

# Placement Prediction and Training Tool Using Machine Learning (ML.NET)

<sup>1</sup>N. Kumaran, <sup>2</sup>V. Sankaranarayanan\*, <sup>3</sup>V. Somasundaram, <sup>4</sup>T. Srinivasan

<sup>1</sup> Assistant Professor, <sup>2,3,4</sup> Student,

Dept. of Computer Science and Engineering, Sri Chandrasekharendra Saraswathi Viswa Mahavidhyalaya, Tamilnadu, India

Email: <sup>1</sup>nkumaran@kanchiuniv.ac.in, <sup>2</sup>devathi1105@gmail.com, <sup>3</sup>a.v.somasundaram@gmail.com, <sup>4</sup>11179A238@kanchiuniv.ac.in

**Abstract:** This paper concerned on Placement prediction software using C# and ML.Net, for prediction and analyzing of placement based on the academic details. Placement can be throttled through many aspects like mock programs, practice tests, training programs, reference guides, and lectures from placed students of our college/university or even through MOUs. This process can be fine-tuned if we have a prediction system to drill down our process deeper to engage the students and staff towards Placement more effectively. Here, we elaborate a tool that predicts the placement probability of a single student or a group. We have titled this as "Placement Prediction and Training Tool". Though prediction is being done, training based on those predictions is also needed. Thus, a module for the training is persisting within this tool. The tool is being developed as a Windows Stand-Alone Application that involves an individual to predict their placement possibility. This tool is not just a single user application that requires a user to insert inputs to get the predictions; it is an application that has an admin perspective that enables to access the prediction for a group of students as well.

**Key Words:** Prediction, Fast Tree Regression, Machine Learning.net, Graphical User Interface, C sharp.

## 1. INTRODUCTION:

Statistics say 1.5 million engineers are graduating each year in India. The demand and need for qualified graduates in the field of IT are raising day by day. One of the largest facing challenges for an educational institution is to boost the placement performance of scholars. It's one of the responsibilities of the institution to give more placement options and training to its students. Measures, initiatives and systems are huge on the list in the field of education, and to this arena, our work aims to be included at some point shortly, as one flower to the huge bouquet of facilities for the student community. The proposed system is the perfect substitute for the latter. Today internal server hosting programs are being available in every department of the institution, the deployment of this "Prediction and Training Tool" is easy and shall bring new formats of predicting student's placement, to place where there was nothing but exams. Keeping in mind a simple architecture that uses a straightforward mechanism through an easy-to-use windows-based application for predicting placement in a "Prediction and Training Tool", it is proposed to build software on C sharp.net and using Machine Learning module. This also deals with a set of user's placement prediction and also with individual use.

## 2. LITERATURE REVIEW:

According to [1] they used Deep Learning Artificial Neural Network (ANN) algorithm for predicting the percentage. The author has uploaded the dataset first and allows the user to write a sample entrance test with that score historic data is compared and the prediction percentage is determined. The author satisfies only the pre-processing data module and classification techniques module. The author took a wise decision of choosing Artificial Neural Network because it has the advantage of working with incomplete information that is after the artificial neural network is trained the data can produce output even without incomplete information. In [2] the author did a very refined methodology of data gathering, pre-processing, processing, and interpretation in the whole approach. The author used the supervised learning method for classification and regression of the dataset. In this approach, the author has used Random Forest and Decision Tree for the prediction. The data was first gathered and cleaning of data is performed before the pre-processing and processing method. A supervised learning method is a function that maps an input to an output based on example input-output pairs. It can be used to map new examples also. Decision Tree and Random forest algorithms had a pretty good accuracy when compared to each other separately. In [3] some direction in classifying model for predicting campus placement performance using data mining techniques has been proposed. In this system author used Naïve Bayesian algorithm in the classification method. They also used the J-48 Decision Tree classifier method in data mining and visualized using the WEKA tool. This paper gave a brief note on how deep

learning algorithms work and are visualized in the tool called WEKA. Data visualization helps in better understanding the dataset and the functioning of the algorithm. This paper helps our project in understanding how an algorithm works. The author had executed this system in various other algorithms to identify the precision of accuracy and rate of loss occurred. The accuracy level is lesser than that of the accuracy level which we perform in our system.

