E-Learning nodes estimation for NAAC Indian Universities

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Abstract: India is of the developing countries and consists of lot of Human Resources and Second highest country in terms of best Human Resources which are available to all parts of the world. India is competing in terms of Science and Technology and trying to produce the best Human Resources to country in all fields of Arts, Science, Management, Technology etc. Even though it is largest second country in population, still it is very behind in terms of Economics and Finance. Government of India has the aim and a proposal to give “Education for all” as a spirit of India constitution. So e-Learning and Distance Education Systems are the next alternative to regular education systems. In this paper author simply discussed about the role of e-Learning and its limitations with respect Social, technical, and Mathematical dimensions. The authors gave a flavor of developing countries’ e-Learning system for clarity of concept. Finally authors test the e-Learning nodes of Indian Universities with Data mining tools and Gini Index.

Keywords: e-Learning, Linear Programming Problem, Data mining tools, Gini Index

1. INTRODUCTION

India has lots of Universities throughout of its country in terms of different forms such as State, Central, Deemed, Private, National Importance of Institutes etc. Broadly all Universities are divided into two types one is Government sector and other is private sector. The authors constructed two dimensional only for easy use and implementation of 2D purpose. Basically there are totally seven types of Universities or University type Institutes are available. For more details of Indian Universities list refer official website of University Grants Commission [1]. Authors in their publications[2],[3],[4],[5] have already discussed about the various University nodes and its role in cluster formation[2]. They already pointed out the different types of clusters are available at University level. They found that in real world different types of clusters are available such as Bi-clusters, Continent level clusters, University level clusters and country level clusters [2].

India has diversity in many aspects and single rule or procedure should not give optimum solution. The important thing is there are totally three Ministries are working for Education sake and their policies are independent of each other. For more details of policies visit official websites of Ministry of Human Resources, Ministry of Higher Education and Ministry of Telecommunications and IT. Ministry of HR and Higher Education leads regular and Distance Education system and e-Learning System is leading and monitoring by the Ministry of Telecommunications and IT.

The policies of these three Ministries are out of scope of this paper. Ministry of TIT already completed different projects for e-Learning systems and has its own FYD for e-Learning implementation. It has a Memorandum of Understanding (MoU) with different agencies and different organizations for e-Learning implementation. Generally IIT’s are leading these projects. These IIT’s are highly reputed and autonomous bodies under the Ministry of HR. Now in India approximately 20 projects are very successfully completed by MT&IT. All details are available in CDAC, India and different IIT’s. All these projects are successfully completed in X th and XI the plan of Govt of India. For example online course of “Cyber – security” is successfully completed by CDAC-Hyderabad. For more details visit www.cdacindia.com. Some projects are handled with joint venture between two or more organizations. For example the project “Training of teachers in e-Learning” is a joint venture between the three organizations, i.e. DOEACC of Imphal, Calicut and Gorakhpur. For more details of the project visit three branches of DOEACC (Imphal, Calicut, and Gorakhpur). The project “National Competitiveness in Knowledge Economy” is completely handled by IIT-Chennai and IIT-Roorkey purely.

The e-Learning system in India still is in the infant stage and lot of Government involvement is necessary to speed up the e-Learning system. There are so many reasons are available for poor performance and implementation of e-Learning in India. There is a lot of gap between developed countries and India in this aspect. The authors feel that lack of Government policies and multi authorities are degrading the performance of an e-Learning system in India. We don’t have a separate autonomous body to take care of e-Learning system like developed countries. For each and every thing the system completely depends on Ministry policies is also degrading the performance of e-Learning system. The points observed by authors for poor e-Learning in India are as follows. Out of these available some are policies based, some are technically based, some are nature based, some are social conditions etc.
• Lack of knowledge in global market and global job environment
• Completely depend upon traditional systems
• Government policies (Both State and Govt. Policies)
• Employers are giving preference to regular mode
• More job opportunities for regular mode
• E-Learning/Online modes are highly technical modes which require English skilled people. Highly skilled people generally demand more salary.
• Basically India is agriculture based country (80%) and Government cannot allot more funds.
• Only private or Deemed Universities are generally offered online mode or e-Learning.
• Only IGNOU is offering in e-Learning mode and indirectly supports other Govt. Universities.
• Generally Government Universities can’t approach private Universities for initiation of the process.
• Lack of common policy between different legislatures.
• Lack of English language and IT skills
• Teachers are addicted to old traditional methods.
• Department of Telecommunications and IT are common portfolio ministry. So generally they are showing on interest on Telecommunications but not for e-Learning.
• As per Govt. of India policy there is no separate IT policy, IT portfolio is under Telecommunications only.
• Basically Telecommunications ministry is industry oriented and IT is Education and e-Governors.
• Ministry is implementing e-Learning in terms of projects but not as per policies.
• Generally all students are thinking that Distance Education and e-Learning are same. But we have policy on Distance Education. For more details about policy please refer Dept. of Higher Education, India official web site. The policy details are tagged with AICTE official website.
• E-Learning is policy of Dept. of Telecommunications IT whereas Distance Education is policy of Higher Education Dept.
• Now in India all Engineering colleges up to 80% are working under private management. For private colleges AICTE approval is mandatory. So AICTE tagged Distance Education from Dept. of Higher Education policy in their official website but not e-Learning. So in private sector Employers are not preferred e-Learning or Distance Education mode in India.
• Job opportunities by doing other than regular mode are only 8% that too with high English language and IT skills.
• In India common man thinks that Education means in regular mode only. For Distance Education mode also there is degraded when compare to regular mode in terms of the Employer.
• Regular or Distance modes are given opportunities to write Civil services also But with e-Learning certificates there is policy ambiguity.
• All Open Universities are working under the Distance Education policy under the Ministry of Higher Education, Govt. Of India. (Details of Distance Education in India are out of scope and 13 Govt. Open Universities are functioning for this theme. Now the list of Open Universities is available on the UGC official website itself. Previously it has separate website as www.dec.ac.in.

