IDENTIFICATION AND COMPARISON OF FREQUENT STEPS FOR EVALUATING AND DESIGNING ONLINE ADMISSION SYSTEMS USING DATA MINING IN R AND WEKA REFERRING TO PROFESSIONAL PROGRAMMES

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ABSTRACT
A human being can achieve many things based on education; hence education is inseparable. After the pandemic, in education use of Online Admission System is the need of an hour. It is also one of the Emerging Economies. This research paper lists different Professional Programmes where Online Admission Process is used and provides guidance for understanding various key terms used in admission process by University Grant Commission in India. The authors have concentrated on Evaluation and Standardization throughout the study of the system. Paper evaluates admission processes of 46 organizations conducting online admissions for professional programmes in different universities of Maharashtra and for standardization Indian Institute of Technologies admissions are considered. The paper identifies and compares frequent steps for evaluating any online admission system using the scientific approach of Data Mining in R and WEKA using Apriori and FP-Growth algorithms. The author proposes that frequent steps are necessary requirements for admissions growth in any educational organization.
Keywords: Online Admission System (OAS), Professional Programmes, Data mining, R, WEKA, Apriori algorithm, FP-Growth algorithm

Introduction

Activity which admits students to universities is Admission,(Helms,2008).University's or Institution's existence is only because of student admissions. Using offline admission procedures it is difficult to manage large volume admissions. In pandemic situations Education is the field where everything from admissions till result, used Information and Communications Technology (ICT). College admission has become extremely competitive hence students and colleges should keep pace with the latest technology. Using web technology, online admission systems Colleges and Universities are competing to get quality students, (VIGNESH, 2014) (Gifford, 2005). Using the Internet all steps of the admission system are carried out to offer an accurate, transparent, simple and fast admission process to society is the Online Admission System. Technology shows its positive impact in the admission process from Playgroup admissions to Ph.D., doctoral admissions in the current scenario. Growth of use of online admission systems in India is the main reason to do research work in this domain by the researcher.

This paper uses the scientific approach of data mining which becomes the basis of identification of frequent steps for evaluating Online Admission Systems using the scientific approach of Data Mining in R and WEKA with reference to professional programmes.

Literature Review

Historical development and changes in different Professional Educational sectors in India like Agriculture, Engineering and Technology, Medical and Health sciences, pharmacy, Management, Education, Law, Applied Sciences and Social Sciences, (Pawar, 2013).

History of Engineering admissions in India and a comparative study of online (off campus) counseling process to the admission of undergraduate engineering and technology courses in the various state of India like Haryana, Uttar Pradesh, Madhya Pradesh, Odisha, West Bengal, Kerala, Rajasthan, Gujarat, Maharashtra and at IIT and AIEEE is done. It explains why there is a need for online counseling as the number of institutions is increasing every year. So, the Ministry of Human Resource and Development had decided that from 2002 admission of engineering courses should use online procedure, (Bhuria, 2013).

There is a need to evaluate information system's functionality performance because organizations are using IT in their work processes for increasing efficiency and effectiveness of resources. Evaluating any Information

System should include evaluation of hardware, software, computer networks, data and human resources, (Platiša, 2009).

Digital University Framework under which services are provided to students, university, and affiliated colleges. It explains benefits achieved and how efficiency can be improved. It also gives an idea of how software is deployed. It lists project management activities involved in a project. The article gives server infrastructure details of MKCL. It finds how technology is helpful in various stages of admission and how admission data will be beneficial in later stages such as generating attendance sheets, I-cards, Exam Hall tickets, Results (Sawant, 2006).

Government of Maharashtra's initiative in providing e-Governance in (12) twelve Universities using MKCL 's digital university framework which is beneficial to students, Universities, and affiliated colleges for higher Education. It lists all facilities provided to students using E-suvidha. Under E-suvidha the student gets information about various Programmes, courses offered by the Universities. Similarly, they get information about syllabus, timetables, exam timetables, center, venue, and hall tickets which can be downloaded. Different applications for Statement of marks, Verification, Revaluation, Convocation, Bonafied and Migration are also available. Information about job opportunities is also available. It saves a lot of money, time, and effort for the student. It displays a list of affiliated colleges under universities, which will be helpful for students at the time of making decisions for admission, (Kulkarni, 2012).