Whereas in [4] the author proposed some directions for recommendation system using content filtering using machine learning. A content-based recommendation and hybrid recommendation approach has been carried out in the entire system project. The author had used several steps for applying the algorithm to find results are pre-processing, Extraction, Filtering, Clustering, Identification of Users, Content-Based filtering in the Recommendation System. These steps gave the entire process a tremendous workload from the extraction of data to getting the results in hand. The author has also included big data concepts to handle a large amount of data at a time. From the warehouse, the required data and information has been extracted, and filtering of data and clustering is done before categorizing the data. And in [5] the authors proposed a project of prediction system and placement training using fuzzy inference system. The author used MATLAB as a tool to do this system completely. To be in short authors have classified the student's dataset into placed and non-placed classes. A fuzzy inference system is used here to predict the performance of the students. Fuzzy inference is a simple logic that provides a Boolean output of true or false values representing truthfulness and falsehood values. The authors had created an input and output member function range in MATLAB and used Fuzzy inference for the prediction. A member function correlates the classified data and tries to interpret it in a Boolean true or false fashion

## **2.1. OBJECTIVE:**

The objective of this paper is, the traditional way of analyzing the students of the institution for the placement was held with the help of some mock interviews and tests, which played a vital role in Placement analysis and also for training purposes. These conventional methods must set forward a very important scope of digitization. This is approached, by using a Standalone Software, approached using Machine Learning based Placement Prediction and Training tool, in place of the said traditional method which helps to save a lot of time and human labor. Of course, it is a working system remaining in use for ages. The large process of traditional analysis of student's capacity will be replaced with a single software tool which can be installed in all the windows system. The traditional method can also prone to mistakes and loss of information, and this should be managed and controlled by a central authority. Such shortcomings and disadvantages which are to name a few, which are faced by the faculties, are resolved to the best possible extend using our "Prediction and Training Tool".

## **2.2. STATEMENT OF THE PROBLEM:**

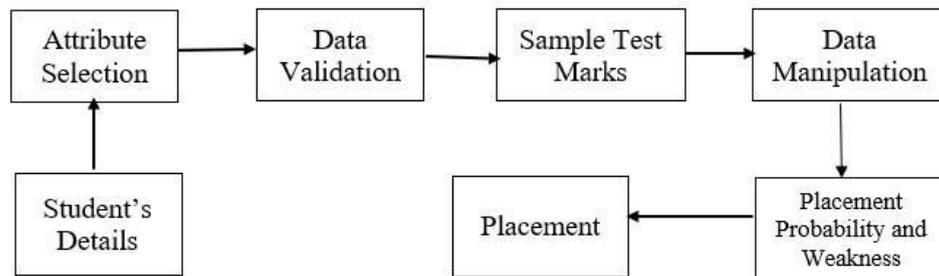
Today internal server hosting programs are being available in every department of the institution, the deployment of this "Prediction and Training Tool" is easy and shall bring new formats of predicting student's placement, to place where there was nothing but exams. In the existing systems, the prediction is performed to analyze a student's performance, but in the proposed method we overcome the problems faced by the existing systems like system compatibility, usability, etc. The problem of group placement prediction has been tackled in a very effective way where the administrator could find the placement probability with just a few buttons clicks.

- Binary prediction results are replaced with percentage probability for placement because binary prediction can only know whether the particular student is getting placed or not whereas our system provides the vital percentage of placement probability and also addresses their strengths and weaknesses.
- Our project emphasizes predicting and analysis of an individual or group of candidate's placement probability. It is also proposed that our tool is used to train the users for their placement so that it can be integrated with the network of students' development as it is a useful tool in the future. This project is going to give a stand-alone windows application which can be installed and executed in all windows computer

## **3. METHODS AND MATERIALS:**

### **3.1. Single User Prediction:**

Theoretically, the system works as (shown in Figure 1) a stand-alone application where the user enters their details (single user prediction) and from the details entered by the user only the necessary attribute was selected and being validated behind the screen. Then a sample test with some random questions asked in recruitment process was displayed and the user is supposed to answer all the questions. The score from the sample test is also added to the attribute set and the entire data is manipulated for determining the placement probability, Hence the placement probability with the suggestion for their strengths and weaknesses was displayed to the user/student.



