

# **Web Recommender System for Private Universities' Admission in Iraq: UHD Case Study**

Karzan Wakil<sup>1\*</sup>, Ban Akram<sup>2</sup>, Ngein Kamal<sup>2</sup>, Amirhossein Safi<sup>3</sup>

<sup>1</sup> Fine Arts Institute in Sulaimaniyah (FAIS)-Iraq, Rizgari, Sulaimaniyah, KRG, Iraq.

<sup>2</sup> University of Human Development (UHD), Sarchia, Sulaimaniyah, KRG, Iraq.

<sup>3</sup> University Technology Malaysia (UTM), Skudai, Johor, Malaysia.

\* Corresponding author. email: karzanwakil@gmail.com.

Manuscript submitted September 5, 2014; accepted October 29, 2014.

doi: 10.7763/ijeeee.2014.v4.348

---

**Abstract:** Admission recommender system provides a way to finding suitable course in universities that best fit students' merits and interests. Iraqi universities are using a complex admission process which is not supporting recommender systems, and it is only based on the candidates' Grade Point Average (GPA). In addition, applicants don't have enough information on available courses and their available majors. In this paper, we prepare a new admission recommender system that is developed by using a hybrid method of Neural Network (NN), Decision Tree (DT), and Our Proposed Algorithm (OPA). We using DT to classify the applicant to 10 groups, each group has special properties, but NN used to apply the applicant to the available courses that can apply, our algorithm mixed with NN to finding best course. Our algorithm considers GPA, test score, candidates' interest and their desire jobs as decision parameters. The aim of this paper to solve the complex systems that used more than one criteria to apply more than one courses. The result of the system is better and more reliable outcome comparing to other available admission systems; furthermore our system can find a suitable course for each applicant.

**Key words:** E-recommender system, admission system, neural network, decision tree.

---

## **1. Introduction**

University educations are a key piece of most individuals' readiness for working life. An admission to college is consequently turned into a vital testing point. Thus, viable college confirmation expectation administrations are required for helping students to enter the right college school. Then again, because of the colossal quantities of students required going to the college consistently, this choice making procedure turned into an extremely unpredictable issue. This procedure is not only depending on students' test scores, it additionally relies on upon students' experiences and different capabilities weighting criteria that relate to the execution of their tertiary instruction. College or school affirmation is a complex choice process that goes past matching test scores and confirmation necessities [1]-[3].

Focal points of a recommender framework can quickly be the unification of the whole process. In addition, the utilization of a focal database instead of a paper-based framework also gives a simple open way. Utilizing a mechanized recommender framework contrasting with customary paper-based ones evacuates human mistakes furthermore, causing a much speedy work which spares part of the time. Also, if strategies or minor insights concerning the confirmations process at colleges changes, this could be reflected inconceivably minor progressions to the code of the framework, to retrain representatives as opposed to

having with respect to the new practices [4].

Consistently, students in thousands line up for gathering admission structures and then again for submitting the admission structures. This prompts issues in dealing with the applications, bringing about irritated folks and conflicts among people. In the Iraq, the colleges not suggest for the students in general terms, they centered the GPA which the students got the final year in high school [5]. That is an issue for discovering the best college for the students; we tackled this issue by introducing online confirmation framework based on normal degree, fascinating, proportionality with division, testing evaluation, and eventual fate of the division. For simple to grouping the candidates and discovering fit divisions for candidate as per normal testing score, interesting and etc., we utilize NN, DT and OPA to take care of this issue.

As of late, applicants in the Iraqi colleges have taken after the physical methodology. The University and College Admissions Service (UCAS) has proposed a manual guide as a hard book of the undergrad confirmation process, which will see students applying to college after they get their exam result, the framework take after the average imprint with a few tenets. However, there are a few changes yet as of recently; they utilize the same framework [6]. For finding best program in the university fro applicant, we using a hybrid method when consists of NN, DT, and OPA.

The DT is a classifier communicated as a recursive allotment of the info space focused around the estimations of the characteristics. As expressed prior, every inside hub parts the occurrence space into two or more sub-spaces as per certain capacity of the info characteristic qualities. Each one leaf is allotted to one class that speaks to the most suitable or regular target esteem. Cases are grouped by navigating the tree from the root hub down to the leaf as indicated by the result of the test hubs along this way. Every way might be changed then into a tenet by joining the tests along this way [7].

