

# Developing and Implementing Web-based Online University Facilities Reservation System

**Daniyah Alkhalidi, Dhai Alkhalidi, Hajer Aldossary, Mutasem k. Alsmadi, Ibrahim Al-Marashdeh, Usama A Badawi, Muneerah Alshabanah, Daniah Alrajhi**

*Department of Management Information Systems, College of Applied Studies and Community Service, Imam Abdurrahman Bin Faisal University, Al-Dammam, Saudi Arabia.*

## Abstract

To solve the imbalanced use of the university facilities such as Halls, Theaters, and Swimming pools and Sports Venues and as a part of the role of the university in the community services, the online facilities reservation system for Imam Abdurrahman Bin Faisal University (IAU) is designed and implemented through incorporating the existing online reservation systems experience. Based on the general requirement analysis, the basic function of the of the proposed IAU online reservation system are user's registration and login, halls, stadiums, theaters, swimming pools reservation and database construction. The proposed work was designed and implemented using the Unified Modeling Language (UML), MySQL and visual basic (VB) programming language. The proposed IAU online reservation system will solve the current lack of IAU facilities management system and give the ability to the people to reserve the university facilities as a part of the role of the university in the community services.

**Keywords:** Information System; Reservation System and Unified Modeling Language.

## INTRODUCTION

Community services have grown in the recent period by the government and private institutions because of the awareness of the importance of community services in the development of society [1, 2], distinctive community services provided without charge are now available, the services provided are not only the financial services, but also there are other community services which are important for progress and prosperity of society, by making individuals active and constructive members of this society [1, 3].

Given the importance of these community services, the universities seek to provide many social services to the community around them [2-8], such as: the establishment of free accredited courses for students and the holding of meetings and arrangement of secondary schools students tests (General Aptitude Test (GAT), Qiyas Tests ... etc) and many others services. In order to spread the community service culture, the university is proposed to provide this services which allows all employees of the IAU and visitors to reserve the university facilities, such as: university halls, university courts, university swimming pools and university theaters. Through this proposed system the user can make the

reservation, cancel the booking, follow up the booking and manage the account, based on the fact that all the university facilities are managed, monitored and maintained continuously.

Nowadays, Artificial Intelligence (AI) algorithms have been used widely for solving several difficult problems, such as image segmentation [9-17], medical image analysis [18-22], nurse rostering problem [23], Healthcare Monitoring [24, 25], patterns recognition and information retrieval [26-37], Learning Management System [38] and river flow forecasting [39-41]. Many researchers designed and implemented booking and scheduling web system using AI algorithms and web technology for covering real booking and reservations problems [42-45].

The main motivation of this work is that there is no online reservation system for all IAU facilities, through the proposed system; the customer can reserve the IAU facility from any place and at any time according to facilities schedule, this will increase the utilization of university facilities by the community members. Thus, an online facilities reservation system for IAU is necessary. The facilities reservation system should provide user friendly interface and complete functions.

The rest of this paper is organized as follows: Section 2 explains analysis of the proposed system. Section 3 shows the interface design. Section 4 discussed the obtained results. Section 5 concludes the paper.