North Maharashtra University at Jalgaon is using technology in various phases of its operations like providing e-Suvidha for students for admissions using MKCL's OASIS framework for affiliated colleges, Online staff approvals, affiliation, Online Ph.D. Process, SAP ERP implementation for internal administration. With the use of technology accuracy, efficiency and transparency was achieved by the university in admissions, affiliation, approval, and examination process. The state-wide Online Admission system solution made available by Maharashtra Knowledge Corporation Limited is adopted by universities and it has provided an opportunity to affiliated colleges in attracting students from all corners of the state, (Chaudhari, 2013).

Mining is used for discovering interesting relations between variables in large databases. Introduction to database and data mining concepts with particular emphasis on data analysis is provided. The concepts and techniques cover classification, prediction, association, and clustering and are presented with examples, (Han, 2006).

The association rule mining as a vital component of data mining attracts much attention. Discovering association rules is at the heart of data mining. Association Rule Mining is the process of finding interesting correlations, frequent patterns, or associations among sets of items in the transaction databases, relational databases, or other information repositories. An association rule is an expression in the form of $X \Rightarrow Y$, where X and Y are sets of items called item sets and intersection of X and Y is null. The portion of the rule to the left of the implication ($\Rightarrow$) is known as the antecedent (X), whereas the right side of the implication is known as the consequent (Y). A rule may contain more than one item in antecedent and consequent part. Association rule mining tends to produce a large number of rules. The goal is to find the rules that are useful to users. There are two important basic measures for association rules: Support and Confidence. Usually, thresholds of support and confidence are predefined by users to drop those rules that are not so interesting or useful. The two thresholds are called minimum support and minimum confidence, respectively (Kaur, 2013).

WEKA is a data mining system containing a collection of machine learning algorithms for data mining tasks. The algorithms are applied directly to a dataset. WEKA implements algorithms for data preprocessing, classification, regression, clustering, association rules; it also includes visualization tools. WEKA is open-source software issued under the GNU General Public License. It provides step by step procedure for analysis using WEKA Explorer preprocessing, classification, clustering, association, attribute selection, and visualization tools. Apriori and Fpgrowth algorithms are used, and analysis is obtained (Svetlana, 2004).
Examples of various data mining functionalities in R and case studies of real-world applications are presented in the book (Zhao, 2014).

Objectives of the study

Researchers in this paper will try to achieve following research objectives:

1. To study various key terms used in the Online Admission System domain.
2. To determine scope of study and identify the Professional Programmes used for study.
3. To identify the online admission steps based on which evaluation of the Online Admission system can be done for identified professional programmes.

4. To identify frequent steps in the online admission Process using Data Mining.
5. Do comparative study of data mining approaches, Apriori and FP-Growth in R and WEKA.

Research Methodology
Keeping in mind the aforesaid objectives, this research has used a hybrid research approach consisting of survey, design and creation.

Survey: To acquire relevant admission process information, survey of websites, review of prospectus of different organizations involved in the admission system was conducted. Experts and stakeholders in this field were interviewed.

Design and Creation: It includes analysis of online admission systems used in the current context by organizations conducting professional programmes in Maharashtra. Study has identified the frequent steps used in the Online Admission system.

Scope of Study
To conduct work on research objective one **to study various key terms used in Online Admission System domain**, here researcher is concentrating on finding meaning of keywords such as Professional council, Professional Programmes, Programme, Qualification, Professional Education, course, Non-Professional Programmes.

Secondary Data Analysis: Keywords / Key Terms Definitions in Online Admission System Domain
Professional Programmes key word consists of two words, profession, and programmes. According to the Oxford dictionary, a *profession* is a job requiring special training and a formal qualification. *Qualification* is a degree awarded by a university. After completion of a **Program** Degree, Diploma Certificate is awarded depending on for which program student has taken admission. Example: Faculty of Management will consist of BBA, MBA, PGDBM and Ph.D. programmes. *Universities are* established according to the UGC Act. *Professional Education* is the higher formal education and training given to an individual so that he or she can perform effectively and efficiently in their profession. University offers a wide range of programmes from the short-term certificate level up to the research and doctoral level.

Thus, degrees in above mentioned fields are considered as Professional Programmes. Many times, there is confusion between the programme and course so let us clear that also
According to the UGC "Programme consists of a group of Courses." Example: the BCA Programme will consist of DBMS, C-Programming, Java courses.