The NN has been connected to an expanding number of certifiable issues of extensive unpredictability. The most critical focal point is that fake NN are equipped for tackling issues that are excessively mind boggling for ordinary advances – issues that do not have an algorithmic result or that result is excessively intricate to be found. The application area of NN today touches very nearly the whole circle of science. These include Association, Clustering, Classification, Pattern Completion, Regression and Generalization, Forecasting, and Optimization and so on to name a few [8].

Moreover, our admission recommender system is scalable and frequently is updated with government instruction and new university admission rules. The output of this system is very accurate and meets the candidates' preference in selection of departments. Moreover, because it performs much faster than traditional systems, it provides more time that can be allocated for other tasks such as student registration.

This paper is organized as follows: Section 2 explains the background work for the recommended admission system. In section 3 represents challenges and approaches of admission recommender system. In section 4, we analyze our case study to prepare recommendation system. In the section 5 prepares the hybrid approach when consists of NN, DT and OPA for the Iraqi private universities recommender system, also represent an experimental result. In the section, 6 discuss conclusion and future work.

## **2. Related Work**

Most existing investigations of college admission [9]-[11] are focused around the viewpoint of colleges who are to get the new approaching students, and not on the point of view of high schools that are sending their students to seek after advanced education, or on the viewpoint of the applicant who need to choose which college to apply to. Given that the college knows nothing about the candidate, though the optional school knows significantly all the more, there is esteem in augmenting the college affirmation procedure to incorporate high schools [1].

Fong and Robert, 2009 present a half and half model of the NN and DT classifier that serves as the center outline for a college affirmation recommender framework. The aftereffect of framework is high forecast for students [4].

Furthermore, Ragab *et al.* 2014 present another school confirmation framework utilizing cross breed recommender focused around data mining methods and learning revelation principles, for handling school affirmations forecast issues. The framework is versatile, since it could be tuned up with other chief qualities performing trusted required errands quicker and fairly [12]. Fig. 1 shows the history of recommendation online admission system.

Authors	Year	Approach	Characteristics
J. A. Freeman	1991	Neural networks (NN)	Performing pattern recognition and categorization. However, training a neural network consume a long time.
E. Gottlieb	2001	Linear programming models	Admission problem is solved as a simple yes or no decision.
I. Hatzilygeroudis, J. S. Moore	2004	Expert System	A rule-based system that uses a type of certainty factors. The values of the parameters (weights) are determined via training, before the system is used.
S. Vinnik	2005	Decision Support System	Assessing educational capacity and planning its distribution and utilization in universities.
L. Chang	2006	Data Mining	Predictive modeling was applied to enhance the prediction of enrollment behaviors of admitted applicants at a large state university.
S. Fong W. C. Lou	2009	Hybrid Model NN and Decision Tree (DT) Classifier.	The recommender predictions based on students' histories. Combining NN and DT improves recommendation output.
A. Ragab, etal	This paper	Cascaded hybrid Recommender and DM.	Use rules and DM achieving student's admission fairly, and accurately prediction and allocation, with high performance.

Fig. 1. History of recommendation online admission system [12].

Lots of researchers have focused in this area in recent years, such as Péterbiró *et al.* 2010 [13] took a gander at the college admissions issue with lower and basic quantities. Stepanjurajda (2010) likewise proposed admission to particular schools, in order. Tolgayureta and M. Kadirdogan, 2011 [14] dealt with affirmation methodology focused around relative preference and inclination in Turkey. Also, Min ZHU, 2013 [15] took a gander at this methodology in China by proposing a system outline point of view.

Braun, S. *et al.* ponders the usage of quantities in matching markets. In a controlled nature's turf, they think about the execution of two college affirmations strategies that both at first save a significant part of seats at every college for an extraordinary subgroup of students. The first instrument impersonates the consecutive technique at present utilized by the focal clearinghouse for college confirmations in Germany. This methodology begins by dispensing saved seats among qualified students and then assigns all remaining seats among the individuals who were not officially doled out one of the held seats in the first piece of the method. The second instrument is focused around a modified applicant proposing conceded acknowledgement calculation in which all seats are assigned simultaneously [13].