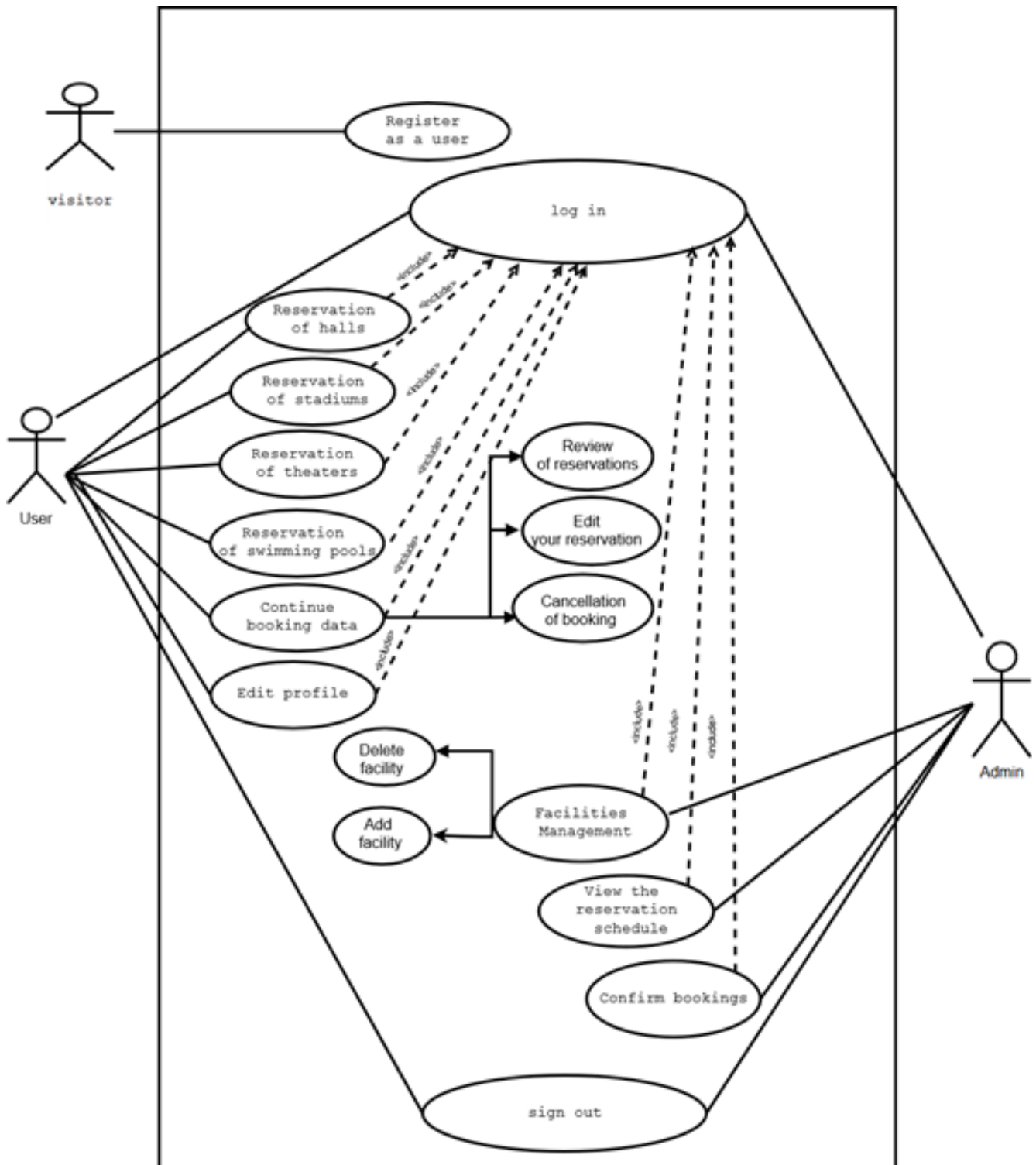
## SYSTEMS ANALYSIS

The IAU system should be able to satisfy the requirement in providing the suitable functionality to the user, where user should be able to know the availability schedule of different IAU facilities, user should be able to reserve a facility needed online anywhere and anytime, and user should be able to check his/her reservation schedule online. The first step is analyzing the requirement of the proposed system for IAU reservation system; the second step is developing the design strategy. The design of the interface specifies how the users will be moved through the proposed IAU system. The database construction defines what data developed and stored. The Unified Modeling Language (UML) will be used to describe the main structure of the proposed system by presenting the use case diagram and class diagram.

### Use Case Diagram

Use case diagram has become an important practice for capturing the functional requirements [46-51]. A set of possible sequences of interactions between the system and users in a particular environment will be involved in the use case diagram for accomplishing particular goal [46]. The use

case diagram has used in the proposed IAU system in order to show the system components that are classified to the administrator of the IAU system and the user, both of the administrator and user have their own operation. Figure 1 represents the use case diagram of the proposed IAU reservation system.