2. LITERATURE REVIEW

“There is room for governments to show greater entrepreneurial acumen and zeal in providing support to clusters….governments should seek out cluster participants and proactively understand their needs at a time when early action can have a transformative impact.” [57]. The Over the last decade, clusters have drawn substantial attention from policy makers, legislatures, business leaders, academics, economic development practitioners and development agencies.[58] Cluster development strategies have been implemented in many parts of the world. Thirty countries, thirty-two American states and all of the Nordic countries have implemented cluster initiatives to position their economies to meet the challenges of the new economy. Clusters are present in the economies of developed and developing nations, large and small, urban and rural, and across jurisdictions (e.g., nations, states, metropolitan areas, regions and cities). The authors observed the various cluster policies of different policies in the world are available as feasible solution but not optimum feasible solution. Some examples are as follows. • Government of Quebec’s Cluster Agenda
- Niagara Ontario’s Wine Cluster
- Ottawa’s Silicon Valley North
- Saskatoon’s Plant Biotechnology Cluster
- New Brunswick’s Information, Communications and Technology Cluster
- Arizona’s Strategic Planning for Economic Development – Cluster Approach
- India’s Bangalore Software Cluster
- Taiwan’s Semi-Conductor and Telecommunications Clusters

The above examples can find as different policies of different cluster policies including Education. For more details see CAN GOVERNMENT CATALYZE CLUSTERS? EXAMPLES OF GOVERNMENT ACTIONS[29], pp. 11-17. The authors proposed this set diagram from common solution of all above said clusters in the form of Venn diagrams from Set theory for easy understanding. Mathematical Induction can also helpful. The authors used set theory instead of mathematical induction due to ease of use and understanding and also particular nodes of system but not general nodes, Mathematical Induction is useful for general output from particular objects or values. Here in this case authors are used different classes A, B & C for data preparation and analysis.
Developed countries have separate implementing policies of the cluster policies and they support Bangalore cluster system. They are as follows.
- Australian Universities Clustering Department wise
- U.K Universities Clustering
- U.S.A Government clustering policy
- European Universities Clustering
- Bangalore-Industry Cluster policy
- Australian Universities Clustering for estimation Research Performance
- NAAC accreditation official website for estimation of accredited Universities in India.

For more details visit official websites of respected Govt’s. The authors already has been discussed about the Australian University Clusters in their published paper [22], pp. 15,17,21. In Australia some Universities have separate policies on cluster construction and implementation. The Australian Universities are as follows.
- Australian National University (ANU), Canberra.
- Deakin University, Geelong.
- Monash University, Melbourne.
- Queensland University of Technology (QUT), Brisbane.
- Royal Melbourne Institute of Technology (RMIT), Melbourne.
- Swinburne University of Technology (SUT), Melbourne.
- University of Adelaide, Adelaide.
- University of New South Wales (UNSW), Sydney.
- University of Queensland (UQ), Brisbane.
- University of Western Australia (UWA), Perth.

Besides this the Australian Government has very definitive hardware initiatives clusters and its details are out of scope.

The names of different clusters are as follows.
- South Australian Centre for Parallel Computing & Australian Partnership for Advanced Computing (APAC11)
- ANU
- Queensland
- Monash
- Swinburne
- Wide Area Clustering
- Research Data Networks Cooperative Research Centre (RDN CRC12)
- The Asia Pacific ATM Network (APAN13)

The European Union Society has a separate policy on its e-Learning clusters. Strategic study on virtual models of universities carried out by the Danish consultancy PLS RAMBOLL Management for the European Commission, DG Education and Culture in 2002-2003. The study was commissioned as Lot 1 of four studies presented in the context of the e-learning initiative. The initiative was adopted by the European Commission on 24 May 2000 and is part of the e-Urbe Action Plan, whose aim is to encourage Europe to exploit its strengths and overcome the barriers that are holding back the uptake of digital technologies. The aim of the study was to provide the Commission with a detailed report on the current and potential future use of ICT by European universities for educational and organizational purposes, and attempts to answer the following key questions:
- What is the current overall status concerning the use of ICT and e-learning in the universities of the EU Member States in terms of both the educational and the organizational settings?
- What trends concerning the integration of ICT in European universities can be identified?
- What are the principal examples of strategic cooperation and partnerships?
- What are the strengths and weaknesses of the various partnership and business models?
- How is virtual mobility being supported in European universities through ICT integration and e-learning?
- What are the possible scenarios for ICT integration in the universities of the EU Member States. For more details visit official webpage [52].

Uses of e-learning applications can raise the level of education, literacy and economic development in underdeveloped and developing countries. In India development of e-learning is more successful in corporate segment where it is seen as a means of achieving business goals. Indian government helps always give preference to the use of ICT’S as means of mass education. In India the e-Learning initiatives is as follows. In 1984, a project named CLASS (Computer Literacy & Social on Schools) started to make a computer literacy as a compulsory project for class XI and XII by the Indian government.

In the 7th five year plan and 8th five year plan 2598 school and 2371 schools respectively started computer literacy having foundation step towards e learning in India.
- During year 2003, with the aim to take at left to schools in every district across the country, a project was started which will cover 6,00,000 school in India.
- University Grants Commission Higher Education Project was launched by UGC in collaboration with INSAT named CONTRY WIDE CLASSROOMS in 1984 to upgrade and enrich quality of education.
- The 1st online education enterprise Net varsity with private initiative was taken by National Institute of Information Technology (NIIT) in 1996.
• In 1991, Indira Gandhi National Open University (IGNOU) started telecasting educational program on Doordarshan. In 1999, it started with virtual campus initiative with two programs the Bachelor of Information Technology (BIT) and Advance Diploma in Information Technology (ADIT) (in collaboration with Edexel, UK, and India).

• GyanDarshan education channel was started in 2000 to on “Enhancing Higher Education Through E-learning” in 20th September 2001 named EDUSAT to provide education to millions of people at their doorstep. It enables information to be broadcasted in local language and devoted to long distance learning in India. Bangalore (IIM-B) used E-Learning face to face teaching. Collaboration with commonwealth of learning (CCOL). MCT, Govt. Of India has its own scope and defined as follows.

• Real time video compression and decompression techniques
• Developing Authoring Tools in Indian Languages
• Developing content independent of platform & environment

The below are its fresh proposals.
• Real time video compression and decompression techniques
• Developing Authoring Tools in Indian Languages
• Developing content independent of platform & environment.

The authors have observed on different architectures and technologies are available for open learning or online learning. They are as follows.
• Workflow based
• Rapid based
• Semantic and Grid based
• Service Oriented
• Cloud Computing based Extended based(Dynamic based)
• Cisco’s
• Mind’s Share-Modern DRAM(DDRx-LPDDRx) & SCORM 2004 Enterprise Edition The different technologies are as follows. In world different technologies are implemented at University level for e-Learning purpose. The authors are observed that in Oman generally all are preferred “Moodle”. The available technologies are as follows
• Apex Learning
• A tutor
• Blackboard Learning System
• Brain shark
• CERTPOINT Systems
• Chamilo
• Claroline
• Desire2Learn
• DoceboLMS
• Dokeos
• eFront
• Hot Chalk
• ILIAS
• Meridian Knowledge Solutions
• Moodle
• Metacoon
• RCampus
• Saba Software
• Sakai
• Spicy Nodes - Create and share radial maps (related to concept maps and mind maps)
• Study wiz
• Zoo logic &
• WebCT

