Evaluating Web Presence of Technological Institutions in India: a webometrics analysis

Dr. Sonali Dapsi

Librarian, Raja Peary Mohan College, West Bengal

Abstract

The article attempts to study the websites of thirty-five selected technological institutes in India for inclusion in the NIRF (National Institutional Ranking Framework) 2022 ranking based on their online impact factor, fostering effective education and community development through enhanced utilisation of diverse teaching sectors in India. Web Impact Factors (WIF) are calculated and links are analysed using tools in this webometric research. Different search engines a vital part in collecting data in the webometric study were used for collecting data from July 18 to July 30, 2022. Data were collected using Google's search engine based on advanced query syntax for the approximate number of various link pages from the websites of selected technical institutions. The major finding is that in the self-link web impact factor IIT Madras occupies the first place with 76200 self-link pages and 134000 webpages with 0.568657 SWIF (Simple Web Impact Factor) followed by Sathyabama Institute of Science and Technology (sl. no. 31).This study involves quantitative data analysis of 35 technological institutes in India. This study serves as a valuable tool for library professionals, aiding them in assessing and leveraging online impact factors of various technological institutes for improved library services.

Keywords: Higher education, NIRF ranking, Technological institute, Web indicator, Webometric study

1. Introduction

Webometrics, as a field of study, encompasses the quantitative analysis of web-related data, evaluating different aspects of websites and online presence. It involves examining parameters like the number of external links (in-links) to a website, its size measured by the number of webpages, visibility in search engine results, and various metrics to gauge impact, influence, and online visibility. This methodology is frequently employed to rank and compare the performance of academic institutions, especially universities and research centers, by assessing the presence and impact of their web content.

This term first came in 1997 by Almind and Ingwersenand the link analysis came in 1998 by Peter Ingwersen. Web impact factor is the web version impact factor. Web impact factor is inaugurated by ISI, Philadelphia. (Kunosic,2019). Comparing the previous literature review, it is evident that webometrics studies various website information and their web search indicators. Presently, we aim to derive insights from website analysis and web impact factors across various technological institutes. Hence, the study emphasises quantitative techniques and diverse link analyses of websites belonging to different technological institutions.

2. Literature review

Webometrics involves quantitatively

assessing a website's effectiveness and efficacy analysis of links. This study specifically focused on conducting webometric analysis on the websites of the top ten oldest NITs (Chakraborty, 2003). Webometrics link analysis of NAAC Accredited degree college in West Bengal was shown by Ghosh and Roy (2019).The Literature reviews of this study indicated the main focus on web indicators of the ranking sector of higher education (Jalal and Biswas,2009).The current research seeks to comprehensively evaluate the impact and visibility of IIT websites through a webometric approach and to demonstrate their impact rate and visibility, utilising metrics like Web Impact Factor, in-links, and Web Indicators for Science, Technology, and Innovation Research (Prakash,2012). Hanuskodi (2012)indicated the webometrics analysis of national level institutes like NIT, IIT, etc. Ranking of National Institutes of Technology (NITs) of the northeast region of India was also done based on web impact factor (Verma and Brahma, 2017). Tunga (2021) also focused on the national-level institute website rankings, assessing various links and features for their evaluation. The entirety of this study entails conducting an analytical examination of web indicators utilising web-based platforms.

3. Significance of the study

Comparing the previous literature review, it is evident that webometrics studies various website information and their web search indicators. Presently, we aim to derive insights from website analysis and web impact factors across various technological institutes. Hence, the study emphasises quantitative techniques and diverse link analyses of websites belonging to different technological institutions.

4. Objectives of the present study

This article is to critically investigate the following objectives:

i. To find out various types of links and explore the web presence of 35 selected technological institutions

ii. To calculate web impact factors of the websites of selected technological institutions

iii. To visualise link page mapping among the technological institutions in India by using the tool SocSciBot4 (http://socscibot.wlv.ac.uk/)

5. Methodology

This analytical study is restricted to 35 technical institutes in India that are ranked nationally in 2022 according to the NIRF based on their online impact factor, fostering effective education and community development through enhanced utilisation of diverse teaching sectors in India. Web Impact Factors are calculated and links are analysed using tools in this webometric research. Different search engines a vital part in collecting data in the webometric study were used during July18 to July30, 2022. Data were collected using Google's search engine based on advanced query syntax for the approximate number of various link pages from the websites of selected technical institutions as follows:

5.1 *Data collection through searching*

For each of the websites of 35 technical institutions the following search queries or syntax used to collect data are under:

- site: URL-this will extract the total number of webpages to the websites under the URL.
- domain: URL- this will extract the total number of webpages to the websites under the URL
- link domain: URL- this will retrieve

the total number of webpages linking to the websites i.e. hyperlink pages.

