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# Mapping the Scholarly publications of Central University of Gujarat

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### Abstract:

The study attempts to analyze research publications of Central University of Gujarat (CUG) during the period of 2010 - 2020. The bibliographic data for this study was extracted from the Scopus database. This paper analyses 771 research papers published by Central University of Gujarat during the period under the study. The study examine the year-wise research publications, authorship pattern, degree of collaboration, types of document, preferred journals for publication, prolific author, h-index, most collaborating institutions and countries etc. Additionally, in this research paper different software used e.g. 'MS-Excel', 'bibliometrix' & 'biblioshiny' of R-Package, VOSviewer applied for the analysis and data visualizations. The research findings indicate that the growth of literature pattern is linear, and journals articles (561) are the most preferred form of publications by the researchers to communicate their research. Degree of Collaboration (DC) 0.728 indicates that the most research work jointly carried out by research scholars of Central University of Gujarat (CUG). Singh M. is found to be the most prolific author and the Journal of Molecular Liquids is the most preferred Journal. The top 10 most cited publications were used from that only one paper was two-authored and received highest 439 citations found and other 9 research papers were shown multiple-authored. In Jawaharlal Nehru University (60) and Banasthali Vidyapith (39) were the leading collaborating Institutions. The USA, Australia, South Africa, UK, and Canada were the top five most collaborative countries. The subject Chemistry was most prominent research area during the study period. The CUG has to make more effort to promote research and develop quality culture, attention of developing better policies to enhance and enrich the research performance.

**Keyword:** Central University of Gujarat (CUG), Scientometric, Bibliometric, Scholarly publications, Degree of Collaboration.

### Introduction:

The purpose of this study is to analyze the role of research and development in recent knowledge world. Now in India, the Ministry of Human Resource Development introduced ranking system and one of the parameters based on the research performance of the University and the Institute. This research includes journal articles, artifacts, books, review articles, patents, etc. One of the measures used to evaluate academic institutions' performance

is their research publications. Therefore, important to analysis and understand the research output of an institute and a discipline. This study evaluates the Central University of Gujarat (CUG) research work listed in Scopus database. CUG established by Parliament of India through the Central Universities Act (2009), Central University of Gujarat (CUG) considers its main objectives to be dissemination and advancement of knowledge creation and sharing. The Central University of Gujarat was ranked overall 60th in India and 2nd among all the Universities in Gujarat in NIRF 2016 rankings. According to NIRF 2017, the Central University of Gujarat ranked among the top 150 Universities in the country. That's why the institution must priorities research and innovation in order to maintain its top position.

Scientometrics is the field of study which concerns with measuring and analyzing scholarly literature. Scientometrics is a sub-field of bibliometrics. The Bibliometrics and Scientometrics both are measuring the scholarly publications with the use of different tools and techniques. By statistical analysis of bibliographies, bibliometric and scientometric techniques are used to analyse and examine research work i.e. Impact of research papers, journal, citations, discipline, institutional affiliation, country collaboration etc.

This article presents a study of detailed analysis of the research output of Central University of Gujarat published during 2010-2020 with the use of bibliometric and scientometric tools and techniques. An attempt has been made to examine year wise publication, average citations per papers, authorship patterns, degree of collaboration, H index, most prominent research areas, most prolific authors, academician's contribution in most popular journals, international collaboration and highly cited papers.

### **Review of related Literature:**

Literature review is a part of educational and academic writing representing knowledge and sympathetic understanding of the academic literature on a definite topic placed in context. It is also comprises an acute evaluation of the material. It is a inclusive summary of prior research on a selected topic and reviews scholarly articles, books, and other resources relevant to a specific area of study (<https://guides.library.bloomu.edu/litreview>) (<https://www.ed.ac.uk/institute-academic-development/study-hub/learning-resources/literature-review>)

**Ivancheva, L. (2013)** Discussed the methodological overview of scientometrics. Study described Scope of research, research instruments, empirical basis and explanatory abilities of the scientometric approach. Researcher explained that Classification of the scientometric methods, methodological peculiarities, limitations, and problems of scientometric, Evolution of the scientometric approach.

**Piryani, R.; Madhavi, D. & Singh, V.K. (2017)** analyzed opinion mining and sentiment analysis(OMSA) research. They have collected the data from Web of Science (WoS) database during 2000–2015. The study revealed year-wise publication pattern, rate of growth of publications, types of authorship of papers on OMSA, collaboration patterns in publications on OMSA, most productive countries, institutions, journals and authors, citation

patterns and an year-wise citation reference network, and theme density plots and key- word bursts in OMSA publications during the period. The Study observed that the Chinese Academy of Sciences has the highest number of research papers with its affiliation, Cambria Erik was most productive authors, China has occupied first place in this rating with 145 publications.

**Pradhan, B.; Mahapatra, R. (2018)** evaluated the research output of Utkal University during 2008-2017. They retrieved 1091 publication's bibliographic data extracted from Scopus. They studied year wise contribution of research work, preferred document types of publications, ten most productive authors, subject wise contributions, most productive authors, preferred collaborating institution/country and most productive journals of the Utkal University. The study found that most productive author in terms of publication is N.C. Mishra (59). Researcher observed that Utkal University researchers have highest publications published in the subject of Physics, highest collaboration with USA followed by Italy.

