

# Smart Career Guidance and Recommendation System

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**Abstract** - Recommender system is a computer program build with the help of experts where the details of the students and their aptitudes help finding a right course for his future. This project proposes feasible predictions for student's field selection based on their marks and choice of interest. Choosing a right field in CSE/IT stream is very important for his/her future. If the decision went wrong it will be a mismatch between student aptitude, capability and personal interest. This project also reveals the research process for preparation of such a recommender system. Smart Career Guidance Recommendation System is developed for recommending skilling courses and certification courses in the CSE/IT domain. A substantial amount of literature focuses on predicting student performance in solving problems or completing courses. Many Machine learning techniques, such as decision trees artificial neural networks, matrix factorization, collaborative filters and probabilistic graphical models, have been applied to develop student performance prediction algorithms. In this paper, we identify and apply the suitable algorithms for Student specific skill oriented course recommendation system in the CSE/IT domain. We present the dataset built using the questionnaire and skill tests to extract the information regarding their interests, abilities.

**keywords** - Machine Learning, Course Recommendation System, Skill Prediction

## I. INTRODUCTION

Competition in today's society is heavily multiplying day by day. Especially it is too hard in present day's to face technical world. So as to compete and reach the goal of students, they need to be plan and organized from initial and final stages of their education. So it's important to perpetually assess their performance, establish their interests and assess however shut area unit they're to their goal and asses whether or not they are within the right path that directs towards their targeted. This helps them in improving themselves, motivating themselves to a better career path if their capabilities are not up to the mark to reach their goal and pre evaluate themselves before going to the career peek point.

Not only that recruiters while recruiting people into their companies evaluate candidates on different parameters and draw a final conclusion to select an employee or not and if selected, finds a relevant stream and career area to student. There are many types of roles like Database administrator, Business Process Analyst, Developer, Testing Manager, Networks Manager, Data scientist and so on. All these roles require some pre-requisite knowledge in them to be placed in them. So, recruiters analyze candidates performance in skills, talents and interests and place the candidate in the right job role suited for them. These kind of prediction systems make their recruitment tasks very easy because as the inputs are given, recommendation is done based on inputs.

Already these type of profession recommendation systems and course recommendation, prediction systems are widely used in various private personal analysing portals like Co-Cubes, AMCAT. They only consider features like technical abilities and psychometry of candidates into consideration. These portals analyze the students technically up to date and suggest the students and industries job roles suited on their performance. But here various factors including abilities of students in sports, academics and their hobbies, interests, competitions, skills and knowledge are also taken into consideration. As the input parameters and final classes of output are more in number typical programming and casual algorithms cannot give the fruitful and possible outcome classification and prediction. So advanced machine learning algorithms like SVM, Random Forest decision tree, One Hot encoding, XG boost are used.

## II. LITERATURE REVIEW

Many machine learning techniques, such as decision trees, artificial neural networks, matrix factorization, collaborative filters and probabilistic graphical models, have been applied to develop prediction algorithms. Most of this work ignores the continuous effect that students enhance their knowledge over time and follow the prediction as a one-time task. To take the temporal/sequential effect into account, a three-mode tensor factorization (on student/problem/time) technique was developed for predicting student performance in solving problems in IT Sector. There are mainly two issues while developing this sort of model one is weather the student is willing to build his career based on his interests and compassions and weather the student has proper identification of improving his Skills by pursuing certification courses based on the interests of the students. So a Questioner developed in this model must classify the reflections of the student outcomes.

In order to build a model that predicts the student interests and compassions towards a course is like a torchbearer because there is no model to predict and analyze the student compassion and make him aware with a course to build rightly and choose wisely. So in order to understand the prior knowledge of the individual it's good to consider the performance into account which makes a difference in learning. Student retention is an important issue in education. While intervention programs can improve retention rates, such programs need prior knowledge of student's performance. That is where performance prediction becomes important.

The usage of machine learning to predict either the student performance or the student dropout is a commonly found subject in academic literature. With this the interests of student can be measured.