2.1 Indian Universities Initiative and action plan for e-Learning in India.

The UGC and NAAC are the two important autonomous bodies which are working for monitoring of Universities and affiliated colleges and QA of Universities and Colleges. Both these bodies are working under the Ministry of HRD, India. MCT exclusively work for e-Learning projects. For more details e-LEARNING projects visit MCT, India official web site an CDAC, India official web sites. CDAC and its associates are doing e-Learning projects. Center for Development of Advanced Computing (C-DAC) is the premier R&D organization of the Department of Electronics and Information Technology (Deity), Ministry of Communications & Information Technology (MCIT) for carrying out R&D in IT, Electronics and associated areas. Different areas of C-DAC, had originated at different times, many of which came out as a result of identification of opportunities. The more details are available from [30], pp.30-40 regarding their technical implementations. The UGC announced its e-Content policy and details are available in [1],[2]. As per UGC official website ugc.ac.in there are totally 620 universities available as of 11-2-2013. The NAAC is giving grades for Indian Universities and the authors observed that there are only 30% of Universities are having NAAC grades, i.e. either Grade-A, Or Grade-B Or Grade-C. Out of 30% of accreditation only 12% have A-Grade, 17% have a B-Grade and 2% have C-Grade only. More details are available from www.naacc.gov.in for its detail reports and policies. The following figure illustrates this concept. The figure-2 shows the NAAC Grade Universities for country wise where all states are actively as local clusters. Totally here are totally 31 local clusters are available as 31 Units and its integration and local cluster formations are available in section 3.2 (In LPP form). The authors have used Pi diagrams with MS-Office with shows percentage of NAAC accreditation for all UGC recognized Indian Universities with Grade-A,Grade-B,and Grade-C.The authors also estimated Universities without accreditiation which have only UGC recognized.
The syllabus proposed for the creation of e-Content shall be as per UGC Model Curricula for Undergraduate level courses. However, the Course Coordinator in consultation with the Subject Experts is expected to incorporate the latest developments that have taken place in that particular subject. The intention here is to provide scope for value added information on the subject[1], pp. 6. The separate guidelines are available by UGC, for e-Content is available in [1], pp. 4-5.

The UGC e-content scheme aims at developing high quality e-content, as well as expertise in generating such content over the long term. The scheme provides financial assistance and technical support to teachers and other experts based in colleges and universities for the development of e-content. The e-content development and associated web based learning described here does not seek to replace traditional teaching and learning, but is expected to supplement them. The inclusion of e-content in learning is now inevitable, and the UGC initiative is designed to meet the new challenges, and to help India take the lead in this newly emerging field [2], pp. 1. The objectives, eligibility and assistance from UGC are available from [2], pp.2-4.

The National Mission on Education through Information and Communication Technology (NME-ICT) is envisaged as a Centrally Sponsored Scheme to leverage the potential of ICT, in teaching and learning process for the benefit of all the learners in Higher Education Institutions at any time anywhere mode. Its motto is “to provide connectivity up to the last mile”, the NME-ICT aims to extend computer infrastructure and connectivity to over 32000 colleges at present and each of the departments of over existing 550 universities/deemed universities and institutions of national importance in the country. The numbers of institutions/Departments are being grown in the future. All e-Learning and ICT policies are available in [3], pp. 1-5. The project name is e-PG Patassala UGC under MHRD. The complete implementation of e-PG Patasala project details is available in [4] and its details are out of scope of context. Their action plan is divided into 4 quadrants and their features are as shown in the figure.

The MoU between UGC and other organizations and their policies are available in [5] on e-PG Patasala project. The UGC states need of MoU with different organization are available in the form of policies and guidelines [5], pp. 2-3. The objectives for English Language Literature e-Learning is as follows [6], pp.1.

E-Content for Under and Post Graduate Courses in English Language and Literature by UGC have objectives

The objectives are as follows.

1. To leverage the potential of ICT in providing high quality personalized and interactive knowledge modules over the internet / intranet for all the learners in Higher Education in 'any time - anywhere' mode.

2. To cater the educational needs of the students enrolled in the external / distance mode of learning. (At present 30% of the total students enrolled in regular course are enrolled in 'External / Distance' mode of learning. The success of this project can be of immense help to these students along with regular students.)

3. To implement pedagogical issues identified through the UGC - research project.

4. E-Content generation through participation of teachers and students of various colleges and universities in several countries.

5. To prepare SAQs for NET (English) on Moodle and WikiEducator.

6. To convert study material of English (as recommended by UGC) in digital form.

Under the National Mission on Education through ICT (NMEICT) e-content creation has been undertaken on a massive scale by many institutions and universities. NPTEL project sanctioned to IIT, Madras provides e-learning through online web and video based courses in engineering, science and humanities streams. The project is now in the second phase of development where more than 990 courses in 23 disciplines in engineering and science are getting generated. Other major initiatives of e-content generation has been taken up by CEC for 68 subjects for UG level courses and UGC for PG level courses in 77 subjects. IGNOU is in the process of developing 500 courses in 17 disciplines of Social Sciences and Humanities. The overall goal is to create high quality, curriculum-based interactive content for all subjects and host them on LMS platform for the benefit of
universities, colleges and the worldwide academic community in open access [42], pp. 1.
The UGC-Academic Staff College, Jawaharlal Nehru Technological University Hyderabad organizes Courses
on Thrust areas for in-service Teachers and also for newly appointed teaching faculty on a regular basis. During the
current academic year 2009-10, a Two-day Workshop on
“e-Learning and effective teaching” is proposed to be
organized during October 8-9, 2009, in the campus of
JNT University Hyderabad. The number of participants is
limited to a maximum of 40, and the selection will be
based on the priority of ‘first-come-first-served’. For more
details visit official website [8] for e-Learning training to
different colleges in India. The objectives of the program
are as follows.
• E-Learning overview.
• Case Studies of e-Learning Tools & Components.
• Instructional Strategies.
• Content Development & Standards.
• Content Management.
• Web Accessibility Guidelines.
The UGC has been released adequate grants to the
Department of Extension to establish an e-learning center
to prepare e-contents and to train the teachers in e-
content development. The department has already
purchased 15 computer systems, one server and
established broadband connectivity for e-learning activities. The staff in the Department has been trained in
e-content preparation by the UGC-CEC. The Department
has already conducted four workshops in e-content
development. Efforts are being taken to prepare an e-
learning package on career counseling for college
teachers. For more details visit Bharathiyar University e-
Learning webpage[7].
Integrating ICT into Teaching and Learning process to
Empower and develop proficiency of Teachers and
Students[With special reference to (TELL) Teaching
English Language and Literature]. The research project
deals with very pertinent problem issues like:
• How far is ICT useful to the student community, or is it
useful at all?
• What is the Role of ICT in teaching English language
and literature? What kind of methods can be used to
overcome students' problems?
• Can it empower teacher-student community? Can it
improve their proficiency of learning? If yes, to what
extent. If no, why?
• How far is ICT useful to empower and improve the
proficiency of the student community?
• Can ICT empower and improve proficiency of the
student community?
For more details visit webpage[9].
The UGC-Academic Staff College of the Bharathiar
University aims at maintaining the top most status at the
National level, not only in terms of number of programs
organized but also in terms of quality, variety, usability,
viability, etc. To accomplish this task, training in
Inflibnet-Infonet, EDUSAT exposure, e-learning and e-
content development are provided to the participants.
Course Materials to the participants are given in the form
of CDs in addition to Xerox copies of Lecture materials
and also hosted in website. The details are available in
[16].
The School of Distance Education of Andhra University
would soon launch teaching through e-learning modules,
its Director N.L. Narasimha Rao said on Sunday.
Speaking at a meeting conducted by final year students
of Master of Journalism and Mass Communications here to
mark the conclusion of contact classes, he said. The-
learning was useful for understanding basic concepts.
Observing that there was a skill gap for want of
professional qualifications, he said distance mode
education had become the only way to acquire various
industries-relevant degrees. This would also help in
making use of the country’s demographic dividends. Head
of MJMC Department Prof. D.V.R. Murthy said the
MJMC (distance mode) course introduced in 2011-12 had
the best study material in the country[31].
Yogi Vemana University will be the first University in
India to promote E-learning through the Open Course
Ware Consortium.Professor C. Narayana and Dr. P.
Srinivas, CEO of Tidal Data dot Com, California,
representing TEPED (Thomas Edison Program for
Environment and E-Learning Development) signed the
MoU here .With this, Yogi Vemana University would be
the first in India to be a part of the Open Course Ware
Consortium, said Prof. Argyle Amachandra Reddy, Vice-
Chancellor of YVU. Under this program, the university
would provide classroom lectures from international
universities to students in rural area universities, he said.
The funding for construction of E-Learning classrooms,
digitization of libraries and procuring equipment to the
university would be provided by TEPED. Two other mice
would be shortly signed by Cornel University and Iowa
University to support the provision of full-fledged
resources where students would receive world class
education.Dr. Srinivas of TEPED said that normalization
of education from rural level to international level would
be a dream come true through E-learning and every
student in India would be able to do research at the
university level.He said education was the prime factor to
fill this knowledge gap. Through E-learning Indian
students would find the passage to international
recognition, he said. TEPED would also fund and
encourage the study of global environmental
development[32].
Osmania University, established in 1918, is the seventh
oldest in India, the third oldest in south India and the first
to be established in the erstwhile princely state of
Hyderabad. Through out its existence of over eight
decades, it has shown remarkable progress and sustained
an integrated development of all faculties. It has
significantly contributed to the academic and economic
development of not only the region but also of the
Country [33]. The e-Journals are available as shown in figure.