In another paper Fong, S. *et al.* propose a half-breed model of the NN and choice tree classifier that predicts the probability of which college an applicant may enter, by examining his scholastic benefits, foundation and the college confirmation criteria from that of chronicled records. Their model framework was tried with live information from wellsprings of Macau high school students. Notwithstanding the high forecast precision rate, adaptability is preference as the framework can foresee suitable colleges that match the students' profiles and the suitable channels through which the students are encouraged to enter. Their model might be summed up with different traits and perform speedier when contrasted with utilizing a NN alone [4].

Daniūnas, A. *et al.* manage the fundamental standards of advanced education change in Lithuania and how the circumstances has changed in the field of admission to Lithuanian higher schools, including Vilnius

Gediminas Technical University (VGTU) [14]. Indian University Admission (IUA) is a complex wonder including different elements both substantial and impalpable. Separated from Merit-Caste, Community and Religion assume an urgent part in getting admission to different courses offered by universities. The Single Window Admission System emulated by practically all government universities (for instance: Anna University, Chennai) is, in this way, the best practice to offer admission looked for by applicant group. At the same time, still, in private universities, the admission methodology is carried out physically since number of students looking for a course is littler in size. This manual methodology is loaded with a few downsides, for example, slower in time, unwieldy and costlier, predisposition by the admission officer, manual blunders while handling, because of impact practiced by effective individuals qualified students not getting their course of decision and unfit students getting into their course of ability and so forth. This paper addresses these issues by means of NN building design based admission framework which will wipe out all the pitfalls and disadvantages inalienable in the current framework and offers a smooth, clearer, less demanding and financially smart method for applicant confirmation framework usage in Indian universities [15].

Wabwoba, F. and F. Mwakondo, examine the potential use of Artificial Neural Networks (ANNs) at the Joint Admission Board (JAB) for the process of selecting students for university courses. Based on the fact that ANNs have been tested and used in classification, the paper explains how a trained NN can be used to perform the students' placement effectively and efficiently [16].

However many papers solved the online admission complexity by using different approaches, but these approaches not mach for the online recommendation system in the Iraqi universities. Therefore we need a new approach for solving this problem which consists of DT, NN, and OPA when can address that issues.

### **3. Challenges and Approaches of Admission Recommender System**

In this section we explain the challenges of the recommender admission system in the current systems and Iraqi system, moreover we explain the recommendation approaches how to working in the admission systems.

#### **3.1. Admission System Challenges**

Confirmation methodology starts with a potential applicant finishing an application structure through the UCAS; the first step for students is to apply specifically to the college through a custom online structure. In the wake of checking of the obliged data and archives by the framework, if any of the obliged data is forgetting, the secretary reach the potential applicant and organizes the conveyance of the remarkable information. Affirmation guides will acknowledge qualified competitors and reject different ones when an application is finished [1], [5]. The determination strategy of candidates for college affirmation is carried out in four after steps: 1) Forms preparation; 2) Queries handling and form distribution; 3) Forms collection; 4) Sorting the list of candidates.

In addition to the above, the admission process is not transparent, prompting extension for far reaching misbehaviors. So as to correct these inadequacies upgrade the current affirmation process and make it more transparent web technology has concocted an Online Admission Application System (OAAS). This framework is proposed to conquer the accompanying issues [17]: 1) Geographical Boundary, 2) Long Queues, 3) Huge Paper Work, 4) Only Eligible Candidate Apply, 5) Large human Involvement, 6) Accuracy and reliability, 7) Dynamic and User Friendly, 8) Customizable Real Time Reports, 9) Operational.

#### **3.2. Iraqi Admission System Challenges**

These proposed mechanisms cannot be used in Iraqi universities due to the following reasons [5]:

- Problems in the Ministry of Higher Education Instruction (MHE) updates, since it updates yearly.

- The instructions that are sent from the MHE changes.
- Problems in filling degrees in their forms: Writes its degrees by hand errors are likely to happen. And also schools writes the degrees errors are likely too.
- Everything is manual. However in the 3 last year became to online, but did not perfect it.
- Choosing a college might cause problems since some only accept science students.
- Private Universities wait for government universities to accept the students, and wait for almost 2 weeks.
- Acceptance is just by GPA of all courses.
- Changing the college by the applicants is one of the biggest problems.