Behdad Bankshinategh[1], Gerasimos Spanakis[2], Osmar Zaiane[3] and Samira ElAtia Pal[4] conducted a study in India, to determine factors that most heavily affected student performance. They first utilized of the classic Collaborative Filtering (CF) method for their study for achieving various goals in their research. They have used these algorithms on the really time data sets but it is done on data mining and some tools in weak for mining the data. A second challenge lies with the scalability of the algorithm. To have a reasonable response time for making recommendations to a high number of students might raise the need to include new techniques. In this challenges the also tried matrix factorization will be explored, as well as explore how performance can be boosted. However, since this research focuses on predicting student academic motivation using data mining methods and only, this review of literature presents only the results from several relevant studies that have used diverse predictors available from different files and various methods for predicting academic motivation within an online learning environment.

Another study about Recommendation System for Course Selection by Students for Graduate Courses was made at the University of Desh Bhagat University, Mandi Gobindgarh, and Ludhiana, India. The paper presents Student Recommender System for matters associated to the problem of course selection for 10+2 students in all streams and provides effective advice and counselling for them. They have created a web site to collect the data from the real time which consists of the personal data as well as the tests of different fields by these test the recommend the course to join after 10+2. In this system they have used the data mining, statistical and artificial intelligence techniques to make appropriate recommendation for the students. A framework is shared out here considering the necessity and need of the course. This framework used these techniques: Clustering Technology, Feed-forward back propagation probabilistic neural network and Classification using Fuzzy Logic and Rough Set. Which It was categorized into three phases: Data Preparation, Data Analysis and Predictive Modelling, training and testing data. And there future scope is to build the project in another ways using different algorithms and also says that this system can help for job recommendation also.

Bhardwaj [5] and Pal [6] conducted a study in India, Faizabad[7] to determine factors that most heavily affected student performance. They used Bayesian Classification for their study. Researchers have recognized the potential of information stored in LMS log files and have used it for achieving various goals in their research. Frequently, their focus has been on predicting student performance, but some research goals were set on measuring a sense of community in courses, extracting quality characteristics of the LMS courses or even increasing student Retention However, since this research focuses on predicting student academic motivation using machine learning methods and only raw log data, this review of literature presents only the outputs from various related studies that have used various predictors available in log files and different procedures to predict academic motivation within an online learning environment.

Cocea[8] and Weibelzahl[9] calculated five variables (user identifier, percentage of correctly answered tests, time spent on pages, number of accessed pages, time spent performing tests and motivation) from log files and used decision trees tried to determine whether log files can be used for predicting student motivation.

Tajul Rosli Razak[10] at el., proposed a system that gives recommendation for student about their career based on academic result and their abilities by using fuzzy logic approach.

Another study about performance prediction was made at the University of Jordan .A data set of students from different countries was used. In addition to using individual machine learning methods, the researchers also applied ensemble methods, and compared the results between them. Decision trees provided the best results. Another area that the researchers focused on was behavioural features. A model was built with and without these features. It was found that the inclusion of behavioural features improved the prediction results.

Expert Systems for Career Guidance Advice helps students to interpret information and apply it to their own situation; guidance is the in-depth support provided by qualified practitioners to help students explore their options and make informed choices that are best for them (CDI, 2014). In

other words, counselling is a transformative process of helping people to learn all that are to be learnt both in and outside the school (Egbo 2013). According to Odu (2004), “the main aim of guidance and counselling is to assist the student to develop physically, mentally, emotionally, morally and educationally to cope with the learning situations within and outside the school

environment”. Akinade(2012) opined that there is limited number of trained counsellors in Nigerian schools and the ones already trained choose to go into non-school settings. This makes the need for computer-based counsellors in schools extremely imperative. The role of ICT in guidance can be seen in