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Student Support</th>
<th>Amenities</th>
<th>E-Journals</th>
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<tr>
<td>INDIAN e-Journals</td>
<td>UGC-INFONET e-Journals</td>
<td>SAGE e-Journals</td>
<td>Common Gateway for e-Journals</td>
</tr>
<tr>
<td>NPTEL Projects</td>
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Figure 3 Osmania University e-Learning system.

The Hyderabad central University has action plan by the name called “Distance Education and Virtual Learning”. The University is offering different Diploma courses under this scheme [34]. It has a joint venture with IIT-B for some academic Research Programs as e-Learning is one of the Module. For more details visit IIT-B official website where it has an MoU with other Universities also like a joint venture.

During the past 33 years, GITAM has been committed to excellence in higher education foraying into diversified disciplines of learning. It has steadily evolved into a world class university recognized for the experiential learning it offers, the competent and compassionate faculty, the stellar research laboratories, academic vibrancy and cosmopolitan culture. The various e-resources are e-Research Learning Center, e-Journals, NPTEL course contents, UGC-InfoTech digital library and course material developed by GITAM faculty. For more details visit the website [35].

The Koneru Lakshmaiah Charities was established as a trust in the year 1980 with its official address at Museum road, Governor pet, Vijayawada, Andhra Pradesh – 520 002 and started KL College of Engineering in the Academic year 1980-81. The trust was converted into a Society by the name Koneru Lakshmaiah Education Foundation in the year 1996. The KL College of Engineering has attained autonomous status in the year 2006 and in February 2009, the Koneru Lakshmaiah Education Foundation Society was recognized as Deemed to be University. At short Koneru Lakshmaiah Education Foundation is named as a K L University. All e-Learning resources are permitted to only students and staff. Registration is mandatory for e-resources access. For more details visit website [36], [37].

Vignan University is an institute, which provides quality education in a diverse and intellectually stimulating environment. It imparts value added training to students to make them competent and inspired engineers. The Institute celebrates the power of knowledge, cultivates vision and encourages new ideas, besides aiming to inculcate human values and build awareness about the self and society around. All core Engineering courses have e-Learning facility viz, Electronics & Communications, CSE, Civil Engineering, Electrical and Electronics Engineering, IT etc. This e-Content facility would allow students to get the full advantage of the experience of article ship which adds to their worth. Students are encouraged to make good use of this online resource to have a better understanding of the subjects and enhance preparation for their forthcoming Examinations. In Home page itself they have e-Learning User ID and Password for staff and students as shown in the figure. For more details visit website [38].

Figure 4 Shows Vignan University e-Learning

Maulana Azad National Urdu University (MANUU) is a Central University established at National Level in 1998 by an act of Parliament to promote and develop the Urdu language and to impart vocational and technical education in Urdu medium through conventional and distance modes. The headquarters of the University is at an outstanding central location-Gachibowli, Hyderabad, sprawled over 200 acres. The students and staff of the University are drawn from throughout India. They are attracted by its commitment to excellence in quality Urdu education in all disciplines of knowledge. The various e-Learning a digital learning resources are as follows. For more details visit University e-Learning webpage [39]. The various e-Learning resources are available from this University are as follows.

- Sakshat Portal
- National Programme on Technology Enhanced Learning (NPTEL)
- Open Courseware Consortiumhttp
- MIT Open Courseware
- Open Yale Courses
- Webcast. Berkley
- Open Michigan
- Open Learning
- Open Culture
- World Lecture project

Situated in the heart of the city at Kukatpally a major landmark, Jawaharlal Nehru Technological University, Hyderabad has an environment of academic excellence with ‘A’ Grade accreditation by NAAC (National Assessment and Accreditation Council). Bringing the spark of knowledge to young minds and instilling a new confidence and vigor to face the world, it is providing quality education for nearly 4 decades. The main e-Learning activities of the University are

- Online-content
- Virtual classrooms
- Virtual labs
- Intelligent pre-assessment systems &
- QA framework for e-Learning systems.

For more details of University e-Learning objectives visit official website [40]. The University also conducts e-Learning training for other colleges in India. For more details visit the official website [8].

