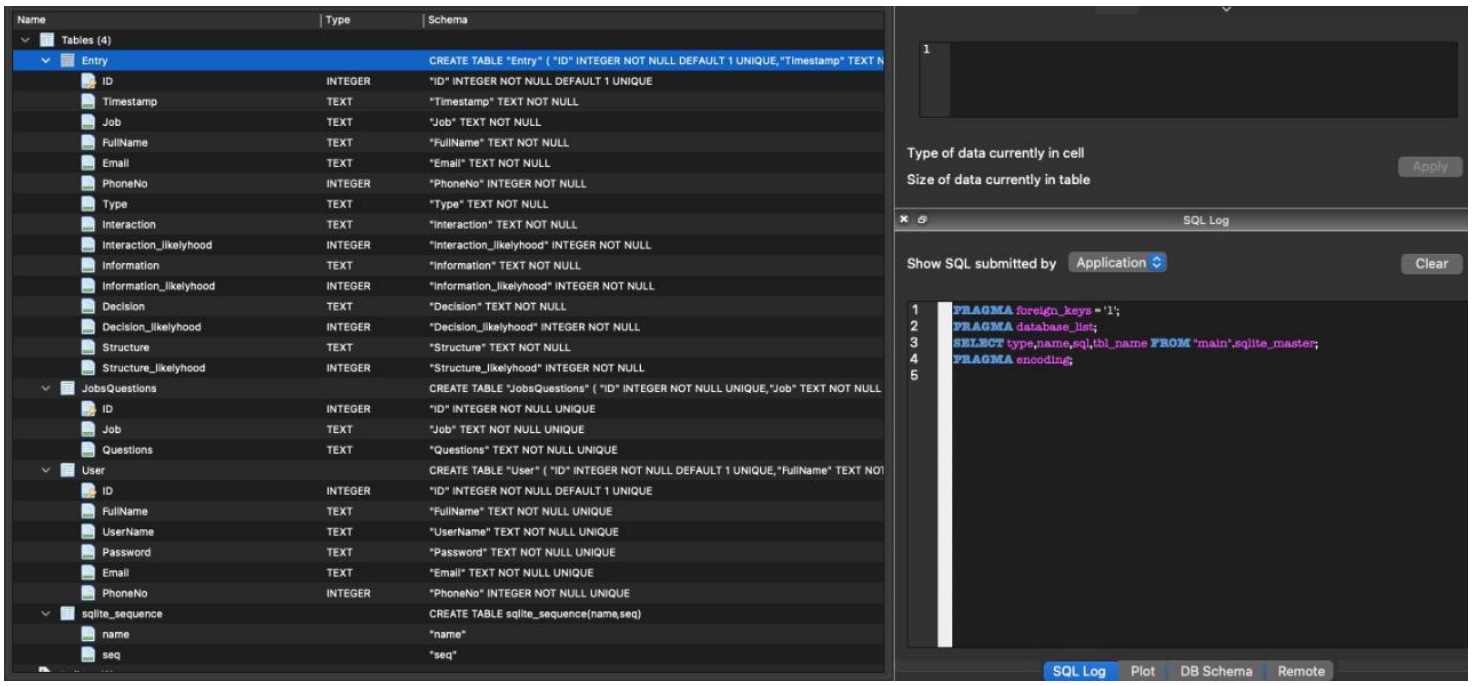


Fig 7.5 Employer database

8. Future Work

The current model is desktop based application, which has a limitation of sending the entire pickle file based tensorflow model and tokenizing it in the end user system, which has major bias as well as huge security constraints. To overcome this I want to build a restful web application which composes mongodb for BASE architecture data persistence and PostgreSQL with node.js for server management. Then we can scale the application over the internet which increases the model security as well as the overhead of the user and employer maintenance. And for the classifier I believe I can achieve more accuracy with more hyper parameter tuning.

9. Conclusion

I have presented a working model of the proposed deep learning architecture with an end to end working application. I believe, with the approach proposed, the Human resource management as well for the job seekers to have a more unbounded approach, which makes use of MBTI personality identification. Which can be used for more job profile screening also, ANN applied to HR can study how to make working conditions improve, how employees should be distributed in their company regarding their abilities as well as identify those employees that are keen to stay longer in the organization.

10. References

[1] https://ieeexplore.ieee.org/document/8474769/

[2] https://ieeexplore.ieee.org/document/8126098

[3] L. Li and H. Zhu, "Enterprise Human Resource Management Outsourcing Decision-Making Model Based on BP Neural Network", *2010 Second International Conference on Modeling Simulation and Visualization Methods*, Aug 2010.

[4] S.K. Mishra and M. Reddy, "A Bottom-Up Approach to Job Recommendation System", *Proceedings of the Recommender Systems Challenge*, 2016.

[5] L. Li and H. Zhu, *Enterprise Human Resource Management Outsourcing Decision-Making Model Based on BP Neural Network*, 2010.

[6] X. Wang and Y. Jiang, *The Study of Enterprise Human Resource Evaluation Research Based on Neural Network*, 2010.

[7] https://ieeexplore.ieee.org/document/8509092/