three ways: as a tool, as an alternative, or as an agent of change (Oye et al, 2012). Ojenge and Lawrence(2008) recommended the use of expert systems for career guidance. According to Satvika et al(2010), “It is concluded that while expert systems in education have great potential, they remain un-established as a useful technology due to lack of research and documentation. Expert system for career selection can be developed using Fuzzy logic, neural network( Waghmode & Jamsandekar, 2015), decision tree and other Artificial Intelligence techniques for guiding students to select proper career stream. Waghmode & Jamsandekar (2015) presented some expert systems used in educational sector for career guidance, few of which have been reviewed in this paper iAdvice: This expert system uses features such as reasoning ability, providing explanations, alternative solutions, uncertainty and probability measures, questioning ability and also forward chaining, backward chaining and rule based inference in designing expert system. Past examination performance, student preferences and skills, industry alignment with subjects, are the main factors considered by a human expert in providing career guidance. The system was designed by Hendahewa et al (2006) .

PAS: Post graduate Advisor Expert System (PAS) was proposed and developed by Al-ghamdi (2012) for advising post graduate students of computer science major in King Abdulaziz University (KAU) to select suitable course during their PG programme.

CAM (Career Advisor Model) - is a model proposed to provide right advice to students. This model is based on machine learning technique and rule based decision support capability. It was presented by Mundra(2014)

CMS (Career Master System): Balogun et al( 2009) present development of career master DSS for counsellors to assist students in selecting the right discipline for secondary school leaving students of Nigeria who have problems with their choice of careers as they intend to study at tertiary institutions of their choice. This career master system was implemented using Visual Basic. This system is designed for desktop and counsellors, and system recommendation were based on parameters like ability, skills, Intelligent Quotient, interest, parents and friends influence, preferences, parent occupation and hobbies, past academic performance.

Intelligent Systems for Career Guidance Advice candidates to have information and apply it to their own situation; guidance is the deep support provided by qualified practitioners to help students enhance their choices and make informed options that suit for them (CDI., 2014). In other words, counselling is a transformative process of helping people to learn all that are to be learnt both in and outside the school (Egbo 2013). According to Odu (2004), “the main aim of guidance and counselling is to assist the student to develop physically, mentally, emotionally, morally and educationally to cope with the learning situations within and outside the school environment”. Akinade(2012) opined that there is limited number of trained professors in Nigerian convents and they already trained opted to go into non-school settings.