### **3.3. Admission Recommender System**

The school recommender contains two inner segments a Classifier and Allocator, individually. The College Recommender (CR) administration students who succeeded in all preparatory year courses. It designates students into universities decently as per the GPA and essential qualified courses expressed by specific schools. The classifier is utilized to order students as indicated by their sexual orientation and their capabilities. The CR completes information handling utilizing example disclosure tenets. The example disclosure guidelines recognize inhabitant native students (Non-Saudi), which are considered affirmation by proportion from 5% to 10% of the aggregate offered college limit. The CR utilizes the pseudo code of peculiarity choice and information revelation tenets clarified in segment [12].

### **3.4. Recommender Approaches**

Numerous methodologies are utilized for proposal framework, for example, NN, DT, data mining, linear programming models and hybrid approach. With a specific end goal to help in Iraq confirmation colleges, we have utilized DT, NN, and OPA together.

#### **3.4.1. Decision tree (DT)**

The DT is a classifier communicated as a recursive parcel of the info space focused around the estimations of the qualities. As expressed prior, every interior hub parts the example space into two or more sub-spaces as indicated by certain capacity of the data quality qualities. Each one leaf is doled out to one class that speaks to the most suitable or continuous target esteem. Examples are ordered by navigating the tree from the root hub down to a leaf as indicated by the result of the test hubs along this way. Every way could be changed then into a tenet by joining the tests along this way. Case in point, one of the ways in Fig. 2 could be changed into the tenet: "If Outlook is Sunny and Humidity is Normal then we can play tennis". The coming about standards is utilized to clarify or comprehend the framework well. There are numerous calculations proposed for taking in the DT from given information set, yet we will utilize Id3 calculation due to its straightforwardness for usage. In this segment, we will talk about Id3 calculation for DT development and some of the habitually utilized capacities utilized for part the information space [7].

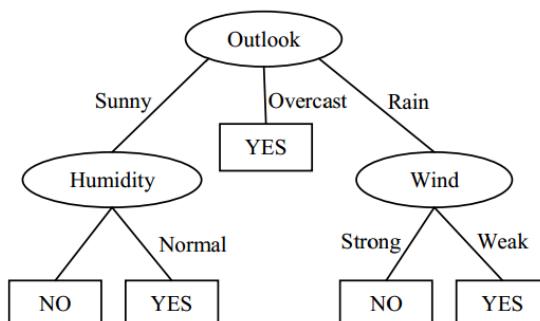


Fig. 2. Decision tree example.

### **3.4.2. Neural network (NN)**

NN are made out of straightforward components working in parallel. These components are in saved by organic sensory systems. As in nature, the associations between components to a great extent focus the system capacity [18]. An ANN comprises of a gathering of handling components that are profoundly interconnected and trans-structure a set of inputs into a set of coveted yields. The aftereffect of the change is dictated by the qualities of the components and the weights connected with the interconnections among them. By adjusting the associations between the hubs the system can adjust to the sought yields [19].

An ANN might be prepared to perform a specific capacity by modifying the values of the connections (weights) between elements. A couple of real enter and sought yield is obliged to prepare the ANN. NN have been prepared to perform complex capacities in different fields, including example distinction, ID, arrangement, discourse, vision, and control frameworks [18]. The NN picks up the experience at first via preparing the framework to effectively recognize preselected cases of the issue. The reaction of the NN is audited and the setup of the framework is refined until the NN's investigation of the preparation information achieves a tasteful level. Preparing of the system is directed until yields of the system fulfill the fancied target or until the system compasses wanted execution as showed by some lapse level (contrast in the middle of yield and coveted focus of net-work). Normally this lapse is formed as mean square blunder [20]. Notwithstanding the starting preparing period, the NN additionally additions encounter about whether as it leads investigates on information identified with the applicants' course choice according to their favored decision.

## **4. Analyzing Case Study**

In this paper we using University of Human Development (UHD) as case study, UHD is a private university in Iraq, we choosing 8 courses with codes which is consists of Computer Science, English Language, Arabic Language, Information Technology, Accounting, Bank and Financial Science, Law, and Politic Science as shown in Table 1.

**Table 1. List of Available Courses with Codes**

No.	Available course	Code
1	Computer Science	Cs31
2	English Language	En21
3	Arabic Language	Ar22
4	Information Technology	It32
5	Accounting	Ac42
6	Bank and Financial Science	Bf41
7	Law	Lo11
8	Politic Science	Ps12

According to ministry of higher education each of courses has different rules, for examples computer science should be the applicant come from science branch in high school, GPA more than 60 and sum of physics and math degree more than 120. Table 2 shows the rules for each course.