**Figure. 1:** Overview of single prediction model

### 3.2. Multiple User Prediction:

The multiple user prediction is done in an admin authorized panel where the admin is supposed to upload an excel file containing the following columns (attributes for prediction), ssc\_p (SSC percentage), ssc\_b (SSC board), hsc\_p (HSC percentage), hsc\_b (HSC board), degree\_p (Degree percentage), backlog (yes/no), certifications (yes/no). A phenomenal plugin called “Model Builder” for implementing Machine Learning algorithm in .net environment has been used in the back end for creating Machine Learning Model in order to predict the placement probability. When the author clicks on the predict button in the window, the created model which is imbedded in the Prediction software is being executed for ‘N’ iterations for calculating the placement probability. Where N is the number of rows in the uploaded excel file. At last, the predicted output will be displayed in a new column next to the excel file uploaded.

### 3.3. System Requirements:

#### Selection of Software and Language

- Front End : C#.Net
- Back End : SQL Database, Microsoft Excel Database
- Platform : Windows Operating System higher than Windows XP
- IDE : Visual Studio 2019
- Machine Learning : Model Builder ML.Net

#### Selection of Hardware

- Processor : Intel i3 and above
- Hard Disk : 512 GB and above
- RAM : 1 GB and above

### 3.4. Module Description:

**3.4.1. Home Module:** This module is the landing page for the software. This module is used to redirect Student and Administrator to view company details, student’s prediction, Training ground, and multiple predictions and company details updating respectively. This module also has a redirection to know about the software and the user manual page.

**3.4.2. Admin Module:** This module is used to authenticate the administrator before starting the prediction or updating company details which can be done only by the administrator. Hence, this module is very essential to prevent misusing the software.

**3.4.3. Single Prediction Module:** This module helps the student to enter their personal and academic details and validate them to predict their placement probability. This module also allows the students to write the sample test for the added parameter for prediction.

**3.4.4. Sample Test Module:** This module displays the set of questions in the various round and gets the entered answer from the students which will be used later for prediction purposes. At the end of this module, the placement probability of the student is calculated from the entered details and test score.

**3.4.5. Company Details Module:** This module helps the user to take a look at the list of companies that are coming for placement. This window also tells users some details about the recruitment process of a particular company in a tabular fashion. The details it shows are Company Name, several round in recruitment, Company Base, Several Students were recruited(approximate), Difficulty level, Eligibility exams if any, Name of the eligibility exam, Several technical rounds.

**3.4.6. Training Ground Module:** This module helps the students to get trained for the placement. This is typically used as a guide to improving themselves in their strengths and weaknesses.

**3.4.7. Company Details Updating Module:** This module collects the information of the companies and allows only the administrator to add company details in a form that will be stored in a SQL database and then displayed in the company details module as mentioned above.

**3.4.8. Multiple User Prediction Module:** This module allows only the administrator to predict the placement probability of multiple students at a time and also allows the admin to save or export the predicted information for further purposes.

**3.4.9. About the Software/User Manual Module:** This module tells the user about the software and also teaches the user how to use the software (User Manual).

**4. MACHINE LEARNING APPROACH:**

For placement probability prediction for **multiple users**, we use Machine Learning as a key tool which was integrated into the software using “Model Builder”. Model Builder is a plugin for Visual Studio 2019 for performing Machine Learning algorithms. After integrating this plugin, we have to choose the scenario for working in it. Once the scenario is selected the environment, we work in should be selected, next the dataset or the input files to train the machine to have to be uploaded and previewed. Then we have to select the input which we want to predict. And then the training of the machine will be started. We can set the time limit and iterations required for developing the model and for training the machine. The specialty of “Model Builder” is that it has several built-in Machine Learning Algorithms which will be executed when the machine is getting trained. Once all the algorithms are explored Model Builder will give us the most efficient algorithm which has minimum Time is taken, more efficiency, and lesser loss. And the next step is to evaluate this generated model code by giving inputs and testing the results. As “Model Builder” searches the phenomenal algorithm for the type of input we give to train the module/machine, it calculates the loss, accuracy, time is taken and some other parameters for every algorithm that suits for performing the desired action and hence will give us the most efficient algorithm which has minimum Time is taken, more efficient and lesser loss (Figure 2). After the completion of these steps, we can add this model to our project. Model Builder helps with that too. It will auto-generate the sample code for the particular algorithm which has been selected as efficient. The sample code has been modified according to the project needs and embedded inside the form which we want to execute. While the admin imports the excel file to be predicted and presses the predict button the code, we create for this model will run behind the screen in a loop. Which in turn fetches the number of rows we have in that excel and starts the calculation. Once the calculations were done it is programmed to add a new column along with the existing excel and prints the placement prediction. From here the admin can save/import the modified excel file into their public storage.