### III. SYSTEM ARCHITECTURE DESIGN

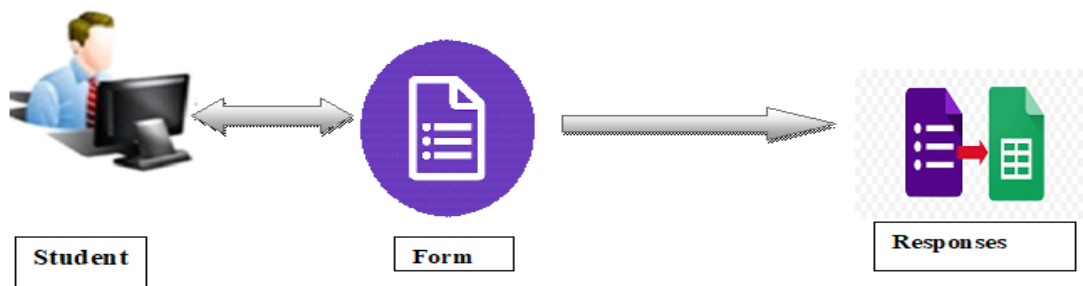


Fig 1: System Architecture

### PROCESS FLOW AND IMPLEMENTATION

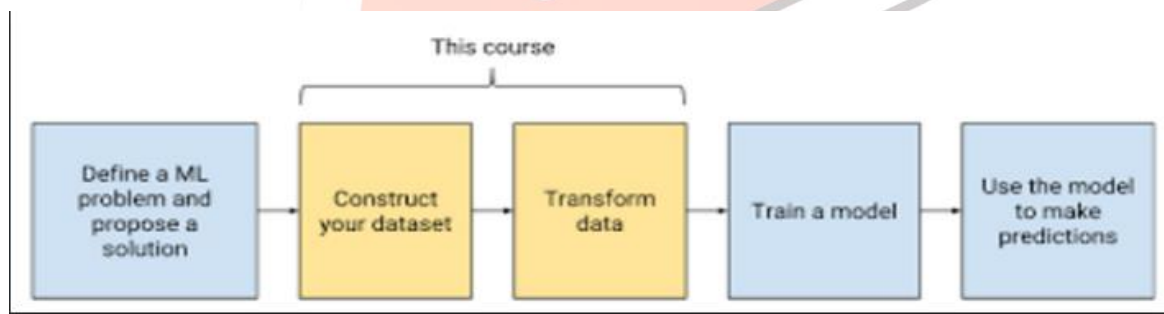


Fig 2: PROCESS FLOW AND IMPLEMENTATION

### IV. METHODOLOGY

Student Login to Gmail.

Student can open the form by clicking on link which sends to different mail ID's.

Student Can See Various Fields.

A student can take the Test.

Result for the test has to be calculated.

Data Preprocessing.

Predicting the Skills from the Data.

Then Recommend the respected skill Certifications.

#### Student Login to Gmail

The Career Guidance form will be sent to student's individual mails

Students can view the form by logging into their respected mails

**Student can open the form by clicking on link which sends to different mail ID's**

Form link will be mailed to student's mail id,

By clicking on the link student can view the form.

**Student Can See Various Fields**

After opening the form students can see various fields like Programming, Web Developer, Networking and Hardware, Data Science , Android

**A student can take the Test**

After opening the form student can start filling the form and answer the questions.

**Result for the test has to be calculated.**

Every individual response of students will be saved in Responses section of the form in the format of a spread sheet that we can download into a csv file.  
Not only spread sheet ,the result can also be displayed in the graphical format.

**Data Preprocessing**

We preprocess the data in to required format.  
For Example, the data in data set will be stored in the form of words nothing but alphabetic.  
We convert those into numerical format.

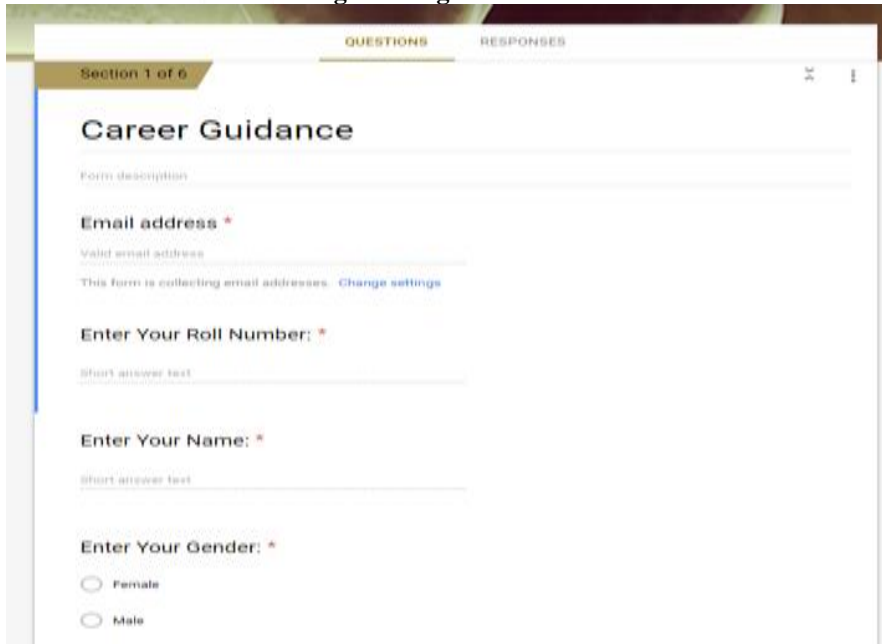
**.Predicting the Skills from the Data**

By applying various machine algorithms on the data set ,we found more accuracy.  
At any one algorithm ,thus it suits for the recommendation system to be accurate.