Description job of courses is a factor to finding an interesting course from applicant, for example if applicant apply to computer science, he/she can work as IT technician, developer, programmer, assistant researcher or teacher. Table 3 shows the description job for the available courses.

Table 2. Courses with Rules

No.	Course	Rules
1	Computer science	1-High school, science branch, 2-GPA >=60, 3-sum of physic +mathematic >=120
2	English language	1-High school, Science or literature, 2- GPA >=60, 3-English subject >=60, 4-test score >=70
3	Arabic language	1-High school, Science or literature
4	Information technology	A-1-High school, science branch, 2- GPA >=60, 3-sum of physic +mathematic >=120, B-industrial branch >=60(%20)
5	Accounting	1-High school, Science or literature
6	Bank Financial Science	A-High school, Science or literature, B-commercial (%30 of seats)
7	Low	1-High school, Science or literature, 2- GPA >=60
8	Politic science	1-High school, Science or literature, 2- GPA >=60

Table 3. Descriptions Future Courses

No.	Course	Job Description
1	Computer science	IT technician, Developer, Programmer, Assistant researcher, Teacher
2	English language	Translator, Assistant researcher, Teacher
3	Arabic language	Translator, Assistant researcher, Teacher
4	Information technology	IT technician, Developer, Programmer, Assistant researcher, Teacher
5	Accounting	Accountant
6	Bank	Banking manager
7	Low	Lower
8	Politic Science	Embosser, Politic analyzer

## 5. Preparation of Recommender System

As mentioned earlier, in our approach we are using DT, NN, and OPA to provide an ordered list of suitable departments in universities for each candidate. We prepare recommender system by using NN, DT and OPA for developing university recommender system. Fig. 3 shows the hybrid approach.

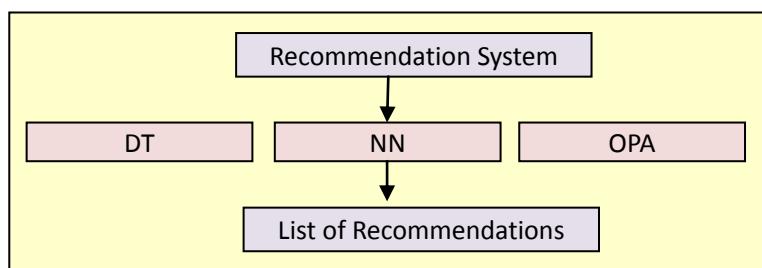


Fig. 3. Hybrid approach.

### 5.1. Decision Tree (DT)

One of the properties DT is classification as explained in section 3.4.1, by using DT we classified the applicant to getting 10 groups s shown in Table 4.

Table 4 shows the groups with description of the applicant, for example, the applicant group1 come from science branch in high school and their GPA equal or more than 60 , and sum of math and physic degree equal or more than 120. The result of this step in convert applicant state from single properties to group

properties. In the next step we will use the groups for finding mach courses for applicant.

Table 4. Groups of Applicant

No.	Group	Description
1	Group 1	High school, Science branch, GPA >=60, English >=60, Math +Physics >=120
2	Group 2	High school, Science branch, GPA >=60, English >=60, Math +Physics <120
3	Group 3	High school, Science branch, GPA <60, English >=60, Math +Physics >=120
3	Group 4	High school, Science branch, GPA <60, English >=60, Math +Physics <120
5	Group 5	High school, Science branch, GPA <60
6	Group 6	High school, Literature branch, GPA >=60, English >=60
7	Group 7	High school, Literature branch, GPA >=60, English <60
8	Group 8	High school, Literature branch, GPA <60
9	Group 9	Commercial branch
10	Group 10	Industrial branch

## 5.2. Neural Network (NN)

Each groups of applicant can apply for several courses according to rules when showed in Table 5, for example the applicant in group1 can apply to these courses (Low (LO11), Politic Science (PS12), English Language (EN21), Arabic Language (AR22), Computer Science (CS31), Information Technology(IT32), Bank and Financial Science (BF41), Accounting (AC42)) but applicant in group10 must be apply only Information Technology( IT32), Table 5 list of groups with courses when can applying.