Trainer	RSquared	Absolute-loss	Squared-loss	RMS-loss	Duration	#Iteration
Trainer	0.7141	7.97	92.76	9.59	1.2	1
1 SdcaRegression	0.8527	5.08	46.81	6.81	0.8	2
2 LightGbmRegression	0.8925	4.07	34.14	5.79	1.2	3
3 FastTreeRegression	0.8918	4.09	34.44	5.83	1.2	4
4 FastTreeTweedieRegression	0.7534	7.25	79.56	8.89	2.2	5
5 FastForestRegression	0.7144	7.95	92.64	9.59	0.5	6
6 LbfgsPoissonRegression	0.6971	8.17	98.24	9.87	0.4	7
7 OnlineGradientDescentRegression	0.7130	8.00	93.12	9.61	0.4	8
8 OlsRegression	0.7188	7.77	91.26	9.52	0.5	9
9 LightGbmRegression	0.8806	4.50	38.07	6.12	1.4	10
10 FastTreeRegression	-15.4006	70.22	5261.07	72.51	0.7	11
11 FastTreeTweedieRegression	0.7195	7.83	90.37	9.47	0.5	12
12 LightGbmRegression	0.9196	3.13	25.67	5.03	1.7	13
13 FastTreeRegression	0.7063	8.09	95.61	9.73	0.7	14
14 FastTreeTweedieRegression	0.6828	8.24	103.18	10.13	0.5	15
15 LightGbmRegression	-4.4460	39.90	1752.54	41.84	1.2	16
16 FastTreeRegression	0.8012	6.19	63.76	7.93	1.8	17
17 FastTreeTweedieRegression	0.7706	6.94	73.99	8.57	0.7	18
18 LightGbmRegression	-11.5769	61.41	4037.11	63.51	0.8	19
19 FastTreeRegression	0.9061	3.73	29.84	5.43	5.3	20
20 FastTreeTweedieRegression	0.7727	6.72	72.95	8.52	0.5	21
21 LightGbmRegression	-9.9025	57.08	3501.10	59.15	0.9	22
22 FastTreeRegression	0.6992	8.11	98.08	9.86	0.9	23
23 FastTreeTweedieRegression	0.7234	7.79	89.44	9.42	0.5	24
24 LightGbmRegression	Top 5 models explored					

Figure 2. Comparing Algorithm’s Efficiency

**5. RESULTS AND DISCUSSION:**

- Firstly, when the user enters the academic details and attempts the sample the test, the single user placement probability along with the strengths and weaknesses of the user is being displayed as shown in Figure 3 and Figure 4.

- Secondly, when the Admin enters the admin panel (Figure 5) by entering the credentials correctly and the excel file is being uploaded for performing multiple user prediction, the model builder (ML.NET) works behind and the resulting placement probability is added in the excel file (Figure 6) and can be exported to local device for future purposes.
- Thirdly, after knowing the strengths and weaknesses the student/user can enter the training ground module for separate training programs for several important topic related to recruitment process. (Figure 7).
- Fourthly, the company details (recruiters of the institution) can be updated only by the admin in company details updating module (Figure 8) and can be viewed by users in company details module (Figure 9).

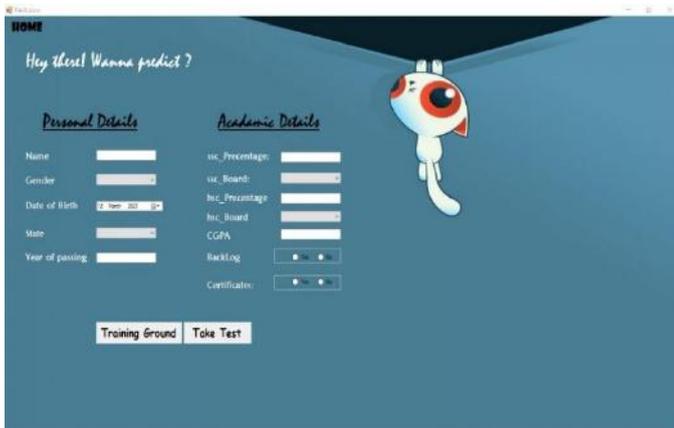


Figure 3. Single User Prediction (data collection)