**Pradhana, B et al. (2020)** carried out a study Scientometric Assessment of the Research Output of the Sambalpur University during 1990-2019 based on indexed in Scopus database, to find out the total publication output, its growth rate, quality of papers published, global ranking, national and international levels of collaborative papers share, citation impacts etc. Researcher analyzed 1527 publications with 15,440 citations (ACPP 9.88%). The study shows the collaborative research work there was DC as 0.95 and the CC as 0.62 during said study period. The United States and Japan are the two countries that made significant research collaborations with Sambalpur University. They suggested that the study will direct authoritatively, policy makers, funding agencies and the researcher's new pathways towards increase of research and development activities thereby enhancing the research output through quality publications.

**Chaudhary, A.; Mandalia, S.; and Parmar, A. (2021)** presented authorship patterns and growth of Public health foundation of India in Public Health research. They examined 1941 records of publications authored by 12523 authors during the period 2011– 2020 derived from SCOPUS database. They analyzed various bibliometric parameters i.e. Authorship pattern, RGR, Dt, CAI, DC, Bradford's Law of distributions etc with the use of different tools like MS-Excel, 'biblioshiny' of R-Package software and VOSviewer software. The evaluation figured out Average yearly contribution 194 research however accounted Mean RGR(P) '0.34'; Mean Dt (P) '2.74 reveals inconsistent growth of research output.

### **Objectives:**

The main objectives of the study are as under;

- To analysis the year wise growth rate of the publications
- To analysis the document wise publication
- To find out the most prolific authors of the publications.
- To identify the geographical distribution of the publication.
- To analyze the country wise collaborative publication
- To explore the International collaboration

- To explore top 10 highly cited papers

### Scope and Limitations of the study:

The scope of the present study is restricted to the publications of Central University of Gujarat during the publication period of 2010 to 2020 indexed in Scopus Database only. Researcher involved 771 research publications and it's received 7813 citations during above said period and evaluating various aspects such as year wise research, research area, citation, subject growth, Collaboration etc.

### Research Methodology:

The study retrieved and downloaded 11 year publication data of Central University of Gujarat from the SCOPUS database covering the period 2010 to 2020. While Searching the SCOPUS database with affiliation AF-ID ( "Central University of Gujarat" 60107668 ) AND ( LIMIT-TO ( PUBYEAR , 2020 ) OR LIMIT-TO ( PUBYEAR , 2019 ) OR LIMIT-TO ( PUBYEAR , 2018 ) OR LIMIT-TO ( PUBYEAR , 2017 ) OR LIMIT-TO ( PUBYEAR , 2016 ) OR LIMIT-TO ( PUBYEAR , 2015 ) OR LIMIT-TO ( PUBYEAR , 2014 ) OR LIMIT-TO ( PUBYEAR , 2013 ) OR LIMIT-TO ( PUBYEAR , 2012 ) OR LIMIT-TO ( PUBYEAR , 2011 ) OR LIMIT-TO ( PUBYEAR , 2010 ) ). In which produce the result of 771 publications and received 7813 citations basically affiliated with Central University of Gujarat in the period of 2010 to 2020 published by 874 authors by singularly or multi author work. All the bibliographic details of searched records exported in bibtex file and csv file for further analysis, and applied statistical analytic and graphical representative tools within the scope of this evaluation study. The “Bibliometrix”, R package used to perform various quantitative analyses on the extracted bibtex format file of Scopus for publications and citations data. The VOSviewer used for data visualizations.

### Data Analysis and Interpretation:

Data analysis is a process that involves examining the collected data for interpretation to determine significant information for propose conclusions to solve a selected research study. In this research paper the secondary data has been used for data analysis. The data analysis and interpretation as under;

### Year wise Publication growth and citation metrics:

Table I. Publication growth and citation metrics								
Year	No. of Publications	Annual Growth Rate (in %)	Cited articles	Non-cited articles	No. of citations received	Mean Total Citations per Article	Mean Total Citations per Year	Citable Years
2010	4	0	2	2	8	2.00	0.18	11
2011	6	50	5	1	98	16.33	1.63	10
2012	16	167	13	3	230	14.38	1.60	9