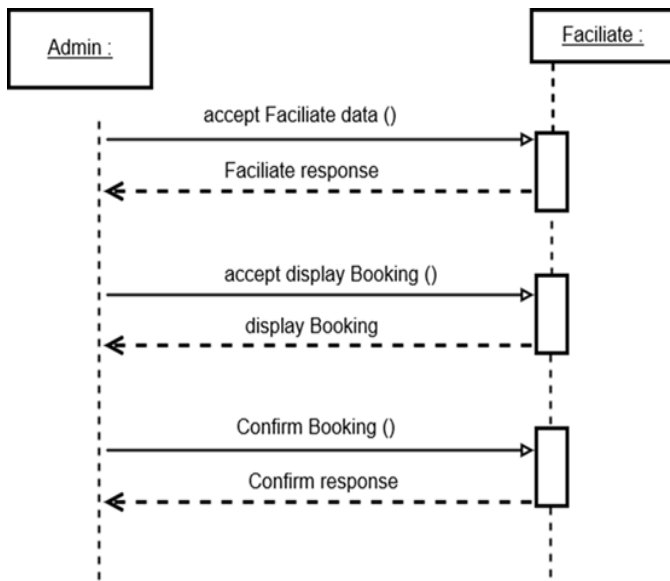


**Figure 1:** The use case diagram of the proposed IAU reservation system.

As noted in Figure 1, the use case diagram deals with the issues related to the authentication of the system administrator or users (customers), creation of a profile for each user that reflects his interest in different kinds of reservation such as halls, stadiums, theaters, and swimming pools reservation. Additionally, the customer can continue reservation information, view or update his account details. The administrator can manage the facilities by adding and deleting any facility, view the reservations schedule and confirm the reservation from the user.

**Sequence diagram**

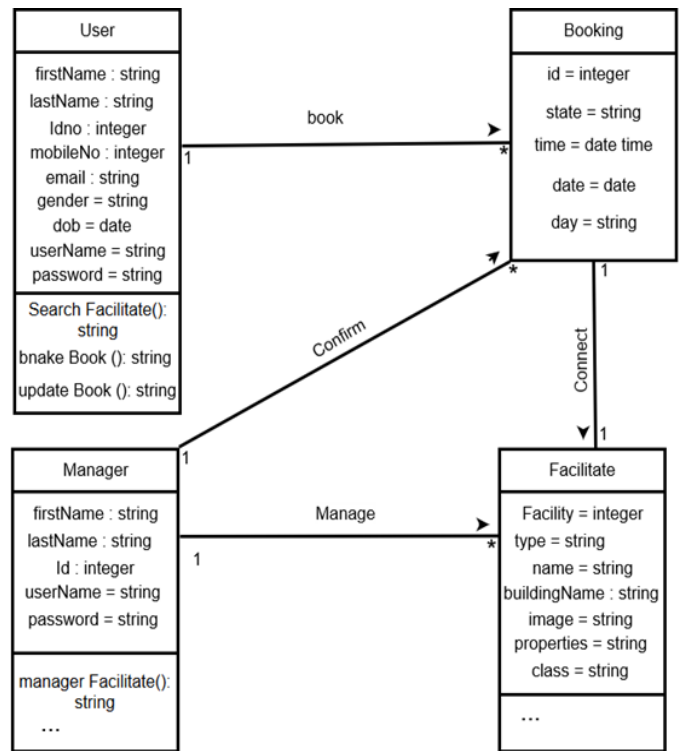
The sequence diagram shows the classes and objects that will be involved in the scenario, the sequence of messages exchanged between the objects were needed to perform the scenario functionality [48]. Figure 2 shows the sequence diagram of the proposed IAU reservation system.



**Figure 2:** The sequences diagram of the proposed IAU reservation system.

**Class diagram**

In the object-oriented analysis and design, class diagram is one of the most required and important entity [47-49, 52]. Class diagram is used to describe the objects types that will be involved in the system and shows the static relationships between the system internal classes. Moreover, class diagram used to describe the attributes, class operations and to apply constraints on the manner of the objects connections.



**Figure 3:** The class diagram of the proposed IAU reservation system.

Figure 3 shows the design of the class diagram for developing the IAU reservation system. The diagram illustrates both of the operations and attributes of the associated class. The User class consists of several operations such as Attribute, Name, Mobile number, Email. The domain modeling involves all attributes discovered during analysis activities. The design of the class diagram contains more information on attribute types, properties and initial values. Furthermore, the diagram can include the operations that accomplished by the class.