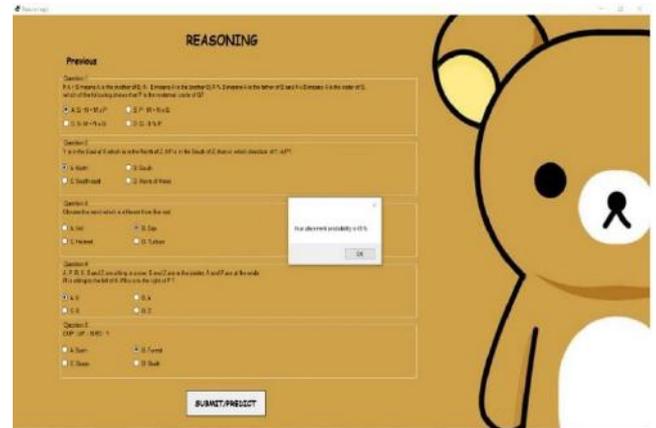


Figure 4. Single user prediction result.



Figure 5. Admin login panel

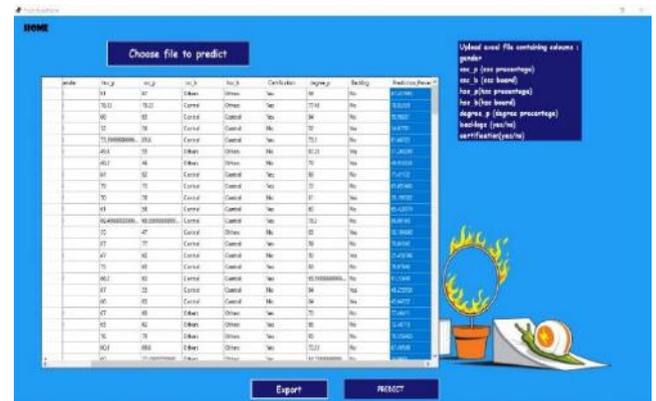


Figure 6. Multiple user prediction (output has been added in the highlighted column)



Figure 7. Training Ground

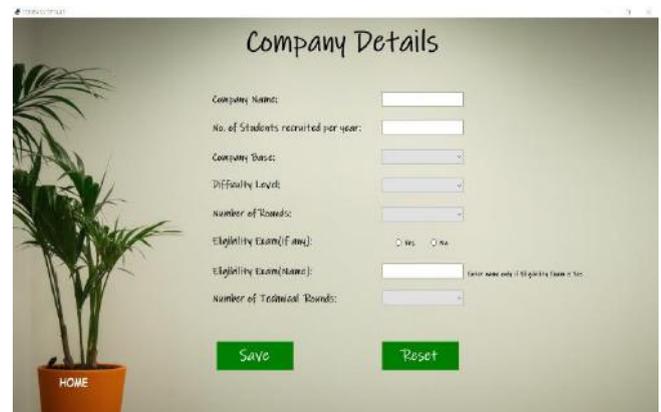


Figure 8. Company details updating module.

ID	Company Name	Company Size	Number of Available Recruits	Number of Roles	Difficulty	Eligibility	Stability	Number of Technical Fields
1	ABC	Small Sized	10	3	Medium	Yes	High	2
2	DEF	Medium Sized	20	5	Medium	No	Low	3
3	GHI	Large Sized	50	10	Hard	Yes	High	4
4	JKL	Small Sized	15	4	Medium	No	Low	2
5	MNO	Medium Sized	30	7	Hard	Yes	High	3
6	PQRS	Large Sized	60	12	Very Hard	Yes	Very High	5

Figure 9. Company Details Module

## 6. CONCLUSION:

To conclude the whole paper of our Placement Prediction and Training Tool which we have completely elucidated earlier is that the best way of providing a service in the field of education, where timely usage of the software is important, by combining the need of technology. It's a need for the future generation to have their education system to the next level and institutions a platform to establish themselves over such technical and technology-based cosmos. To make the path easier and viable we choose this Machine Learning platform which is a standard application that provides an interface between unknown coding to automated learning controls on an everyday basis. Out of all parts of this Placement Prediction Software, the most interesting part is the integration of Model Builder code, where the working of the entire system is governed in a different platform, thereby making a Placement Prediction and Training Tool is effective energy and time saving to the best possible extend.

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