- link: URL AND site:URL-it will provide a complete report of several webpages under the websites that provide links from the same websites i.e. Self-Link pages.
- link: URLAND NOT site: URL - it will provide a complete report of several webpages not under the websites which provide links from the other websites i.e. External-Link pages.
- link: URLNOT site: URL - it will provide a complete report of a number of links incoming from other websites.

5.2 *Calculation of Web Impact Factors (WIF)*

Most of the webometric study is based on the web impact factors (WIFs) of either simple WIF (WIFs) or revised WIF (WIFs).

5.3 *The calculation of WIF is as follows*

1. Simple WIF = Total number of link webpages (LWP)

   (SWIF) = Total number of webpages (NWP)

2. Self-link WIF = Total number self-link webpages

   (SLWIF) = Total number of webpages (NWP)

3. External-link WIF = Total number of external-link webpages

   (ELWIF) = Total number of webpages (NWP)

4. In Link/Revised WIF = Total number of in-link webpages

   (ILWIF/RWIF) = Total number of webpages (NWP)

Where A = Total number of webpages of a given site; B = Total number of external back links to a given site; C = Total number of self-link of a given site; D = Total number of links to a given site.

6. Data analysis and interpretation

6.1 *WIF for each NITs and IITs in India*

WIF for each NITs and IITs in India has been calculated based on the formula which is given in section 5.3 in four different ways. These are Simple WIF i.e. a ratio of the number of total link pages and the number of webpages; Self-link WIF which denotes a ratio of the number of total self-link pages and the number of webpages; External link WIF is a ratio of the number of total external link pages and number of webpages; Revised link WIF is a ratio of number of totals in-link pages and number of webpages which reflex of the degree of impact of the domain spaces on the WWW. A matrix may represent the calculation of WIF of different web spaces in different levels shown in table 1.