**Entity Relationship (ER) diagram**

Figure 4 represents the Entity Relationship (ER) diagram. ER diagram shows the relationships of the entity sets stored in a database [53]. Here; an entity is a data component. In other words, ER diagram demonstrates the logical structure of the proposed IAU facilities reservation online system database.

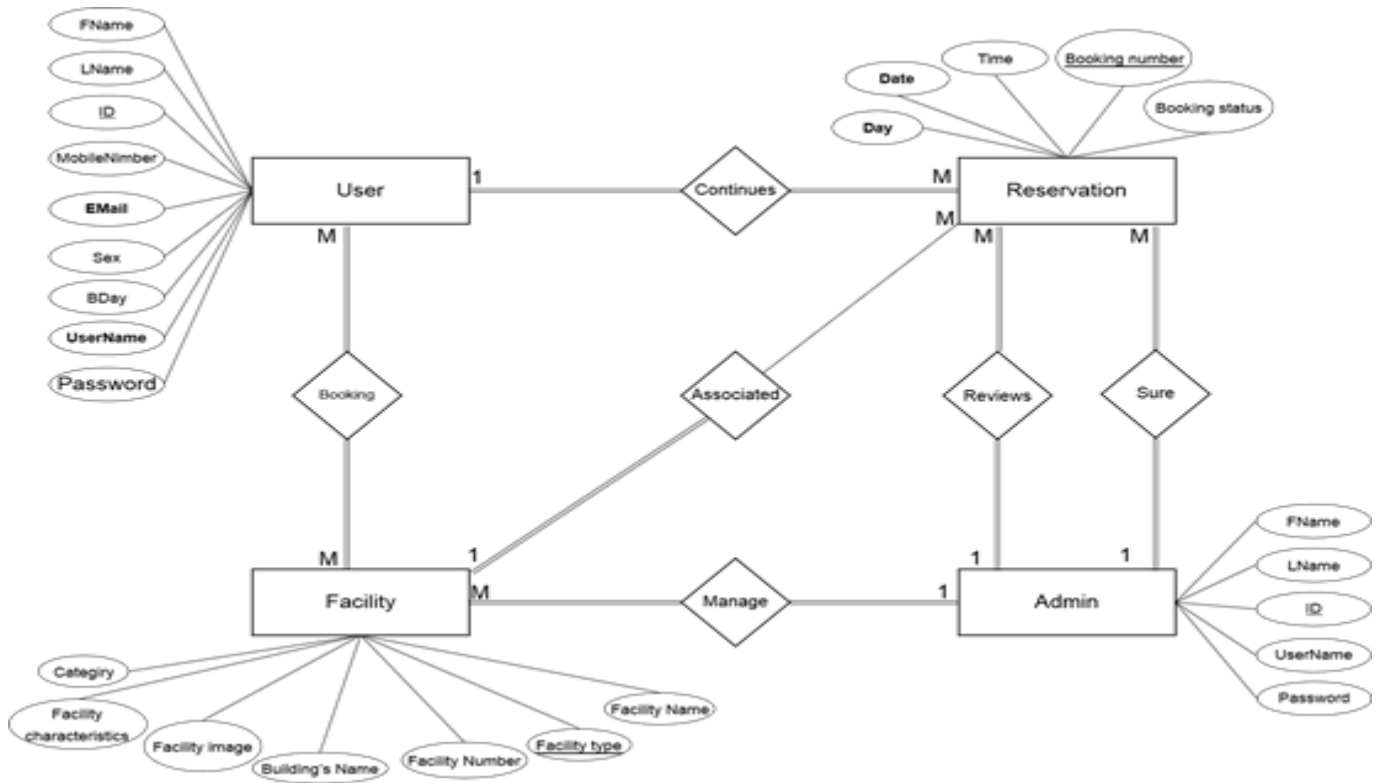


Figure 4: The ER diagram of the proposed IAU reservation system.

**Database Testing and Construction**

Testing the database is an important process in order to find errors that might affect the system reliability, consistency, performance and security. It also assists to validate the system

against the requirements specified by the user [53, 54]. The proposed IAU facilities reservation online system used MySQL server to implement the database. Several tables have been created as following:

Table 1: Booking Database.