To carry out work on research objective two to determine scope of study and identify the Professional Programmes to be used for study, the following flowchart is prepared

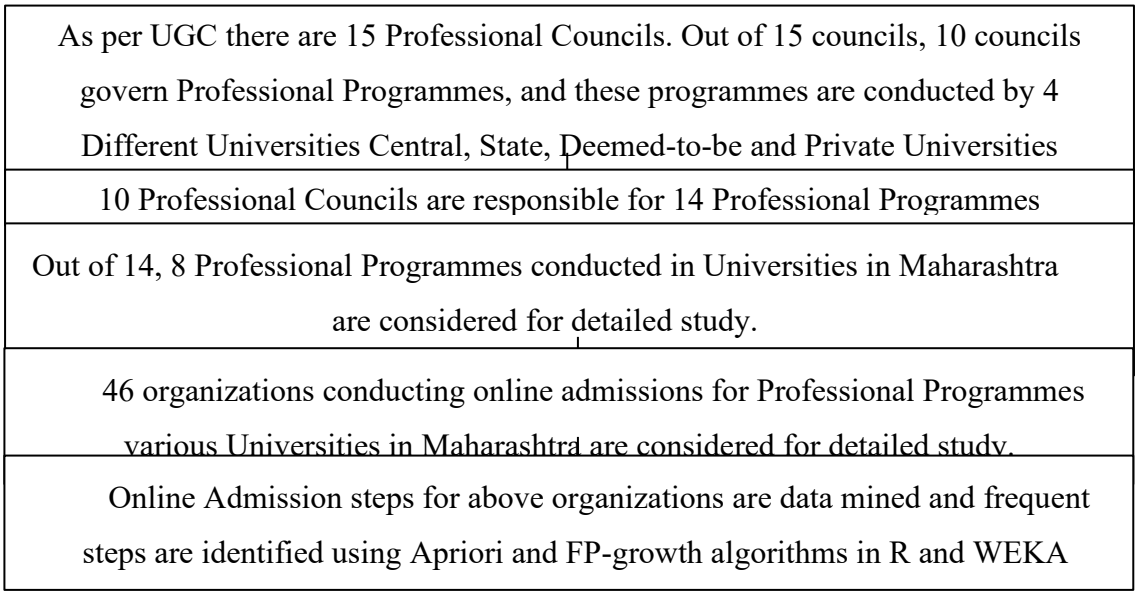

Figure 1 Flowchart to decide scope of study
Source: Prepared by the Researcher

Overview Of Online Admission Systems Used By Different Universities.
Following are University types in India, controlled by the University Grant Commission. (University Grant Commission New Delhi, 2023).

Central University or Union University: It is a university established or incorporated by a Central Act. It is under the Department of Higher Education in the Ministry of Human Resources and Development.
State University: A university established or incorporated by a Provincial Act or by a State Act. They are run by the state government of each state.

Deemed-to-be University: An Institution Deemed to be University, commonly known as Deemed University, refers to a high-performing institution, which has been so declared by Central Government under Section 3 of the University Grants Commission (UGC) Act, 1956. Autonomy is granted to them by the Department of Higher Education.

Private University: A university established through a State or Central Act by a sponsoring body viz. A Society registered under the Societies Registration Act 1860, or any other corresponding law for the time being in force in a State or a Public Trust or a Company registered under Section 25 of the Companies Act, 1856. But they are not allowed to have off-campus affiliated colleges.

Differentiation between Professional and Non-Professional Programmes
Following Table 1 is being used to distinguish between which Programme to consider as

Professional and which is not Professional (University of Pune, 2012). The same is considered for analysis.

Professional Programmes	**Non-Professional Programmes**
1.Engineering/ Engineering and Technology	1.Arts
2.Pharmacy	2.Fine Arts
3.Management	3.Mental, Moral Social Sciences
4.Architecture	4.Degrees in Social work,
5.Law	5.Communication and Journalism
6.Education	6.Commerce
7.Physical Education	7.Home Science
8.Computer	8.Science (excluding Applied and computer science courses)
9.Applied courses in science like Bio- Informatics, Bio-Technology, Health Sciences, Environmental sciences.	
10. Electronics	
11. Medical, Dentistry, Homeopathy, Unani, Nursing, Physiotherapy	
12.Audiology and Speech Language Pathology	
13. Agriculture	
14.Animal and Fishery Sciences	

Table 1 Professional and Non-Professional Programmes
Source: University of Pune, (2012)," Procedure for Transcript. University of Pune." http://unipune.ac.in

Professional programmes considered for research work professional councils.
As per UGC there are 15 Professional Councils established by Act of Parliament that control accreditation and coordination, set, and maintain standards for higher Education and offer grants to UG programmes. (University Grant Commission, 2022).