The Jawaharlal Nehru Technological University-Kakinada, in a first-of-its-kind initiative in the country, will introduce e-learning to improve the standard of
education in the over 220 engineering colleges under its fold, Vice-Chancellor G. Tulsi Ram Das said on Tuesday. He told a press conference here that e-learning provided the practical way to overcome the shortage of faculty in colleges and improve the quality of engineering education. He announced that the syllabus revised by involving experts in the fields of education and industry, would be adopted for first year students for the new academic year. E-learning would be adopted in June for II year to IV year engineering students and for the first year students from August. For more details visit official website [41]. The press meet picture of the University Vice Chancellor is as follows.

Figure 5 JNTU-K Vice-Chancellor G. Tulsi Ram Das addressing media on e-learning in Ongole on Tuesday— photo: Kommuri Srinivas.

Technology enhanced learning (TEL) has the goal to provide social-technical innovations (also improving efficiency and cost effectiveness) for e-learning practices, regarding individuals and organizations, independent of time, place and pace. The field of TEL therefore applies to the support of any learning activity through technology. In the state of Karnataka, e-learning division of the Visveswaraya Technological University has spearheaded the cause of e-learning in a big way. The VTU e-learning Centre is gaining momentum in the country. It is going to open up many opportunities both for the students and working professionals to enrich their knowledge horizon at anytime, anywhere. For more details visit the official webpage [42]. The VTU has tied up with Mysore University as shown in the figure. In this Case VTU is pure Technical University and Mysore University is traditional courses University like Arts,Sciences and Commerce. Professional courses are also available in MU.

Figure 6: Shown VTU e-Learning system tie up with Mysore University.

The BU has an association, named, “INFEXA – Information Explorer Association” was inaugurated on 9th April 2009 by Dr. Gopinath Ganapathy, Department of Computer Science, Bharathidasan University. He delivered a lecture on “E-Learning”. For more details of functioning e-Learning center visit BU official website [10]. With innate and ardent academic stints facilitated in capacity building of the myriad facets of higher education. The coordinated endeavors facilitated in designing the state-of-art Architecture in launching a network of academic institutions in the country and some innovative programs viz. e-journals scheme, Multimedia, e-content and e-learning etc. Facilitated in the provision of academic and logistical support to the Commonwealth of Learning (COL) workshops, Audio-Visual and Multimedia Technologies, e-content development for e-learning. The coordinated endeavors accomplished in designing the State of Art Architecture in university Network of Indian universities (UGC-INFONET) and e-journals consortium of academic rich journals for research and development apart from launching SITs for EDUSAT programs. The common wealth of Learning (COL) has very big e-Learning network and a lot of different Universities in the world as members. From India five Universities have a membership. For more details visit COL official website [44]. For more details of COL in India and e-Learning implementation visit web site [45],[46].

Navrachana University (NUV) is a private statutory University established in 2009 under the Gujarat Private Universities Act, 2009 (Gujarat Government Gazette, Extraordinary, Volume L, Tuesday, July 7, 2009). In March 2011, it was recognized by the University Grants Commission under the UGC Act, 1956 (UGC, Website - http://www.ugc.ac.in). The e-Content project is an initiative of the Ministry of Human Resource Department under the National Mission on Education through ICT. The e-Content for Biochemistry will be hosted for open access through the University official website. For more details visit website [12].

IITG is one of the 16 renowned Indian Institutes of Technology set up by the Government of India. Center for Educational Technology at IITG is involved in Research, Design & Development of digital content & e-Learning Technologies. NPTEL is one of the major projects at CET under the National Mission on Information & Communication Technologies (NMICT). Seven IITs & IISc Bangalore are involved in NPTEL. As part of its mandate to deploy learning content through digital technologies, IITG is pleased to organize this national program for the benefit of institutions in the North East. The following figure concept of NPTEL Under MHRD, Government of India. For details visit websites[13],[21].

All IIT’s and IISc formed like cluster with NPTEL which works under Ministry of Human Resources are as shown in the figure.
In Module II, the Amrita University aims at developing teaching material corresponding to the tools we are developing (most tools are based on machine learning) so that it can be delivered as part of Undergraduate computer science and engineering curriculum on data mining/machine learning. This will ensure a critical amount of manpower required for sustaining translation effort needed for national mission on education. The Amrita University has tied up with IIT-B, Tamil University, Dravidian University, and Hyderabad Central University. For more details visit [14], pp. 1-3. All IIT’s have different ventures on open learning.

The All India Management Association (AIMA) was created as an apex body of professional management with active support of the Government of India and Industry in 1957. AIMA is a group- a body to pool management thoughts in the country, a forum to develop a national managerial ethos, an organization to facilitate the furtherance of the management profession in the country. AIMA is represented on a number of policy making bodies of the Government of India and a number of National bodies / organizations. Some important ones are as under:

- All India Council for Technical Education (AICTE),
- Boards of Governors, Indian Institutes of Management (Ahmedabad, Bangalore, Calcutta, Indore, Kozikode, Kishipur, Udaipur, Ranchi, Rohtak, Tiruchirapalli and Raipur),
- Bureau of Indian Standards, New Delhi
- National Productivity Council, New Delhi
- Central Direct Taxes Advisory Committee

For more details visit the official web pages [15],[47]. Mahindra Institute of Management and Technical studies (MIMTS), Khurda, Bhubaneswar, Orissa is established under the auspices of Mahendra Kumar Jena Memorial Trust with the sole objective of imparting quality education at par with international standards and is steadfast to provide services that are efficient, empathetic, and responsive beyond the generally expected. Thus, the underlying academic philosophies of the institution are: independent educational process, catalytic effort, innovative pedagogy, human resource development and all round development of the students, faculty and staff.

Their methodology is as shown in the figure and more details visit [16]. The architecture flow consists of 3 separate units or modules namely Students, Functional Experts and Executonal experts and are collectively constitute a system and they are logically connected with all defined parameters which are available in different modules as are shown in the figure.

Keeping with the advances in technology, Madras University has been taken the initial steps towards “anytime anywhere” learning by starting a “Centre for E-Learning.” In addition, the University is one of the partners in the “Virtual University Program” connecting the three oldest Indian Universities. We consider the Pan African E-Network project an important assignment in establishing our potential in the area of Online Education. The University of Madras has been allotted four programs under the Pan African Project- Master of Science in Information Technology (M.Sc IT), Bachelor of Business Administration (BBA), Certificate in German and Certificate in Arabic. All the four programs have already been offered by us to our Distance Learners. The M.Sc. IT and BBA programs, in particular are in good demand. Very soon, all are can access University program details through Madras University brochure. For more details visit [18],[19] pp. 7.

Anna University was established on 4th September 1978 as a unitary type of University. It offers higher education in Engineering, Technology and allied Sciences relevant to the current and projected needs of the society. Besides promoting research and disseminating knowledge gained there from, it fosters cooperation between the academic and industrial communities. The University was formed by bringing together and integrating two well-known technical institutions in the city of Madras (Chennai).