BookingID	FacilityID	BookingSDate	BookingEDate	BookingDay	BookingSTime	BookingETime	BookingStatus	ID
1	6	13/04/2018	02/01/0001	الجمعة	8:00	09:00	مؤكد	201344
7	2	29/03/2018	03/01/0001	الخميس	11:00	01:00	انتظار	201344
8	2	03/04/2018	03/01/0001	الثلاثاء	19:30	08:30	انتظار	201344
5	6	14/03/2018	16/03/2018	الأربعاء	9:00	11:00	مؤكد	201344
6	6	03/04/2018	05/04/2018	الثلاثاء	9:00	11:00	انتظار	201344
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Table 2: Facilities Database

FacilityID	FacilityCate...	FacilityType	BuildingName	FacilityDetail	FacilityImg
1	مسبح	مسبح النادي الرياضي	600	مسبح متوسط الحجم	~/FacilityPic/1.png
2	قاعة	القاعة الكبرى	55	قاعة بسعة 100 فرد مزودة بوسائل ابضاحية وجهاز عر...	~/FacilityPic/2.png
3	مسرح	مسرح الجامعة	100	مسرح بسعة 200 فرد	~/FacilityPic/3.png
4	ملعب	ملعب الجامعة	450	ملعب متوسط الحجم	~/FacilityPic/4.png
5	قاعة	قاعة كبيرة	564	قاعة تكفي 50 فرد	~/FacilityPic/5قاعة.png
6	قاعة	قاعة مؤتمرات	45	عدد المقاعد 100 شخص مزودة بجهاز عرض وجهاز ت...	~/FacilityPic/6قاعة.png
8	قاعة	DMM	100	33	~/FacilityPic/100قاعة.jpg
NULL	NULL	NULL	NULL	NULL	NULL

**Table 3:** User Database

ID	FName	LName	Mobile	Email	Gender	Date_of_Birth	User_name	UserPassword
201344	دانيا	الخالدي	509843892	s1472000@...	انثى	1-7-1997	Dania1	12345
10456689	ضي	محمد	5555555555	Dhai@gmai...	انثى	1-2-1997	Dhai0	D1234
**	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

**INTERFACE DESIGN**

From the administrator perspective, the usability issues of the proposed system will be discussed in this section. As the software becomes more flexible, allowing a wide variety of reservations types to be used, the user task of specifying the complete set of rules for the reservation becomes more difficult. In the IAU facilities reservation online system, the

user has to register into the proposed system for performing reservation activities (see figure 5). In the proposed site, the user starts with the welcome page, then the user proceeds to the login process if he/she has an account as shown in figure 6, if not the user has to proceed to the user registration process and fill the registration information. In addition, Figure 7 shows “manage reservation” interface.

**Figure 5:** The user registration interface.

**Figure 6:** The login interface.



Figure 7: Track reservation interface.

## RESULTS DISCUSSION

This section presents the usability of the proposed system, where the proposed system has been tested by running the system on the Google chrome, Mozilla Firefox (most suitable) and Internet Explorer with the local host server. Twenty students have been involved to evaluate the proposed system prototype from College of Applied Studies and Community Service at IAU. Every student was given a brief description about how to use the proposed system, test the system and give the answer based on the prepared survey questionnaire. The survey contains of 10 questions measured by 5 Likert Scale in order to prove the usability and measure the user satisfaction of the proposed system. The obtained results from the questionnaire indicates that a high percentage of the student agree that the proposed system is helpful, usable and achieved the key target of the project. Table 4: collected data results from the twenty students.

Table 4: Collected data results from the 20 students.

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Strongly disagree										
Disagree										
Neutral	5	4	6	3				3	2	1
Agree	5	8	6	6	10	9	15	13	14	14
Strongly agree	10	8	8	11	10	11	5	4	4	5

## CONCLUSION

The IAU facilities reservation online system has designed and developed in this work. The proposed system solved the imbalanced use of the university facilities such as Halls, Theaters, Swimming pools and Stadiums, where the IAU reservation facilities system proposed to be used by the community as a part of the role of the university in the community services without any financial profit to the university. The proposed IAU facilities reservation system was designed and implemented using the Unified Modeling Language (UML), MySQL and visual basic (VB) programming language. The proposed system successfully solves the current lack of IAU facilities management and gives the ability for the community to reserve the university facilities without any financial profit. The proposed system can be also extended to other facilities of IAU or other universities or companies; this will improve the use of their facilities and resources.