Table 5. Groups with Courses

No.	Group	Course Code
1	Group 1	LO11,PS12,EN21,AR22,CS31,IT32,BA41,AC42
2	Group 2	LO11,PS12,EN21,AR22,BA 41,AC42
3	Group 3	LO11,PS12,AR22,CS31,IT32,BA41,AC42
3	Group 4	LO11,PS12,AR22,BA41,AC42
5	Group 5	LO11,PS12,AR22,BA41,AC42
6	Group 6	LO11,PS12,EN21,AR22,BA41,AC42
7	Group 7	LO11,PS12,AR22,BA41,AC42
8	Group 8	LO11,PS12,AR22,BA41,AC42
9	Group 9	IT32
10	Group 10	BF41

## 5.3. Our Proposed Algorithm (OPA)

After performing DT and NN methods, the last step is make an ordered list of colleges and universities for each candidate. This is done by using the following equation, this equation is Fitness equation that can find the best courses for applicant, this equation apply to hidden layer in NN.

$$F(i) = \frac{\sum_{i=0}^n S_i(U_j)}{\sum_{i=0}^n U_j} \quad (1)$$

S: student score  
U: university score

The result of the equation for each department shows the percentage of suitability of that department for selected student. Table 6 shows the wait if fields score to finding best course for applicant by using equation 1.

Table 6. Wait of Fields

Field of Score	Wait
GPA	%60
Test score	%15
Interesting	%15
Relation subject	%10

For example an applicant has GPA = 72%, test score = %50, Interesting = 75%, nod Relational subject = 80% the calculation of the  $F(i)$  shows the following:

$$F(i) = \frac{\sum_{i=0}^n S_i(U_j)}{\sum_{i=0}^n U_j} = \frac{72\%}{60\%} + \frac{50\%}{15\%} + \frac{75\%}{15\%} + \frac{80\%}{10\%} = 68.95\%$$

#### 5.4. Result of the Hybrid Recommendation System

In this section we show the whole recommendation system when consists of DT, NN, and OPA, Fig. 4 shows the diagram of recommendation system.

Our system can predict the list of courses when the applicant can apply and sort the courses for applicant according to score of recommendation. For example an applicant from group 4 with GPA = 72 done the process according to the following table.

Table 7. Prediction Example

Available Course	GPA	Test Score	Interesting	Relational Subject	F(i)
L011	72%	50%	75%	80%	68.95%
PS12	72%	60%	80%	80%	68.2%
AR22	72%	90%	90%	60%	76.2%
BF41	72%	50%	80%	71%	69.8%
AC42	72%	60%	50%	71%	66.8%

The system sort the available course according to  $F(i)$  and recommend for the applicant as the following table:

Table 8. Recommendation Example

Available course	Course Name	Recommendation Degree
AR22	Arabic Language	76.2%
BF41	Banking and Financial Science	69.8%
L011	Law	68.95%
PS12	Politic Science	68.2%
AC42	Accounting	66.8%

The above table is a final result, the system recommends for current applicant suitable and mach course

is Arabic Language 76.2% after Arabic language Banking 69.8%, and so on. This is good guideline for the applicants.