The Table 2 prepared by researchers below summarizes the professional council responsible for admissions, rules for different U.G or P.G programmes for which they are Statutory or Regulatory bodies.

Sr. No.	Professional Council	Professional Programme it governs
1	AICTE (All India Council of Technical Education, 2022)	Diploma or B.E. / B.Tech. / M.E. / MTech/ M. Pharm / M. Arch MCA and MBA, Applied Arts, Hotel Management and Catering Technology
2	Medical Council of India (MCI INDIA, 2022)	M.B.B.S. /M.D./PG Courses in Medicine
3	DCI (Dental Council of India, 2022)	B.D.S./M.D.S./PG Courses
4	Central Council Medicine (CCIM)	B.A.M.S./B.S.M.S./B.U.M.S./Postgraduate and Post Diploma courses in Ayurveda
5	Central Council of Homeopathy (CCH)	B.H.M.S. / M.D.(Homeopathy) and other courses
6	Indian Nursing Council (INC)	Auxiliary Nurse and Midwife/ B.Sc. (Nursing)/ M.Sc. (Nursing) etc.
7	PCI (Pharmacy Council of India)	D.Pharm/ B. Pharm
8	ICAR (Indian Council for Agricultural Research)	U.G./P.G. Programmes in Agriculture,
9	Council of Architecture	B.Arch. / M. Arch.
10	National Council for Teacher Education (NCTE)	B.Ed./M.Ed.
11	Bar Council of India (BCI)	L.L.B./ L.L.M. / 5-year Integrated Law programme
12	Distance Education Council (DEC)	Distance mode Programmes M.B.A., M.C.A., B.Ed., M.Ed., Diploma / Degree Engineering etc.
13	Rehabilitation Council	Postgraduate
14	National Council for Rural Institutes (NCRI)	Post graduate diploma in rural development and various programmes for Gandhian basic education which are based on agriculture, handicrafts etc.
15	State Councils of Higher Education (SCHE)	Programmes designed according to needs of the society, priorities, and expectations higher education;

Table 2 Professional Councils and respective Professional Programmes Governed
Source: Prepared by the Researcher

Primary Data Analysis:
Professional Programmes governed by ten (10) Professional Councils are considered for study. Out of all Professional Programmes, eight (8) Professional Programmes are selected which are conducted by Universities in Maharashtra under the study are as follows.

1. Engineering and Technology Programmes
2. Management Programme MBA
3. Management Programme MCA
4. Health Sciences Programmes whose admissions are through CAP and authority is DMER. For all the above, the process is one process under Programme Health Sciences. (DMER, 2022).
5. Pharmacy Programmes

6. Education Programmes
7. Agriculture Programmes
8. Law Programmes

Forty-seven organizations conduct admissions of professional programmes considered for study
Standardization: IITs (Indian Institute of Technology) Online Admission process considered as standard.

Evaluation: For evaluation 46 Organizations that conduct online Admissions are considered (Pant, 2016).

Admission steps derived from study of all forty-six organizations mentioned above
For research objective three to identify the online admission steps based on which evaluation of Online Admission systems can be done for identified professional programmes, careful examination of admission steps in above mentioned organizations following admission steps are identified by authors in Table 3 below.