## REFERENCES

- [1] Martiskainen M. The role of community leadership in the development of grassroots innovations. *Environmental Innovation and Societal Transitions*, 2017, 22: 78-89.
- [2] Nuangchalerm P and Chansirisira P. Community service and university roles: an action research based on the philosophy of sufficiency economy. 2012.
- [3] Albulescu I and Albulescu M. The University in the Community. The University's Contribution to Local and Regional Development by Providing Educational Services for Adults. *Procedia - Social and Behavioral Sciences*, 2014, 142: 5-11.
- [4] Wiewel W and Broski D C. University involvement in the community: developing a partnership model. 1997.

- [5] Leliugiene I and Barsauskiene V. The role of the university in community development. *Higher education and national development: Universities and Societies in Transition*, 2006: 227.
- [6] Ali A. Developing the community: The role of universities and open and distance learning. 2010.
- [7] Keerberg A, Kiisla A and Mäeltsemees S. University implementing its community service role through curriculum development in a regional college. 2013.
- [8] Albulescu I and Albulescu M. The University in the Community. The University's Contribution to Local and Regional Development by Providing Educational Services for Adults. *Procedia-Social and Behavioral Sciences*, 2014, 142: 5-11.
- [9] Farag T H, Hassan W A, Ayad H A, AlBahussain A S, Badawi U A and Alsmadi M K. Extended Absolute Fuzzy Connectedness Segmentation Algorithm Utilizing Region and Boundary-Based Information. *Arabian Journal for Science and Engineering*, 2017: 1-11.
- [10] Thalji Z and Alsmadi M. Iris Recognition using robust algorithm for eyelid, eyelash and shadow avoiding. *World Applied Sciences Journal*, 2013, 25(6): 858-865.
- [11] Alsmadi M K. A hybrid Fuzzy C-Means and Neutrosophic for jaw lesions segmentation. *Ain Shams Engineering Journal*.
- [12] Badawi U A and Alsmadi M K S. A Hybrid Memetic Algorithm (Genetic Algorithm and Great Deluge Local Search) With Back-Propagation Classifier for Fish Recognition *International Journal of Computer Science Issues*, 2013, 10(2): 348-356.
- [13] M A, K O and S N. Back Propagation Algorithm : The Best Algorithm Among the Multi-layer Perceptron Algorithm. *International Journal of Computer Science and Network Security*, 2009, 9(9): 378-383.
- [14] Alsmadi M k, Omar K B, Noah S A and Almarashdah I. Performance Comparison of Multi-layer Perceptron (Back Propagation, Delta Rule and Perceptron) algorithms in Neural Networks. In 2009 IEEE International Advance Computing Conference, 6-7 March 2009, pp. 296-299.
- [15] Alsmadi M k, Omar K B and Noah S A. Proposed method to decide the appropriate feature set for fish classification tasks using Artificial Neural Network and Decision Tree. *IJCSNS* 2009, 9(3): 297-301.