Table 1: Link analysis and web impact factor of NITs and IITs in India

Sl. No	Name	URL	WP	SIMP link	Self Link	Extl link	In link	SIM_WIF	SFLWIF	EXTL WIF	INL_WIF
1	Birla Institute of Tech & Sci.	bits-pilani.ac.in	37000	213000	13400	14000	2220	5.756757	0.362162	0.378378	0.06
2	Cochin University of Science and Tech	cusat.ac.in	99600	36300	4960	4870	3120	0.364458	0.049799	0.048896	0.031325
3	Dr. B R Ambedkar NIT, Jalandhar	nitj.ac.in	9860	12900	4390	4450	1320	1.308316	0.445233	0.451318	0.133874
4	IIT (Banaras Hindu University) Varanasi	iitbhu.ac.in	13400	46700	2120	2010	1040	3.485075	0.158209	0.15	0.077612
5	IIT (Indian School of Mines)	iitism.ac.in	10200	15200	2060	1800	899	1.490196	0.201961	0.176471	0.088137
6	IIT Bhubaneswar	iitbbs.ac.in	24300	48000	3860	4410	740	1.975309	0.158848	0.181481	0.030453
7	IIT Guwahati	iitg.ac.in	40800	86900	15400	17000	2370	2.129902	0.377451	0.416667	0.058088
8	IIT Hyderabad	iith.ac.in	33400	102000	4400	3570	2350	3.053892	0.131737	0.106886	0.070359
9	IIT Indore	iiti.ac.in	27300	1650000	3680	3160	2010	60.43956	0.134799	0.115751	0.073626
10	IIT Kanpur	iitk.ac.in	450000	169000	60300	64100	24200	0.375556	0.134	0.142444	0.053778
11	IIT Madras	iitm.ac.in	134000	99100	76200	59700	17100	0.739552	0.568657	0.445522	0.127612
12	IIT Ropar	iitrpr.ac.in	24700	53900	3410	2930	847	2.182186	0.138057	0.118623	0.034291
13	IIT, Bombay	iitb.ac.in	211000	8	51000	47800	17300	3.79E-05	0.241706	0.22654	0.081991
14	IIT, Delhi	iitd.ac.in	129000	62600	35200	38800	10600	0.485271	0.272868	0.300775	0.082171
15	IIT, Gandhinagar	iitrpr.ac.in	24700	53900	3410	2930	847	2.182186	0.138057	0.118623	0.034291
16	IIT, Kharagpur	iitkgp.ac.in	154000	199000	12700	10900	6110	1.292208	0.082468	0.070779	0.039675
17	IIT, Mandi	iitmandi.ac.in	27100	14300	4840	5650	2090	0.527675	0.178598	0.208487	0.077122
18	IIT, Patna	iitp.ac.in	11,400	41500	3140	3640	1060	3.640351	0.275439	0.319298	0.092982
19	IIT, Roorkee	iitr.ac.in	77300	151000	6470	6420	2200	1.953428	0.0837	0.083053	0.028461
20	Indian Inst of Engi Sci and Tech, Shibpur	iiests.ac.in	16300	15900	1790	1780	487	0.97546	0.109816	0.109202	0.029877
21	Institute of Chemical Technology	ictmumbai.edu.in	2,300	11000	933	798	240	4.782609	0.405652	0.346957	0.104348
22	Kalinga Institute of Industrial Technology	kiit.ac.in	25000	98300	4510	3980	1220	3.932	0.1804	0.1592	0.0488
23	Malaviya NIT	mnit.ac.in	10100	26000	2240	2150	1100	2.574257	0.221782	0.212871	0.108911
24	NIT Durgapur	nitdgp.ac.in	6,760	8600	941	1090	690	1.272189	0.139201	0.161243	0.102071
25	NIT Karnataka, Surathkal	nitk.ac.in	86000	45200	7620	8200	2970	0.525581	0.088605	0.095349	0.034535
26	NIT Rourkela	nitrkl.ac.in	68,600	13100	12900	13000	6440	0.190962	0.188047	0.189504	0.093878
27	NIT Warangal	nitw.ac.in	8470	71500	2380	2410	898	8.441558	0.280992	0.284534	0.106021
28	NIT, Silchar	nits.ac.in	4800	1490000	1260	879	332	310.4167	0.2625	0.183125	0.069167
29	NIT, Tiruchirappalli	nitt.edu	20200	204000	8530	8220	1640	10.09901	0.422277	0.406931	0.081188
30	S.R.M. Inst. of Science and Technology	srmist.edu.in	52,900	16200	9390	8450	1970	0.306238	0.177505	0.159735	0.03724
31	Sathyabama Institute of Sci.e and Technology	sathyabama.ac.in	3,880	25500	2130	2410	1240	6.572165	0.548969	0.621134	0.319588
32	Shanmugha Arts Science Tech.& Research Academy	sastra.edu	30700	509000	1980	2150	462	16.5798	0.064495	0.070033	0.015049
33	Thapar Institute of Engineering and Technology	thapar.edu	41700	295000	4190	4190	738	7.074341	0.10048	0.10048	0.017698
34	Vellore Institute of Technology	chennai.vit.ac.in	4320	368000	1180	1100	261	85.18519	0.273148	0.25463	0.060417
35	Visvesvaraya NIT, Nagpur	vnit.ac.in	19800	22100	6010	5100	4600	1.116162	0.303535	0.257576	0.232323

Note: NWP=No. of Web Page, WP=Webpage SL=Simple Link, SEL=Self Link, EL=External link, IN-LWP =In-Link, SIM IF =Simple Impact Factor,SEL IF =Self Link Impact Factor, EL IF= External link Impact Factor, IN-L IF= In-Link Impact Factor

Table 1 shows the link analyses and WIF of selected NITs and IITs from around India.

With 310.4167% SWIF, NIT, Silchar (Sl. no. 28) holds the top position. Vellore Institute of Technology (Sl. no. 34) and IIT Indore (Sl. no. 09) are conferred the second and third places, respectively.

IIT Kanpur (sl. no. 10), IIT Bombay (sl. no. 13), and IIT Kharagpur (sl. no. 16) have more webpages than the three Technical Institutes of India, but they are placed 31st, 35th, and 23rd, respectively, based on their SWIF since they have less simple link pages than other IITs. IIT Madras (sl. no. 11) holds the top position in the self-link web impact factor with 76200 self-link pages and 134000 webpages with a SWIF of 0.568657.With SWIFs of 0.548969% and 0.445233%, Sathyabama Institute of Science and Technology (sl. no. 31) and Dr. B R Ambedkar NIT, Jalandhar (sl. no. 3) are positioned second and third, respectively. Although IIT Kanpur (Sl. no. 10), IIT Bombay (sl. no. 13), IIT Kharagpur (sl. no. 16), and IIT Delhi (sl. no. 14) have more webpages than any other accredited college. They still occupy the 27th, 14th, 33rd, and 12th positions in the ranking, respectively, because their number of link pages is much lower than that of their webpages. According to the External Link Web Impact Factor (ELWIF) ranking among technical institutes in India, Sathyabama Institute of Science and Technology (sl. no. 31) is in first position with 3880 webpages, 2410 link pages, and an ELWIF of 0.621134%.