Step No.	Description
S1	Whether student can get all admission information from website
S2	Use Dynamic Website
S3	Use Static Website
S4	Candidate must or can apply online for Entrance Exam
S5	Through static websites Entrance Exam Form for Admission is available to download from the website.
S6	Traditionally, candidates get Entrance Exam Form from the Admission office of organization in person or by post.
S7	From Mobile App candidate can apply
S8	Other Entrance Exam's score is also considered for Admissions
S9	Audio-Video is used to provide help on website demonstrating the Form Filling Process
S10	Screenshots of form are used to provide Help to fill the Entrance Exam Form
S11	Textual information is used to provide help for filling online Form
S12	Offline Prospectus
S13	Every Applicant applies Online gets Application ID or Username and Password
S14	Payment of Admission Fees should be done before Form Filling
S15	Credit or Debit card used by candidates to pay fees online
S16	Net banking is used by candidates to pay fees online.
S17	E-challan of specific banks is used by candidates to pay Fees online.
S18	Demand Draft is used by Candidate to pay Fees
S19	Cash is used by Candidate to pay Entrance Exam Fees or Admission Registration
S20	Required information to be filled in the Form
S21	Upload Photograph Signature Thumb Impression
S22	Selection of Exams city date and schedule online
S23	Person with disability will be provided with help
S24	Corrections in the Filled form if any, online by paying specified fees within specific schedule
S25	Through Own login candidate can download exam's Hall Ticket
S26	Through email candidate can download exam's Hall Ticket
S27	Through Post or Courier student receives Hall Ticket

S28	Rectification of discrepancies if any in admit cards is done online
S29	Rectification of discrepancies if any in admit cards is done offline
S30	On specified day and schedule candidate appear for Entrance Exam at respective Exam Centers
S31	Flexible More than one time on different dates Entrance Exam takes place
S32	Online Conduction of Entrance Exam
S33	Offline Conduction of Entrance Exam
S34	Display of Answer key and image of response (OMR) sheet of each candidate is. available on website
S35	On website student can see the result or Merit List
S36	Offline Result or Merit List Entrance Examination displayed on Notice board
S37	Online Score card can be downloaded
S38	Dispatched to permanent address score cards
S39	Online Grievances in Result or Merit List can be submitted online from website by paying specified fees within specified schedule
S40	Offline Grievances in Result or Merit List can be submitted online from website by paying specified fees within specified schedule
S41	Online Option or preference form filling
S42	Offline Option or preference form filling
S43	Online Submission of candidates Admission Confirmation
S44	Offline Submission of candidates Admission Confirmation
S45	Online Institute Confirms admission of a student.

Table 3 Different steps used in Online Admission Systems
Source: Prepared by the Researcher

Frequent admission steps derived in R data mining tool using Apriori algorithm.
For research objective four Identify frequent steps in online admission Process using Data Mining, following research work is conducted. Researchers identified that many admission steps are common. Common steps that are frequent steps are verified using data mining technique's association rules. So, researchers have used the APRIORI algorithm to find frequent steps and association rules in admission processes (Han, 2006).

Procedure followed to find frequent online admission steps using Apriori algorithm in R
Using R data analysis software and its APRIORI algorithm in arules package used to mine frequent steps in processes with confidence = 0.8, support = 0.53, target frequent. Twelve (12) frequently occurring steps are found by researchers. R is installed on windows.

Data of admission steps for R
Following sequence is used for Data Mining in R (Hahsler, 2015).

1. Steps for admission used by mentioned above 47 organizations are listed in Table 2 below. They are numbered as S1 to S43.
2. Example organization1 used S1, S2, S4, S9, S13, S15, S20, S21, S22, S24, S25, S30, S35, S37,
3. S39, S41 and so on for other organizations. Details of Data are as shown in Table 3 below.
4. Using if rules related columns (admission steps) are combined.
5. Excel file converted to csv (comma separated values)
6. Appropriate commands are given in R.

Set of commands in R used for analysis
Following are details of commands used in R.
1. Set directory where csv file is stored using > getwd () get working directory.
2. In R use Arules package using command library(Arules)
3. Read the csv file using > d1 <- read.csv("onlydata1.csv")
4. Give command to find frequent steps by giving some restrictions using appearance = list(restrictions)
5. g1<-apriori(d1,parameter=list(support=0.53,minlen=10,target="frequent"),

appearance=list(none=c("OptionorPreferenceForm=0","ScoreCardsavailable=0","SubmitGrievances=0","Correctionsform=0","Staticsite=0","AdmissionConfirmationbyinstitute=0","Dynamicsite=0","UsernameadPassword=0", "uploadPhotographSignatureThumbImpression=0")))
6. Get output using > inspect(g1)
7. Output twelve steps are identified.

Frequent admission steps in R
Thus, from the above output twelve frequent steps in online admission systems are S1, S2, S4, S9, S13, S15, S20, S21, S22, S25, S30, S35.

Frequent admission steps derived in WEKA data mining tools using Apriori and Fpgrowth
The following procedure is to be followed to find frequent online admission steps using Apriori and FP-growth in WEKA. Researchers have worked to find frequent items in the WEKA Data Mining tool, using FPGROWTH and APRIORI algorithms.