- [16] Sharma M, Purohit G and Mukherjee S. Information Retrieves from Brain MRI Images for Tumor Detection Using Hybrid Technique K-means and Artificial Neural Network (KMANN). *Networking Communication and Data Knowledge Engineering*. Springer, 2018, pp. 145-157.
- [17] Gao Y, Li X, Dong M and Li H-p. An enhanced artificial bee colony optimizer and its application to multi-level threshold image segmentation. *Journal of Central South University*, 2018, 25(1): 107-120.
- [18] Alsmadi M K. A hybrid firefly algorithm with fuzzy-C mean algorithm for MRI brain segmentation. *American Journal of Applied Sciences*, 2014, 11(9): 1676-1691.
- [19] Alsmadi M K. MRI brain segmentation using a hybrid artificial bee colony algorithm with fuzzy-c mean algorithm. *Journal of Applied Sciences*, 2015, 15(1): 100.
- [20] Alsmadi M K. A hybrid Fuzzy C-Means and Neutrosophic for jaw lesions segmentation. *Ain Shams Engineering Journal*, 2017.
- [21] Park S H and Han K. Methodologic Guide for Evaluating Clinical Performance and Effect of Artificial Intelligence Technology for Medical Diagnosis and Prediction. *Radiology*, 2018: 171920.
- [22] Kermany D S, Goldbaum M, Cai W, Valentim C C, Liang H, Baxter S L, McKeown A, Yang G, Wu X and Yan F. Identifying Medical Diagnoses and Treatable Diseases by Image-Based Deep Learning. *Cell*, 2018, 172(5): 1122-1131. e1129.
- [23] Jaradat G M, Al-Badareen A, Ayob M, Al-Smadi M, Al-Marashdeh I, Ash-Shuqran M and Al-Odat E. Hybrid Elitist-Ant System for Nurse-Rostering Problem. *Journal of King Saud University-Computer and Information Sciences*, 2018.
- [24] Almarashdeh i, Alsmadi M K, Farag T, Albahussain A S, Badawi U A, Altuwaijri N, Almaimoni H, Asiry F, Alowaid S, Alshabanah M, Alrajhi D, Fraihet A A and Jaradat G. Real-Time Elderly Healthcare Monitoring Expert System Using Wireless Sensor Network *International Journal of Applied Engineering Research*, 2018, 13(6): 3517-3523.
- [25] Rasmi M, Alazzam M B, Alsmadi M K, Almarashdeh I A, Alkhasawneh R A and Alsmadi S. Healthcare professionals' acceptance Electronic Health Records system: Critical literature review (Jordan case study). *International Journal of Healthcare Management*, 2018: 1-13.
- [26] Al Smadi A M, Alsmadi M K, Al Bazar H, Alrashed S and Al Smadi B S. Accessing Social Network Sites Using Work Smartphone for Face Recognition and Authentication. *Research Journal of Applied Sciences, Engineering and Technology*, 2015, 11(1): 56-62.
- [27] Alsmadi M. Facial recognition under expression variations. *Int. Arab J. Inf. Technol.*, 2016, 13(1A): 133-141.
- [28] Alsmadi M and Omar K. Fish Classification: Fish Classification Using Memetic Algorithms with Back Propagation Classifier. 2012.
- [29] Alsmadi M, Omar K, Noah S and Almarashdeh I. A hybrid memetic algorithm with back-propagation classifier for fish classification based on robust features