To tackle the shortage of faculty members, many colleges are in the process of installing e-learning systems in their laboratories. Many of them are also intended to assist teachers and aid students with extra training. While SRM, VIT and Amrita University already have their e-learning platforms, most of these colleges also invest in audio-video training for students. For more details visit official web page [20]. ICT options such as e-learning and EDUSAT are available for educational institutions but experts say they are not being utilised properly. “You have lessons at untimely hours. That is why many of these programmes are not used by students anymore,” says Prof Balaguruswamy.

3. Mathematical Approach for E-Learning Nodes Estimation

3.1 Linear and Polycurves
The authors applied these Mathematical models very successfully and details are furnished in [24], pp. 9-11. The authors repeated the same process for estimation of relations between variables. The below picture shows the concept is as follows. The Statistical fundamental values are as shown in the figure. For this the authors used different Data Mining tools. “The results are available in the Results and Discuss” Section.

Table 1

<table>
<thead>
<tr>
<th>Grade-A</th>
<th>Grade-B</th>
<th>NAAC-Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min: 0.000</td>
<td>Min: 0.000</td>
<td>Min: 0.000</td>
</tr>
<tr>
<td>1st Qt.: 1.000</td>
<td>1st Qt.: 1.000</td>
<td>1st Qt.: 1.000</td>
</tr>
<tr>
<td>Median: 0.000</td>
<td>Median: 1.000</td>
<td>Median: 1.000</td>
</tr>
<tr>
<td>Mean: 1.857</td>
<td>Mean: 3.281</td>
<td>Mean: 5.667</td>
</tr>
<tr>
<td>3rd Qt.: 2.000</td>
<td>3rd Qt.: 5.000</td>
<td>3rd Qt.: 8.000</td>
</tr>
<tr>
<td>Max: 12.000</td>
<td>Max: 14.000</td>
<td>Max: 22.000</td>
</tr>
</tbody>
</table>

Figure 9 Shows Statistical fundamental values

Figure 10 shows Normal test of Both UGC and NAAC accreditation (Tanagra tool)

Figure 11 shows the linear nature of curves for Indian UGC Universities.

Curve fitting is the process of constructing a curve, or mathematical function, that has the best fit to a series of data points, possibly subject to constraints. Curve fitting can involve either interpolation, where an exact fit to the data is required, or smoothing, in which a “smooth” function is constructed that approximately fits the data. A related topic is regression analysis which focuses more on questions of statistical inference such as how much uncertainty is present in a curve that is fit to data observed with random errors. The authors considered only linear relation between two variables or data points are as shown in the figure.

3.2 Linear Programming Problem

The standard form is the usual and most intuitive form of describing a linear programming problem. It consists of the following three parts:

- A linear function to be maximized
  \[ f(x_1, x_2) = c_1 x_1 + c_2 x_2 \]
- Problem constraints of the following
  \[ a_{11} x_1 + a_{12} x_2 \leq b_1 \]
  \[ a_{21} x_1 + a_{22} x_2 \leq b_2 \]
  \[ a_{31} x_1 + a_{32} x_2 \leq b_3 \]
- Nonnegative variables
  \[ x_1 \geq 0 \]
  \[ x_2 \geq 0 \]

The problem is usually expressed in matrix form, and then becomes:

\[ \max \{ c^T x \mid Ax \leq b \land x \geq 0 \} \]

Other forms, such as minimization problems, problems with constraints on alternative forms, as well as problems involving negative variables can always be rewritten into an equivalent problem in standard form. The authors consider that LPP problem for NAAC Universities only but not on total UGC-Universities. The reason is NAAC-Universities have grading system and have minimum resources and IT infrastructure. The NAAC-Universities
have A, B OR C Grade. But recently NAAC has given the star system which should not suitable for mathematical conversion. The more dimensions are creating more mathematical complexities. For easy and general understanding authors assume only three grades but not its intermediate states. For example in A-Grade we have A+, A++ etc. The authors have published on “Local clusters for Indian Universities”. For more details of this publication visit [23], pp. 23-25. Now the authors create LPP for the entire country and then with Local LPP’s. This creates a system of “Integration Clusters” and “Local Clusters”. The following figures give the entire concept of “Integration and Local Clusters”.

The real world problem is loaded into above said tool and first row is objective function values and the remaining values are constants. Each column represents Grade-A, Grade-B and Grade-C. The objective function maximizes the function for all Indian NAAC-Universities. The above figure shows the implementation for India wise and it is a collection of South, North-1, North-2, West, East and North-East zones. All these zones are assuming as local clusters. The authors found the Optimum Solution is as follows.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Obj. Cost</th>
<th>Reduced Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>x1</td>
<td>0</td>
<td>70</td>
<td>0</td>
</tr>
<tr>
<td>x2</td>
<td>0</td>
<td>94</td>
<td>0</td>
</tr>
<tr>
<td>x3</td>
<td>0</td>
<td>11</td>
<td>0</td>
</tr>
</tbody>
</table>

All x1, x2, and x3 values are equal to zero and hence no solution for a given LPP problem.

### 3.2 Local clusters for LPP

The authors examine the output from Table-1 for the entire system for estimation of the Optimum feasible solution for NAAC-Universities e-Learning nodes. The zero solution is not a solution. So authors applied the same system for Local clusters as discussed further and the authors have published on Local clusters. For more details visit[23]. Now the authors assume local wise clusters and construct local LPP’s are as follows. The figure shows South Zone local LPP is as follows. The South Zone consists of Andhra Pradesh, Karnataka, Tamilndu, Kerala, Goa, and Pondicherry units. In this zone all Grades are available i.e. >0. (Grade-A, Grade-B and Grade-C Universities are available. The below figure shows geographical locations. This map consists of starts of Republic of India and officially decided as states. In each state we have different Districts and these Districts are once again split as Taluk etc. The small unit of location is called Village. This system is common or entire India. We can consider the state as one real cluster.

![Figure 17](image_url)
Table 2: shows summary of all Local clusters Names

<table>
<thead>
<tr>
<th>Sto.</th>
<th>Zone-Name</th>
<th>Member Names</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>South</td>
<td>Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, Goa and Pondicherry</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>North-1</td>
<td>Orissa, Mahasabha, Madhya Pradesh, Chattarpur and Delhi</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>North-2</td>
<td>Haryana, Punjab, Uttaranchal, Himachal Pradesh and Jammu- Kashmir</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>West</td>
<td>Rajasthan and Goantr</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>East</td>
<td>Bihar, West Bengal and Jharkhand</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>North</td>
<td>Assam, Ananshal Pradesh, Manipur, Meghalaya, Tripura and Nagaland</td>
<td>6</td>
</tr>
</tbody>
</table>

The above table -2 shows the various members of different zones with frequency available. For more details of Local clusters visit www.ugc.ac.in and for location of different zones check any India Map with different states. The authors repeated the process as shown in the figure-16 for all local cluster zones as defined in Table-2, they have value for different local clusters are >0 and results are tabulated as follows.