Steps used for data mining.
Steps for admission found for all forty-seven organizations which are listed in Table no.3 and 4
1. They are numbered as S1 to S43
2. Using if rules related columns (admission steps) are combined.
3. In Weka data of organizations is to be converted to ARTF file.
4. Appropriate steps are used in Weka.

Data of admission steps for Weka
ARFF File used in WEKA is @relation wekadataoas.

Output in Weka for Apiori
After Running in output is in Apriori with conf:(1)
Scheme output showing weka. associations. Apriori -N 10 -T 0 -C 0.9 -D 0.05 -U 1.0 -M 0.1 -S -1.0 -c -. 1Relation Name is wekadataoas. Instances used are forty-seven. Attributes are 18. 10 Best rules found as
1. S9 ==> S1 2. S1 ==> S9 3. S4 ==> S1 4. S1 ==> S1 5. S20 ==> S1 6. S30 ==> S1
7. S4==> S9 8. S15 ==> S9 9. S20 ==> S9 10. S30 ==> S9
So Frequent admission steps identified by Weka using Apriori are six S1, S4, S9, S15, S20, S30

Output in Weka for Fpgrowth
After Running output in FPGrowth is
Scheme output showing Weka.associations. FPGrowth -P 2 -I -1 -N 10 -T 0 -C 0.9 -D 0.05 -U 1.0 -M 0.1. Relation Name is wekadataoas. Instances used are 47. Attributes are 18. FPGrowth found 338 rules (displaying top 10) with <conf:(1)> lift:(1) lev:(0) conv:(0)
1. S9 ==> S1 2. S1 ==> S9 3. S4 ==> S9 4. S30 ==> S9 5. S20 ==> S9 6. S15 ==> S9
7. S4==> S1 8. S30 ==> S1 9. S20 ==> S1 10. S15 ==> S1
So Frequent admission steps in WEKA using FP-Growth are eight as S1, S4, S9, S15, S20, S25, S30, S35.
Frequent steps for online admissions are verified. Both results are the same.

Comparisons between Fp-growth and Apriori in Weka and R data mining tools Table of Comparison Findings
For research objective four do Comparative study of data mining approaches Apriori and FP- Growth in R and WEKA. Table 4 prepared by authors below shows comparison between Fp-growth and Apriori algorithms for association mining for different parameters and in WEKA and R Data Mining Tools.

Sr. No.	R Apriori Steps	Weka Apriori Steps	Weka Fp-Growth Steps	Description
1)	S1	S1	S1	All info
2)	S2			Dynamic site

3)	S4	S4	S4	Apply for entrance
4)	S9	S9	S9	Help is available
5)	S13			Username and Password
6)	S15	S15	S15	Payment of Registration fees
7)	S20	S20	S20	Fill Form
8)	S21			Upload Photograph Signature Thumb Impression
9)	S22			Selection of Exams city date and schedule online
10)	S25		S25	Receipt Admit card
11)	S30	S30	S30	Conduction of Entrance Exam
12)	S35		S35	Display of Result on website
13)	12	6	8	Frequent Steps Identified
14)	same	same	same	Complexity is same in all algorithms
15)	Speed is less		Speed is more	Speed is less in APRIORI but only 47 rows.are data mined

Table 4 Comparison between FP-GROWTH and APRIORI in R and WEKA
Source: Prepared by the Researcher

Findings from data mining

1. Key terms used in Online Admission System domain such as Professional council, Professional Programmes, Programme, Qualification, Professional Education, course, Non-Professional Programmes are defined and explained in paper.
2. Scope of study selected eight Professional Programmes, which are conducted by Universities in Maharashtra for study.
3. Forty-five online admission steps are identified based on which evaluation of Online Admission systems is conducted in above study.
4. Twelve (12) frequent steps are proposed as steps in admission systems which are required if any online admission system is to be designed.
5. Table 4 shows comparison between Fp-Growth and Apriori algorithms findings from study.

Above are research objectives achieved and the findings are listed below

A. As data consists of only 47 rows, speed of computing is not considered, but from theoretical data FP-Growth is better than Apriori.
B. Frequent steps identified in FPGROWTH 8, in APRIORI 6 and in R Using APRIORI 12.
C. After careful study of the above frequent steps identified in data mining, a generalized sequence is proposed for any online admission process as follows.