- extraction from PLGF and shape measurements. *Information Technology Journal*, 2011, 10(5): 944-954.
- [30] Alsmadi M, Omar K B, Noah S A and Almarashdeh I. Fish Recognition Based on Robust Features Extraction from Size and Shape Measurements Using Neural Network *Journal of Computer Science*, 2010, 6(10): 1088-1094.
- [31] Alsmadi M K. An efficient similarity measure for content based image retrieval using memetic algorithm. *Egyptian Journal of Basic and Applied Sciences*.
- [32] Alsmadi M K. Query-sensitive similarity measure for content-based image retrieval using meta-heuristic algorithm. *Journal of King Saud University - Computer and Information Sciences*.
- [33] Alsmadi M K, Hamed A Y, Badawi U A, Almarashdeh I, Salah A, Farag T H, Hassan W, Jaradat G, Alomari Y M and Alsmadi H M. FACE IMAGE RECOGNITION BASED ON PARTIAL FACE MATCHING USING GENETIC ALGORITHM. *SUST Journal of Engineering and Computer Sciences (JECS)*, 2017, 18(1): 51-61.
- [34] Alsmadi M K, Omar K B, Noah S A and Almarashdeh I. Fish recognition based on robust features extraction from color texture measurements using back-propagation classifier. *Journal of Theoretical and Applied Information Technology*, 2010, 18(1).
- [35] Badawi U A and Alsmadi M K. A GENERAL FISH CLASSIFICATION METHODOLOGY USING META-HEURISTIC ALGORITHM WITH BACK PROPAGATION CLASSIFIER. *Journal of Theoretical & Applied Information Technology*, 2014, 66(3).
- [36] Yousuf M, Mehmood Z, Habib H A, Mahmood T, Saba T, Rehman A and Rashid M. A Novel Technique Based on Visual Words Fusion Analysis of Sparse Features for Effective Content-Based Image Retrieval. *Mathematical Problems in Engineering*, 2018, 2018.
- [37] Saritha R R, Paul V and Kumar P G. Content based image retrieval using deep learning process. *Cluster Computing*, 2018: 1-14.
- [38] Almarashdeh I, Alsmadi M K, Jaradat G, Althunibat A, Albahussain S A, Qawqzeh Y, Badawi U A, Farag T and Eldaw K E. Looking Inside and Outside the System: Examining the Factors Influencing Distance Learners Satisfaction in Learning Management System *Journal of Computer Science*, 2018.
- [39] Alsmadi M K. Forecasting River Flow in the USA Using a Hybrid Metaheuristic Algorithm with Back-Propagation Algorithm. *Scientific Journal of King Faisal University (Basic and Applied Sciences)*, 2017, 18(1): 13-24.
- [40] Adeyemo J, Oyeboode O and Stretch D. River Flow Forecasting Using an Improved Artificial Neural Network. EVOLVE-A Bridge between Probability, Set Oriented Numerics, and Evolutionary Computation VI. Springer, 2018, pp. 179-193.
- [41] Ahani A, Shourian M and Rad P R. Performance Assessment of the Linear, Nonlinear and Nonparametric Data Driven Models in River Flow Forecasting. *Water Resources Management*, 2018: 1-17.
- [42] Garvey F and Sankaranarayanan S. Intelligent Agent based Flight Search and Booking System. *INTERNATIONAL JOURNAL OF ADVANCED RESEARCH IN ARTIFICIAL INTELLIGENCE*, 2012, 1(4).
- [43] Lai D and Chun A. Application of Artificial Intelligence for a Computerized Maintenance Scheduling System.
- [44] Aydin I, Karakose M and Karakose E. A navigation and reservation based smart parking platform using genetic optimization for smart cities. In Smart Grid and Cities Congress and Fair (ICSG), 2017 5th International Istanbul, pp. 120-124.
- [45] Duggan C, Finn P, Wagstaff J and Burke K. Method and system for scheduling a meeting. 2016.
- [46] Malan R and Bredemeyer D. Functional requirements and use cases. *Bredemeyer Consulting*, 2001.
- [47] Teixeira L, Xambre A R, Figueiredo J and Alvelos H. Analysis and Design of a Project Management Information System: practical case in a consulting company. *Procedia Computer Science*, 2016, 100: 171-178.
- [48] Majadi N, Trevathan J and Bergmann N. uAuction: Analysis, Design, and Implementation of a Secure Online Auction System. In Dependable, Autonomic and Secure Computing, 14th Intl Conf on Pervasive Intelligence and Computing, 2nd Intl Conf on Big Data Intelligence and Computing and Cyber Science and Technology Congress (DASC/PiCom/DataCom/CyberSciTech), 2016 IEEE 14th Intl C, pp. 278-285.
- [49] Kerdvibulvech C and Win N N. The Dentist Online Reservation System Design and Implementation Web Based Application and Database Management System Project. In International Conference on Education Technology and Computer (ICETC2012) IPCSIT vol.
- [50] ALMRASHDEH I A, SAHARI N, ZIN N A M and ALSMADI M. DISTANCE LEARNING MANAGEMENT SYSTEM REQUIREMENTS FROM STUDENT'S PERSPECTIVE. *Journal of Theoretical & Applied Information Technology*, 2011, 24(1).
- [51] Almarashdeh I, Althunibat A and Fazidah El N. Developing a Mobile Portal Prototype for E-government Services. *Journal of Applied Sciences*, 2014, 14: 791-797.
- [52] Almarashdeh I, Elias N F, Sahari N and Zain N A M. Development of an interactive learning management



system for malaysian distance learning institutions.  
*Middle East Journal of Scientific Research*, 2013,  
14(11): 1471-1479.

- [53] Onuri E E, Omoroje H C, Ntima C G and Omotunde A  
A. Intelligent Tourism Management System. *American  
Scientific Research Journal for Engineering,  
Technology, and Sciences (ASRJETS)*, 2016, 18(1):  
304-315.
- [54] Begg C and Connolly T. Database systems: A practical  
guide to design, implementation, and management.  
2002.