Table 3: Final values of all Grades of Universities

<table>
<thead>
<tr>
<th>Sto.</th>
<th>Zone</th>
<th>Grade-A</th>
<th>Grade-B</th>
<th>Grade-C</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>South</td>
<td>43</td>
<td>1</td>
<td>1</td>
<td>42(4.5)</td>
</tr>
<tr>
<td>2</td>
<td>North-east</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>East</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>4</td>
<td>West</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>North-1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>61</td>
</tr>
<tr>
<td>6</td>
<td>North-2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>18</td>
</tr>
</tbody>
</table>

The above table shows objective function values of different local clusters and all are>0 is highly suitable. In column wise Grade-A AND Grade-C have 0 values and Grade-B has >0 which means more stable than A and C which supports the mathematical statement which is available in Table-11 in Results section.

3.3 Data mining Techniques
3.3.1 Supervised Methods
The authors have used Data mining methods for not only clusters and also for Benford’s law. This law is useful for estimate the nature of data. The authors applied this law for different Grades as shown in the figure.

Figure 18: shows Benford’s law for NAAC-Universities with R (Rattle GUI tool)

The figure shows 0.4 is the maximum value of PR () and maximum values are available at [0.075,0.2].More details of Benfords Law lead to Data Analysis and out of context of this paper.

Figure 19: Shows Decision tree for NAAC System

The authors observed that the tool consider Grade-A as root neither UGC nor NAAC which gives a contradiction, and its calculations are as follows.

The above figure shows the size of the tree is 7 and the time taken to construct the tree by the tool is 0.02 seconds and root is Grade-A. Figure 23 deals about the visualize errors of Decision stump tree.Right part in the picture all values are available in different colors and we can get figure with two dimensional values. Along with X-axis we consider the different states and Y-axis any Grade of University etc. In Weka tool there are total Seven trees are available and we can choose the type of tree as per our nature of the data. The authors observed this data is fit for the Data stump tree only.Each and every tool has its own implementation details for Supervised or Unsupervised methods.In R Forests are also available and this is useful when the data is very big such as temporary files during browsing,Real time data such as Bank transactions,e-Reservation,Big market mall,etc.

Figure 20: Visualize classification errors

Figure 21: Shows Random Forest(ROC Curve) for e-Learning nodes for NAAC-Universities with false alarm rate 0.079.
Lorenz curves represent the distribution of income in an economy. A point (x,y) on a Lorenz curve shows the percentage y of total income in an economy enjoyed by the poorest x% of the population. The Gini index measures income inequality in an economy. It ranges from 0 (perfect income equality) to 100 (perfect income inequality). For example, Australia has a Gini index of 30.5 (2006) and the United States has a Gini index of 45.0 (2007) [source: CIA Fact book]. The yellow line in the above graph is the line of perfect income equality. It is the Lorenz curve for an economy in which all incomes are equal. The Gini index for a set of incomes is calculated from the associated Lorenz curve. It is equal to the area between that curve and the line of perfect income equality, scaled to a number between 0 and 100. The Gini coefficient is the Gini index expressed as a number between 0 and 1. For more details of theory visit [49],[50],and [51]. There are some issues in interpreting a Gini coefficient. The same value may result from many different distribution curves. The demographic structure should be taken into account. Countries with an aging population, or with a baby boom, experience an increasing pre-tax Gini coefficient even if the real income distribution for working adults remains constant. Scholars have devised over a dozen variants of the Gini coefficient. A low Gini coefficient indicates a more equal distribution, with 0 corresponding to complete equality, while higher Gini coefficients indicate more unequal distribution, with 1 corresponding to complete inequality. The various online tools are available for Gini Index and information calculation for different attributes. All reputed Data mining tools are supporting Information calculation theory and its applications. Some tools are available only for Gini and some are available for Gini with other methods. The authors are applied here Gini with other tools as shown in the figure.

The authors repeated the above process for all types of distances and methods which are available for NAAC-Universities also with R(Rattle-GUI-TOOL). They tested totally 56 values as follows.

<table>
<thead>
<tr>
<th>60</th>
<th>27</th>
<th>10</th>
<th>22</th>
<th>18</th>
<th>8.5</th>
<th>9.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>22</td>
<td>8.5</td>
<td>13</td>
<td>13</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>90</td>
<td>50</td>
<td>18</td>
<td>22</td>
<td>28</td>
<td>16</td>
<td>1.8</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.5</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.85</td>
<td>0.87</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

The authors observed that 38% of the rows have NULL values mean a lot of possibilities for instability of clusters. For >0 values authors once again then repeat the process for 56 values which are available as all Distance methods. There are mainly 7 types of Distance methods and 4 linkages are available. Different tools have different methods and links combination. In R (Rattle GUI tool) there are total 56 combinations are available as 7*8 values are as shown in Table-11 and Table-12. All these methods have different Heights of HC and have their own identity as per method. Orange tool has different implementation as shown in figure-24 and have different...
height values when compared to R(Rattle) implementation.

<table>
<thead>
<tr>
<th>Sno</th>
<th>SeriesNam</th>
<th>m</th>
<th>c</th>
<th>R2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Series1</td>
<td>0.0206</td>
<td>1.716</td>
<td>0.033</td>
</tr>
<tr>
<td>2</td>
<td>Series2</td>
<td>0.1065</td>
<td>11.02</td>
<td>0.012</td>
</tr>
<tr>
<td>3</td>
<td>Series3</td>
<td>0.0935</td>
<td>1.535</td>
<td>0.033</td>
</tr>
<tr>
<td>4</td>
<td>Series4</td>
<td>0.0665</td>
<td>3.129</td>
<td>0.007</td>
</tr>
<tr>
<td>5</td>
<td>Series5</td>
<td>0.0145</td>
<td>0.393</td>
<td>0.084</td>
</tr>
<tr>
<td>6</td>
<td>Series6</td>
<td>0.0044</td>
<td>1.283</td>
<td>0.002</td>
</tr>
<tr>
<td>7</td>
<td>Series7</td>
<td>0.0129</td>
<td>0.052</td>
<td>0.1</td>
</tr>
<tr>
<td>8</td>
<td>Series8</td>
<td>0.003</td>
<td>5.342</td>
<td>0.001</td>
</tr>
</tbody>
</table>

4. RESULTS AND DISCUSSION
The results are available on the basis of Linear and Poly-2 curves, LPP basis, Data Mining Methods and finally Gini Index model. We can discuss on by one as follows.