The EWIF placed the Dr. B. R. Ambedkar NIT, Jalandhar (sl. no.3), IIT Madras (sl. no. 11), and IIT Guwahati (sl. 7) in the second, third, and fourth positions, respectively, with scores of 0.451318, 0.445522, and 0.416667, respectively.

Revised or In-link web impact factor of the 35 Technical institutions of India which has been calculated by putting the following formula i.e. In-link or Revised Web Impact Factor=E/A Where E=Internal Link webpage and A=Number of webpage. Sathyabama Institute of Science and Technology(sl.no.31) again ranked first position with 3880 Webpages and 1240 in-link webpages and 0.319588 RWIF; followed by Visvesvaraya NIT, Nagpur (sl. no. 35) with 19800 webpages and 4600In Link webpages and 0.232323 RWIF. Dr. B R Ambedkar NIT, Jalandhar (sl. no. 3) occupied 3rd position with 0.133874% in-link impact factor. Though IIT Kanpur (sl. no. 10) and IIT, Bombay (sl. no. 13) having maximum number of In Link Pages (i.e. 24200&17300) compared to all technical institutions of India they stood at 23rd and 13th position due to their less impact factor.

6.2 *Top five out links per page for NITs and IITs in India*

It will provide a complete report of a number of pages, out links of top five institute of India.

Table 2: Top five out links per page for NITs and IITs in India

Site	Pages	Out links	Out links Per Page
bits-pilani.ac.in/	1	0	0
chennai.vit.ac.in/	1	1	1
cusat.ac.in/	1	1	1
home.iitd.ac.in/	1	1	1
ictmumbai.edu.in/	1	1	1
iiests.ac.in/	0	0	0
iitb.ac.in/	1	1	1
iitbbs.ac.in/	0	0	0
iitbhu.ac.in/	1	1	1
iitg.ac.in/	1	1	1
iith.ac.in/	56	3020	53.92857
iiti.ac.in/	1	1	1
iitism.ac.in/	0	0	0
iitk.ac.in/	350	66727	190.6486
iitm.ac.in/	0	0	0
iitmandi.ac.in/	1	1	1
iitp.ac.in/	0	0	0
iitr.ac.in/	1	1	1
iitrpr.ac.in/	1	1	1
iitrpr.ac.in/	1	1	1
kiit.ac.in/	1	1	1
mnit.ac.in/	1	1	1
nitdgp.ac.in/	1	1	1
nitj.ac.in/	2	12	6
nitk.ac.in/	1	1	1
nitrkl.ac.in/	1	1	1
nits.ac.in/	211	18389	87.15166
nitt.edu/	2	181	90.5
nitw.ac.in/	89	90	1.011236
sastra.edu/	1	0	0
sathyabama.ac.in/	1	1	1
srmist.edu.in	1	1	1
thapar.edu/	2	122	61
vnit.ac.in/	0	0	0
.iitkgp.ac.in/	1	0	0

The above table reflects Indian Institute of Technology, Kanpur and National Institute of Technology, Tiruchirappalli (nitt.edu) is having the highest number of outlines as well as outlines per page (190.6486 and 90.5) followed by National Institute of Technology, Silchar (87.151) and The Thapar Institute of Engineering and Technology (61).

6.3 *ADM and link analysis for NITs and IITs of India*

Academic purposes of web spiders extensively scan each webpage within the prescribed limitations (Jalal et al., 2010). The ADM technique is suggested by Mike Thelwall to collect data without bias (Ghosh, 2021).