**Then Recommend the respected skill Certifications**

Individual student differ from the other student in their skills.  
Recommendation system helps to predict the inherent skill of a student and recommend the respected skill certifications.

**Google form given screen shot**



Given below are some of the screen shots of Google form responses which are downloaded can clearly visualize get the data in the .csv files

**Table 1: Dataset of the student’s personal info**

	A	B	C	D	E	F	G
1	Timestamp	Username	Enter Your Roll Number:	Enter Your Name:	Enter Your Gender:	Date of Birth:	Enter your father name:
2	2019/02/20 11:41:38 AM GMT+5:30	chharivamsi99@gmail.com	17X41A0513	chitturi hari vamsi	Male	1/11/1999	chitturi poorna chandra rao
3	2019/02/20 11:42:59 AM GMT+5:30	rahulchandra360@gmail.com	17X41A0523	RAHUL CHANDRA	Male	5/19/1999	VENKATESWARA RAO
4	2019/02/20 11:44:37 AM GMT+5:30	harikaallamsetty2@gmail.com	17X41A0504	Harika Naidu	Female	2/17/2019	Madhu
5	2019/02/20 11:45:14 AM GMT+5:30	syedkabar2000@gmail.com	17X41A0552	SYED AHAMED KABIR RIFAE	Male	1/19/2000	SYED AZAM
6	2019/02/20 11:45:34 AM GMT+5:30	jaykamineni7@gmail.com	17X41A0524	kamineni jayanthkumar	Male	8/24/1999	hanumantharao
7	2019/02/20 11:46:03 AM GMT+5:30	sivasaikondisetty@gmail.com	17X41A0527	KONDISSETTY SIVA SAI	Male	4/3/2000	SATYANNARAYANA
8	2019/02/20 11:46:15 AM GMT+5:30	vellankiyashwanth8@gmail.com	17X41A0558	vellanki yashwanth	Male	2/28/2000	vellanki madhu mohan rao
9	2019/02/20 11:46:18 AM GMT+5:30	Rayalaspriya.5801@gmail.com	17X41A0546	R.Supriya	Female	10/8/2000	R.PullaRao
10	2019/02/20 11:46:21 AM GMT+5:30	PriyaShivani553@gmail.com	17X41A0516	shivani	Female	8/30/2000	siva ramarao
11	2019/02/20 11:46:42 AM GMT+5:30	sekhhar988560@gmail.com	17X41A0545	Ranga NagaRajasekhar	Male	6/23/1999	VenkataRamarao
12	2019/02/20 11:46:47 AM GMT+5:30	srivenkateswararao7981@gmail.com	17X41A0556	SRI VENKATESWARA RAO	Male	7/10/1999	T.ANANDA BABU
13	2019/02/20 11:46:56 AM GMT+5:30	sazid.sunny@gmail.com	17X41A0550	SHAIK SAZID	Male	8/5/2000	SHAIK KALESHA
14	2019/02/20 11:47:33 AM GMT+5:30	durgarani024@gmail.com	17X41A0522	J.DURGA RANI	Female	9/5/2000	J.TRIMURTHULU
15	2019/02/20 11:47:44 AM GMT+5:30	venky9902@gmail.com	17X41A0536	O.NAGA VENKATESH	Male	2/11/1998	O.KRISHNA
16	2019/02/20 11:47:57 AM GMT+5:30	mansi.neela463@gmail.com	17X41A0534	neela mary mansi	Female	2/11/1999	neela suresh
17	2019/02/20 11:48:19 AM GMT+5:30	sriharikatta1999@gmail.com	17X41A0525	Srihari katta	Male	6/2/1999	venkateswarlu katta
18	2019/02/20 11:48:22 AM GMT+5:30	nafeesakouser99@gmail.com	17X41A0532	NAFEESA KOUSER	Female	5/12/1999	MOHAMMAD NAWAB
19	2019/02/20 11:48:22 AM GMT+5:30	hemabhargavi6499@gmail.com	17X41A0502	AKKEM.HEMABHARGAVI	Female	11/28/1999	akkem.venkateswara reddy
20	2019/02/20 11:48:24 AM GMT+5:30	chdivyavani15@gmail.com	17X41A0511	chandana.Divya vani	Female	12/15/1999	chandana.Rama Krishna Bhagavan
21	2019/02/20 11:48:27 AM GMT+5:30	balram.bale05@gmail.com	17X41A0507	balram	Male	4/11/1999	ramesh
22	2019/02/20 11:48:31 AM GMT+5:30	tarunirenuka0001@gmail.com	17X41A0501	A.Taruni Renuka	Female	4/19/2000	A.venkat Rao
23	2019/02/20 11:49:41 AM GMT+5:30	gayathripenumala353@gmail.com	17X41A0538	Gayathri	Female	5/25/2000	Venkateswara rao
24	2019/02/20 11:49:48 AM GMT+5:30	chandralekha1899@gmail.com	17X41A0550	chandralekha.veninalla	Female	12/18/1999	srinivasa.rao.veninalla