4.1 Linear and Poly-2 Curves
The NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL (NAAC) is an autonomous body established by the University Grants Commission (UGC) of India to assess and accredit institutions of higher education in the country. It is an outcome of the recommendations of the National Policy in Education (1986) which laid special emphasis on upholding the quality of higher education in India. To address the issues of quality, the National Policy on Education (1986) and the Plan of Action (POA-1992) advocated the establishment of an independent national accreditation body. Consequently, the NAAC established in 1994 with its headquarters in Bangalore. The author estimates the curve’s matter on the basis of Linear and Poly-2 i.e. with degree 2. All UGC Universities with different types are available in the UGC official web site. Among different types general type are State or Central Universities. Among this Deemed, Private and all Autonomous Institutes are available. Totally seven types of Universities (Institutes) are available as shown in figure 11. All equations are available in the graph are available as shown in figure 11. From figure 11 it is observed that only linear curves are available with R2>0. This Graph is as per UGC-Universities and independent of Grading system. The authors repeated the same process for NAAC-Universities also. For this NAAC-Universities they applied for both linear and poly-2 types of curves as shown in the figure 12 and 13. The results are as shown in the below tables for all UGC Universities and NAAC-Universities.

<table>
<thead>
<tr>
<th>Sno</th>
<th>Property</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>-0.0061</td>
<td>0.1343</td>
<td>-0.014</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>2.6781</td>
<td>1.453</td>
<td>0.604</td>
</tr>
<tr>
<td>3</td>
<td>R2</td>
<td>0.0001</td>
<td>0.0754</td>
<td>0.0222</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sno</th>
<th>Poly-2</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a</td>
<td>0.0065</td>
<td>-0.004</td>
<td>-0.0043</td>
</tr>
<tr>
<td>2</td>
<td>b</td>
<td>-0.1877</td>
<td>0.2468</td>
<td>0.1077</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>3.5556</td>
<td>0.9094</td>
<td>0.0154</td>
</tr>
<tr>
<td>4</td>
<td>R2</td>
<td>0.0071</td>
<td>0.0786</td>
<td>0.1254</td>
</tr>
</tbody>
</table>
Table 9: Shows Grade-A values are imaginary values

<table>
<thead>
<tr>
<th>Sno</th>
<th>Grad e</th>
<th>√(b*b-4ac)</th>
<th>Values</th>
<th>Fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>-0.507</td>
<td>NA(Imaginary)</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>0.7956</td>
<td>50.535</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>0.11</td>
<td>-68.6375,130.3</td>
<td>130.3</td>
</tr>
</tbody>
</table>

4.2 Local LPP clusters

- Grade-B Universities has more consistency since all its column values are >0
- Grade-A and Grade-C have zero values at column level.
- Even though Grade-B and Grade-C have zero values at column level their objective function values are >0.
- Overall all Grades-A, Grade-B, and Grade-C Universities have consistency. All these grades are useful for constructing the objective function and different constraints for LPP formation.

Table 10: Shows zone wise cluster results

<table>
<thead>
<tr>
<th>Sno</th>
<th>Zone</th>
<th>Clusters</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>South,North-1</td>
<td>2 OR 3</td>
<td>A,B,C</td>
</tr>
<tr>
<td>2</td>
<td>North-East</td>
<td>1 OR 2</td>
<td>B,C</td>
</tr>
<tr>
<td>3</td>
<td>East,West,North-2</td>
<td>3 OR 2</td>
<td>A,B</td>
</tr>
</tbody>
</table>

- South and North-1 zones form one cluster
- East, West and North-2 forms another cluster
- North-East becomes isolated.

4.3 Data Mining Methods

In R(Rattle GUI) all methods are available and Dendogram are also available with defined height. These heights are numeric nature only.

Figure 25: Shows HC for NAAC-Universities with Euclidian and Centroid method with height 9.5

Table 11: Shows HC for all combinations of values for NAAC-Universities.

<table>
<thead>
<tr>
<th>60</th>
<th>27</th>
<th>10</th>
<th>22</th>
<th>18</th>
<th>8.5</th>
<th>9.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>22</td>
<td>8.5</td>
<td>13</td>
<td>13</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>90</td>
<td>50</td>
<td>18</td>
<td>22</td>
<td>28</td>
<td>16</td>
<td>1.8</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.5</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.85</td>
<td>0.875</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 12: Shows HC of HC all combinations of values for NAAC-Values

<table>
<thead>
<tr>
<th>65</th>
<th>55</th>
<th>45</th>
<th>50</th>
<th>50</th>
<th>45</th>
<th>45</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>48</td>
<td>38</td>
<td>45</td>
<td>45</td>
<td>40</td>
<td>38</td>
</tr>
<tr>
<td>150</td>
<td>122</td>
<td>100</td>
<td>105</td>
<td>110</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>8.5</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>5.85</td>
<td>5.85</td>
</tr>
<tr>
<td>1.25</td>
<td>0.8</td>
<td>0.8</td>
<td>0.755</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>0.75</td>
<td>0.8</td>
<td>0.5</td>
<td>0.7</td>
<td>0.65</td>
<td>0.58</td>
<td>0.60</td>
</tr>
<tr>
<td>1.05</td>
<td>1.3</td>
<td>0.6</td>
<td>0.85</td>
<td>0.75</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>160</td>
<td>150</td>
<td>84</td>
<td>120</td>
<td>105</td>
<td>82</td>
<td>82</td>
</tr>
</tbody>
</table>

- Table-11 shows a lot of value are equal to zero
- Table-11 values have a scope of infeasible values
- Table-12 shows all values are >0 as HC of HC(Hierarchical Clustering)
- So Table-12 is feasible table may and may or may not optimum solution.

5. Conclusion

Grade-B is common to all and we can do final clustering on Grade-B only which are available maximum in all states. On average basis the above table holds good but not on an individual basis. For example in some states there is no Grade-B Universities are available e.g. Tripura, Jammu and Kashmir etc. But with 1D we cannot construct any mathematical form so 2D is the very reliable form and 3D is more complex also. So we can consider 2D as follows. Grade-A AND Grade-B Bi-cluster OR Grade-B AND Grade-C Bi-Cluster is valid clusters. Practically Grade-A AND Grade-B Bi-cluster is more superior to Grade-B AND Grade-C Bi-cluster. North-East remains as a single cluster without Grade-A Universities which results the less chances of satisfying the e-Learning nodes criteria. We are expecting that Grade-A and Grade-B Universities have more infrastructure and resources than Grade-C Universities. In terms of curve fitting Grade-B AND Grade-C holds good. But practically this is not an optimum solution. Mathematics Grade-A approaches to imaginary values i.e. negative roots which give contradiction to real world application. From North-East region the authors assume that either Nagaland or Tripura for getting the feasible solution. The Nagaland and Tripura give all x1, x2 and x3 are zero and means that no solution (Refer Table-3 and Table-4). The authors find out the Hierarchical clustering for aim is getting with clusters of clusters. For more details refer Table-13 and Table-14. The authors find out that the e-Learning nodes estimation for NAAC-Universities gives feasible solution only and it is supported by Gini Index is >0.5 (Gini Index is considerably larger).

References


AUTHORS

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