1. On website a student should get all information of admission(S1)
2. For Admissions, he or she can apply online using the dynamic website. (S2)
3. For Entrance Exam, he or she can apply online using dynamic website (S4)
4. Help in the form of video or screen shots or text must be present while filling out online forms for admission. (S9)
5. Applicant receives username and password. (S13)
6. Online students should Pay Fees. (S15)
7. Online student should be able to fill all fields required in Online Admission Application (S20)
8. Applicants on websites upload photographs, signatures, and thumb impressions online. (S21)
9. Applicants can choose the Entrance Exam's city, date, and schedule online. (S22)
10. Candidates receive an Admit card or Hall Ticket online. (S25)
11. The entrance exam is there. (S30)
12. Online applicants can check the entrance exam result or Merit List on the website. (S35)

Conclusion

The paper provides a scientific base for identifying frequent steps and concludes with a presentation of 12 steps for any online admission system to be designed or evaluated. These findings will be helpful for stakeholders who want to evaluate their existing Online Admission Systems, third parties who are involved in Online Admission Application development, design and deployment and students and parents who want to apply online for admissions. They will also understand the key terms used for admissions in India.

In future association rules between admission steps can also be identified using data mining. In future researchers will work in the education domain for examination systems, teaching learning where Data mining can be applied, and results can be drawn which will be helpful.

References

All India Council of Technical Education, AICTE (2022), https://www.aicte-india.org.

Bhuria V., (2013), "A comparative study of online off-campus counseling for admission to engineering institutions in india." International Journal of Research in Commerce, It & Management, A Monthly Double-Blind Peer Reviewed, Refereed/Juried Open Access pp.40–43.

Chaudhari P.R., (2013), "Technology in University Administration - A Study of North Maharashtra." International Conference on Technology and Business Management. pp. 18–20.

Dental Council of India, DCI, (2022), https://www.dciindia.gov.in.

Directorate of Medical Education DMER, (2013), https://www.dmer.org.

Gifford D., (2005)," Pen to Mouse: Web-Based Technology's Impact on College Admission Applications", Journal of college admission university of Louisville.

Hahsler M., Buchta C., (2015), "Package 'Arules' Mining Association Rules and Frequent Item sets".

Han J.,(2006), "Data Mining Concepts and Techniques "Second Edition, Morgan Kaufmann Publishers An Imprint of Elsevier.

Helms R. M., (2008)," University Admission Worldwide." International Bank for Reconstruction and Development/ the World Bank Washington, D.C. – USA.

Kaur G. Aggarwal S., (2013),"Performance Analysis of Association Rule Mining Algorithms", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3(Issue 8), pp.856–858.

Kulkarni R., (2012),"e-Suvidha in Higher Education under E-Governance Initiative in Maharashtra", University News, India.

Medical Council of India, MCI (2022), https://www.nmc.org.in.

Pant M., Kadam S., (2016)," Optimized Framework for Online Admission Systems with Reference to Professional Programmes." IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661, p-ISSN: 2278-8727, 18(2), 1–17

Pawar K.B.,(2013) ," Professional Education in India " EDUSEARCH (CEDA(Center For Educational Development Administration) JOURNAL) ISSN 2278 – 2370, 1, pp.6–9.

Platiša G.,(2009),"Methodological Approaches to Evaluation of Information System Functionality Performances and Importance of Successfulness Factors Analysis. Management Information Systems," 4, pp.11–17.

Sawant V., Wadegaonkar A.,(2006), "Digital University Framework" CSI Computer Society of India Special Interest Group on e-Governance (SIGeGov), India.

Svetlana S. A., (2004)," Machine Learning with WEKA Explorer Tutorial for WEKA Version 3.4.3." School of Engineering and Computer Science Department of Computer Science California State University, Sacramento California.

University Grant Commission, New Delhi (2022), "Professional Councils defined by University Grant Commission" https://www.ugc.gov.in/page/professional-councils.

University Grant Commission New Delhi, (2023)," Types of Universities." https://www.ugc.gov.in.University of Pune, (2012)," Procedure for Transcript. University of Pune." http://unipune.ac.in

VIGNESH B., (2014), "Software Requirements Specification for Online University Admission System Version 1

Zhao Y., (2014)," R and Data Mining: Examples and Case Studies"