**V.RESULTS**



Here the table represents the before the adding of the different fields of their semester marks. Below shown is the accuracy table:

S.No	Algorithm	Accuracy
1	Decision Tree Classifier using with Entropy	80.0
2	Decision Tree Regressor	82.0
3	SVM (Support Vector Machine)	68.0
4	Random Forest Classifier	82.0
5	Gaussian naive bayes	60.0
6	Multinomial naive bayes	74.0
7	Passive Aggressive Classifier	92.0
8	Logistic Regression	94.0
9	K-Nearest Neighbors	88.0
10	Linear Discriminant Analysis	94.0
11	Ada Boost Classifier	57.99999999999999

**Table 2: Different Algorithms with Different Accuracies before summation**

Here the table represents after the adding the semester subject marks to the fields is the accuracy is as shown below:

S.No	Algorithm	Accuracy
1	Decision Tree Classifier using with Entropy	74.0
2	Decision Tree Regressor	70.0
3	SVM (Support Vector Machine)	52.0
4	Random Forest Classifier	70.0
5	Gaussian naive bayes	60.0
6	Multinomial naive bayes	80.0
7	Passive Aggressive Classifier	42.0
8	Logistic Regression	82.0
9	K-Nearest Neighbors	72.0
10	Linear Discriminant Analysis	82.0
11	Ada Boost Classifier	64.0

**Table 2: Different Algorithms with Different Accuracies after summation**

## CONCLUSION & FUTURE SCOPE

This project presents Student Career Guidance and Recommendation System using the inherent student skills for choosing right career. Choosing a right career by is significant due to the diversified human abilities. Many students are choosing their career path without receiving proper advice from suitable professional or university services. This may potentially cause mismatch between academic achievements, personality, interest and abilities of the students. In order to recommend students in career selection, it is essential to build a recommendation system that provides direction and guidance to students in choosing their career. The key challenge in this project is selecting key attributes/skills that help in predicting the right path to meet diversified students goals. System is developed using machine learning algorithms like Decision tree Classifier, Support Vector Machine, Ada Boost, Linear Discriminant Analysis, Logistic Regression, ... etc. Logistic Regression and Linear Discriminant Analysis has given more accurate results. We took dataset from 1000 student's data. The recommendation system will be helpful for establishing good Institution Student relationship and improving Institution reputation. This system

In future we can create effective web application that can gather information by evaluating and examining. Analytical, Memory Based, Technical, Logical, Hobbies, interests in Technical/Non Technical, Performance of the student from the child hood and skill based tests can be conducted and information collected can be used to improve the accuracy. The Dataset can be built from several thousands of student's data. We can try to use the clustering methods for better understanding. We can also implement the techniques like Deep Neural Networks and Time series Analysis.

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