Table 3: ADM count summary of NITs and IITs in India

URL of NITs & IITs	Page in links	Directory in links	Domain in links	Site in links	Page out links	Directory out links	Domain out links	Site out links
iitm.ac.in/	354	12	8	1	0	0	0	0
iitb.ac.in/	0	0	0	0	0	0	0	0
home.iitd.ac.in/	0	0	0	0	0	0	0	0
iitk.ac.in/	0	0	0	0	534	21	15	3
iitkgp.ac.in/	181	10	8	2	0	0	0	0
iitr.ac.in/	0	0	0	0	0	0	0	0
iitg.ac.in/	1	1	1	1	0	0	0	0
iith.ac.in/	0	0	0	0	0	0	0	0
chennai.vit.ac.in/	0	0	0	0	0	0	0	0
nitt.edu/	0	0	0	0	0	0	0	0
nitk.ac.in/	0	0	0	0	0	0	0	0
ictmumbai.edu.in	0	0	0	0	0	0	0	0
iitbhu.ac.in/	0	0	0	0	0	0	0	0
iiti.ac.in/	0	0	0	0	0	0	0	0
bits-pilani.ac.in/	0	0	0	0	0	0	0	0
kiit.ac.in/	0	0	0	0	0	0	0	0
iitrpr.ac.in/	0	0	0	0	0	0	0	0
srmist.edu.in	0	0	0	0	0	0	0	0
iitrpr.ac.in/	0	0	0	0	0	0	0	0
iitism.ac.in/	0	0	0	0	0	0	0	0
nitrkl.ac.in/	0	0	0	0	0	0	0	0
iitmandi.ac.in/	0	0	0	0	0	0	0	0
nitw.ac.in/	0	0	0	0	0	0	0	0
sastra.edu/	0	0	0	0	0	0	0	0
thapar.edu/	0	0	0	0	0	0	0	0
iitp.ac.in/	0	0	0	0	0	0	0	0
iitbbs.ac.in/	0	0	0	0	0	0	0	0
iiests.ac.in/	0	0	0	0	0	0	0	0
sathyabama.ac.in	0	0	0	0	0	0	0	0
vnit.ac.in/	0	0	0	0	0	0	0	0
cusat.ac.in/	0	0	0	0	0	0	0	0
nitdgp.ac.in/	0	0	0	0	0	0	0	0
nits.ac.in/	0	0	0	0	105	48	5	2
nitj.ac.in/	0	0	0	0	0	0	0	0
mnit.ac.in/	103	46	3	1	0	0	0	0

The ADM counts for the Indian IITs and NITs are mentioned in table 3. The details in the table are extracted using SocSciBot 4. It has been found from the above figure that there is an inter-relationship among Indian IITs and NITs.