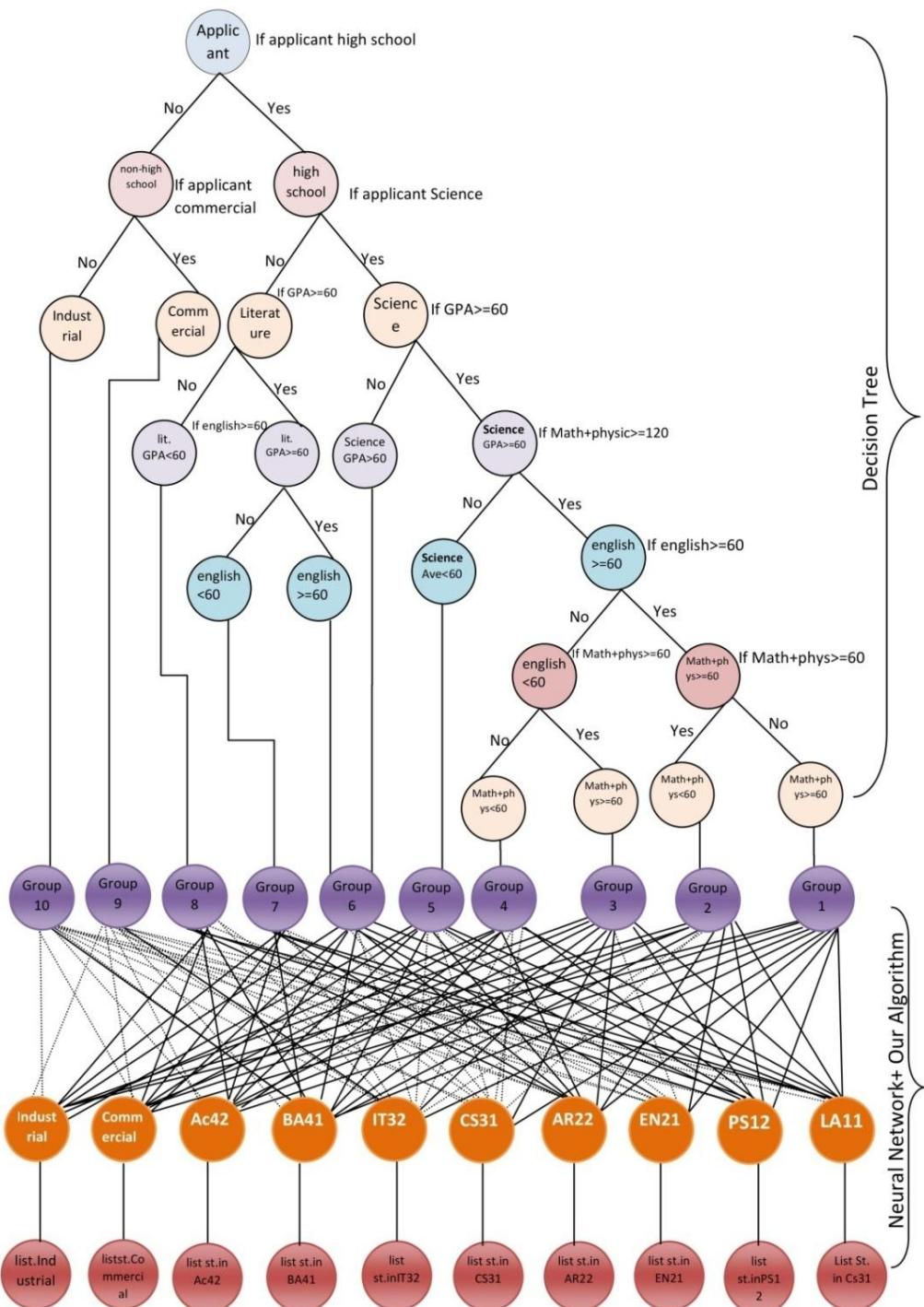


Fig. 4. Hybrid recommendation system diagram.

## 6. Conclusion and Future Work

However many researchers offered solutions for online recommendation admission problems, they are not perfect because each of them solve a part of entire the system, and the solutions not useful for Iraqi university admission system, that is need to find a new approach for designing a new online admission

recommender system for Iraqi private universities or any system that have same complexity. In this paper we used DT, NN, and OPA for solving complexity of web recommender system. In our system we consider major parameters including GPA, score examination grade, candidates' interest and future job. Our system shows better and more reliable outcome comparing to other available admission systems, this system help to high school students to coming university and choosing best courses or department to study. We recommend for the researcher to using other approaches such as data mining to recommend the courses for the students or mixed with other recommender approaches and they can use extra criteria such as geography location and gender for finding best available course.

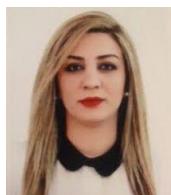
## References

- [1] Fong, S., & Biuk-Aghai, R. P. (2009). An automated university admission recommender system for secondary school students. *Proceedings of the 6th International Conference on Information Technology and Applications* (pp. 37-42).
- [2] Ragab, A. H. M., Mashat, A. F. S., & Khedra, A. M. (2014). Design and implementation of a hybrid recommender system for predicting college admission. *International Journal of Computer Information Systems and Industrial Management Applications*, 6, 35-44.
- [3] Ragab, A. H. M., Mashat, A. F. S., & Khedra, A. M. (2012). HRSPCA: Hybrid recommender system for predicting college admission. *Intelligent Systems Design and Applications (ISDA)*, 107-113.
- [4] Fong, S., Si, Y.-W., & Biuk-Aghai, R. P. (2009). Applying a hybrid model of neural network and decision tree classifier for predicting university admission. *Proceedings of 7th International Conference on Information, Communications and Signal Processing ICICS2009* (pp. 1-5).
- [5] UHD. (2014). Interview with Dr. Rebwar Karim Mahmud, Director of registration in University of Human Development (UHD), Iraq. *UHD Registration Directorate*.
- [6] Education, M. O. H. (2014). Student Guideline.
- [7] Mashat, A. F., Fouad, M. M., Philip, S. Y., & Gharib, T. F. (2012). A decision tree classification model for university admission system. *International Journal of Advanced Computer Science & Applications*, 3(10), 17-21.
- [8] Puri, M. P. & Kohli, M. M. (2007). Forecasting student admission in colleges with NEURAL networks. *International Journal of Computer Science and Network Security*, 7(11), 298-303.
- [9] García, J. C. & Zanfrillo, A. I. (2007). Data Mining application to decision-making processes in university management. *INFOCOMP Journal of Computer Science*, 6(1), 57-65.
- [10] Luan, J. (2004). Data mining applications in higher education. *SPSS Executive*.
- [11] On, R. (2001). Data mining as driven by knowledge management in higher education-persistence clustering and prediction.
- [12] Ragab, A. H. M., Mashat, A. F. S., & Khedra, A. M. (2014). Design and implementation of a hybrid recommender system for predicting college admission.
- [13] Braun, S., Dwenger, N., Kübler, D., & Westkamp, A. (2014). Implementing quotas in university admissions: An experimental analysis. *Games and Economic Behaviour*.
- [14] Daniūnas, A., Kliukas, R., Prentkovskis, O., & Ulinskaitė, D. (2013). The impact of lithuanian science and study reform on university activities (admission): A case of Vilnius Gediminas Technical University. *Procedia-Social and Behavioral Sciences*, 93, 565-573.
- [15] Sankarasubramanian, B., Rathinakumar, M., Balakrishnan, B., & Bharathwajan, R. (2014). An automated implementation of indian university admission system using artificial neural networks. *Ictact Journal on Soft Computing*, 4(3), 767-771.
- [16] Wabwoba, F., & Mwakondo, F. (2011). Students selection for university course admission at the joint

- admissions board (kenya) using trained neural networks. *Journal of Information Technology Education: Research*, 10 (1), 333-347.
- [17] Webtech. (2014, July 25). Online Admission System. Retrieved 2014, from [http://www.webtechsoftwares.co.in/products/product.aspx?name=Online\\_Admission\\_System](http://www.webtechsoftwares.co.in/products/product.aspx?name=Online_Admission_System)
- [18] Demuth, H., & Beale, M. (2014). Neural network toolbox user's guide.
- [19] Cannady, J. (1998). Artificial neural networks for misuse detection. *Proceedings of National Information Systems Security Conference* (pp. 368-381).
- [20] Haryanto, I., Setiawan, J. D., & Budiyono, A. (2009). Structural damage detection using randomized trained neural networks. *Intelligent Unmanned Systems: Theory and Applications*, 245-255.



**Karzan Wakil** is a lecturer at the Fine Arts Institute in Sulaimaniyah (FAIS), Sulaimaniyah-Iraq. He received his BSc. degree in computer science from Salahaddin University, Iraq in 2006 and M.Sc. in computer science from University Technology Malaysia (UTM), Malaysia, in 2013. His research areas are web engineering, software engineering, model driven, soft computing and web systems. He is the member in several organizations such as KUT, IEEE, IACSIT and IAENG.



**Ban Akram** ia s BSc student in computer science in University of Human Development (UHD), Iraq. Her research areas are recommendation system, artificial intelligence, database and web programming.



**Ngein Kamal** is a BSc student in computer science in University of Human Development (UHD)-Iraq, Her research areas are recommendation system, soft computing and web programming.



**Amirhossein Safi** was graduated from master of science in computer science, Universiti Teknologi Malaysia (UTM) in 2013. His bachelor degree was coming from Faculty of Computer Engineering, Shahid Bahonar University of Kerman, Iran. His current research interests include web services, service oriented architecture (SOA), distributed systems, smart environments, and web methodologies.