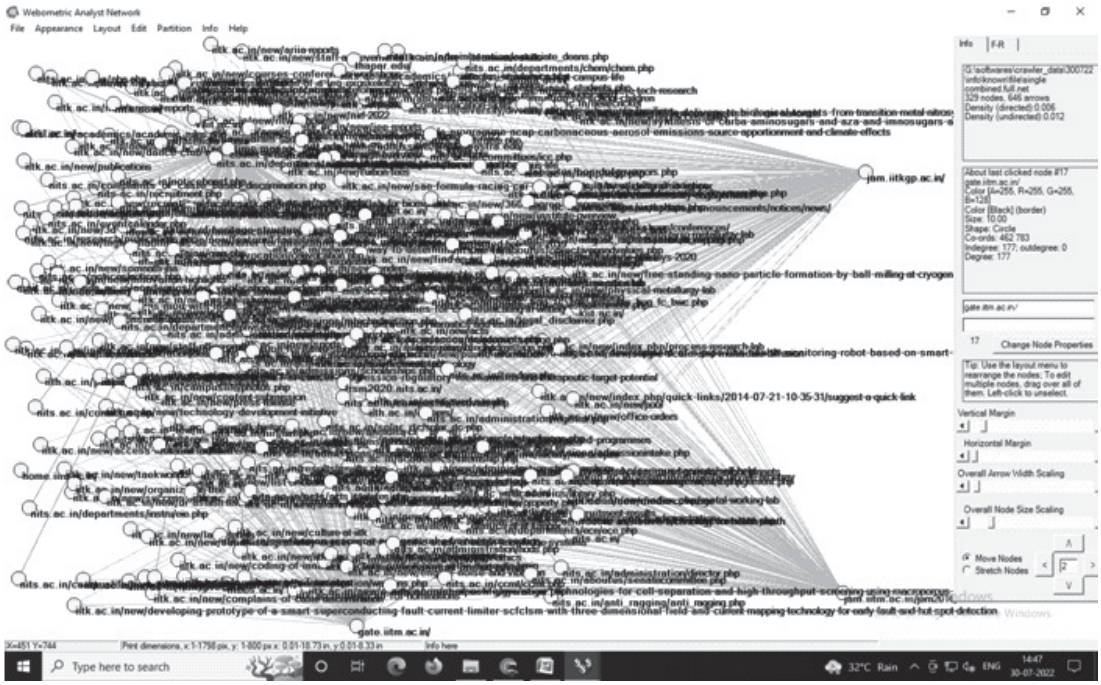

Figure 1: Link topology for NITs and IITs in India

7. Major findings

- In the self-link web impact factor IIT Madras occupies the first place with 76200 self-link pages and 134000 webpages with 0.568657 SWIF followed by Sathyabama Institute of Science and Technology (sl. no. 31), and Dr. B R Ambedkar NIT, Jalandhar are ranked 2nd and 3rd place with SWIF of 0.548969% and 0.445233% respectively.
- Sathyabama Institute of Science and Technology (sl. no. 31) occupies the first place with 0.621134% ELWIF followed by Dr. B R Ambedkar NIT, Jalandhar (sl. no. 3) and IIT Madras (sl. no. 11), and IIT Guwahati (sl. no. 7). Sathyabama Institute of Science and Technology (sl. no. 31) again ranked first position with 3880 webpages and 1240 in-link webpages and 0.319588 RWIF; followed by Visvesvaraya NIT, Nagpur (sl. no. 35) with 19800 webpages and 4600 InLink webpages and 0.232323 RWIF.
- Table 2 reflects Indian Institute of Technology, Kanpur occupies the first position followed by National Institute of Technology; Tiruchirappalli (nitt.edu) with the highest number of outlinks as well as out links per page (190.6486 & 90.5). National Institute of Technology, Silchar ranked third position with (87.151). The figure1 has shown Link topology of NITs and IITs in India.

8. Conclusion

The article on Webometrics represents all ranking categories in India according to the National Institute Ranking Framework, 2022. However, this study doesn't encompass every

institute included in the ranking framework, leaving out certain institutions. This study serves as a valuable tool for library professionals, aiding them in assessing and leveraging online impact factors of various technological institutes for improved library services. Therefore, future researchers are encouraged to complete the assessment of the remaining categories and institutes within the ranking parameters.

References

Chakraborty, I., & Thakuria, A. (2023). Relative evaluation of the quantitative aspects of the websites of the top ten oldest National Institute of Technology (NITs) in India through the application of webometric parameters. *Journal of Information and Knowledge,* 60(5),321-327. Retrieved from https://ln.run/ql_qphttps://doi.org/10.17821/srels/2023/v60i5/171140

Ghosh, S., & Roy, B. K. (2021). Web-based ranking and link analysis of naac accredited general degree colleges in West Bengal: a webometric study. *Journal of Information and Knowledge,* 58(6), 393-407. Retrieved from https://ln.run/5I8uPDOI:10.17821/srels/2021/v58i6/167114

Jalal, S. K. (2019). Exploring web link analysis of websites of Indian Institute of Technology. *DESIDOC Journal of Library & Information Technology,* 39(1),3-9. Retrieved from https://ln.run/5I8uP, DOI:10.14429/djlit.39. 1.13692

Kunosic, S., Ceke, D., & Zerem, E. (2019). Advantages and disadvantages of the webometrics ranking system. In *Scientometrics Recent Advances.* Intech Open. Retrieved from https://ln.run/5I8uP DOI:10.5772/intechopen87207.

Prakash, M. S. (2012). Websites of Indian Institutes of Technology: a webometric study (Doctoral dissertation, University of Delhi, Delhi, India). Retrieved from https://ln.run/_O8rW

Ratha, B., Joshi, L., & Naidu, G. H. S. (2012). Webometric study of IIT libraries websites. *DESIDOC Journal of Library & Information Technology,* 32(3), 249-254.

Thanuskodi, S. (2012). A webometric analysis of selected institutes of national importance websites in India. *International Journal of Library Science,* 1(1), 13-18. Retrieved from https://ln.run/_O8rW DOI: https://ln.run/_O8rW10.5923/j.library.20120101.03

Tunga, S. K. (2021). Content analysis of library websites of national institutes in West Bengal, India: an evaluative study. *Library Philosophy and Practice,* 5120. Retrieved from https://ln.run/SKVJe

Verma, M. K., & Brahma, K. (2017). Ranking of National Institutes of Technology (NITs) of northeast region of India on the basis of web impact factor. *COLLNET Journal of Scientometrics and Information Management,* 11(2), 235-248. Retrieved from https://ln.run/HoM9L