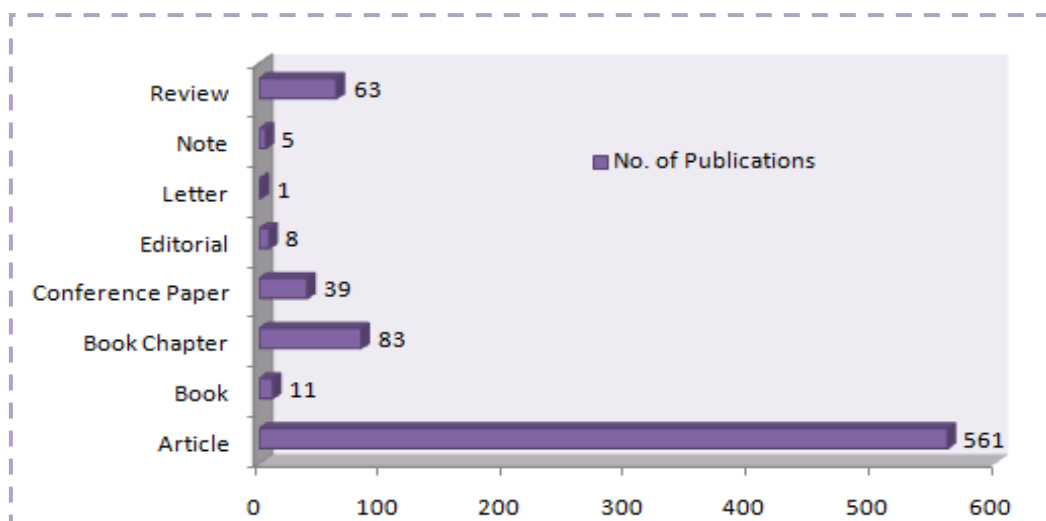
<b>2013</b>	42	163	33	9	777	18.50	2.31	8
<b>2014</b>	44	5	38	6	677	15.39	2.20	7
<b>2015</b>	53	20	44	9	631	11.91	1.98	6
<b>2016</b>	83	57	75	8	1528	18.41	3.68	5
<b>2017</b>	83	0	66	17	1100	13.25	3.31	4
<b>2018</b>	147	77	125	22	1294	8.80	2.93	3
<b>2019</b>	141	-4	122	19	924	6.55	3.28	2
<b>2020</b>	152	8	114	38	546	3.59	3.59	1
<b>Total</b>	<b>771</b>		<b>637</b>	<b>134</b>	<b>7813</b>			

A total number of 771 publications of Central University of Gujarat indexed in Scopus during the period of 2010-2020 was collected. The retrieved 771 publications had received 7813 citations. Table I depicts the Publication growth and citation metrics of CUG from the selected period of study. Researcher has calculated year-wise citation data, mean citation per article and mean citation per year, Annual growth rate (AGR). The publication output expanded from 4 in 2010 to 152 in 2020. It could be observed in results that the publications in 2013 were having highest average with 18.50 citations per publication followed by 2016 with 18.41 citations. The highest annual growth of 167% in publications has been noted in the year 2012. The overall year wise distribution of publication data shown in as Table I.

#### Document wise Analysis:

Table II and Fig. I illustrated the document wise distribution of publications of CUG during the period of 10 year i.e. (2010-2020). The maximum 561 (72.76 %) of publications were 'Article' type documents, followed by 'Book Chapter type document with 83 (10.77 %) of publications and 63 (8.17 %) of publication was 'Review' type documents.

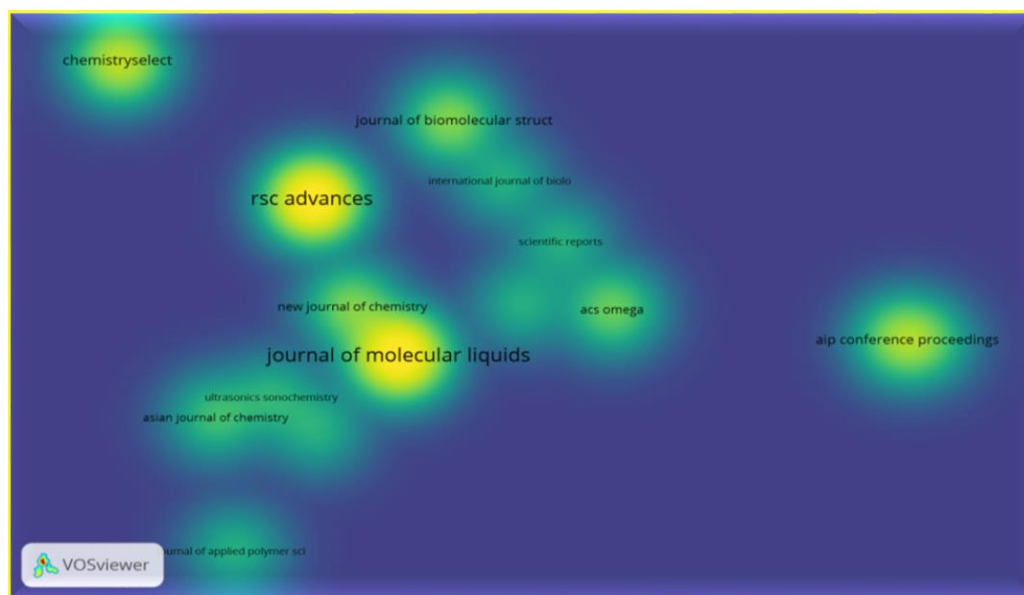
<b>DOCUMENT TYPES</b>	<b>No. of Publications</b>	<b>Percent</b>	<b>Total Citations</b>
<b>Article</b>	561	72.76	5741
<b>Book</b>	11	1.43	80
<b>Book Chapter</b>	83	10.77	159
<b>Conference Paper</b>	39	5.06	160
<b>Editorial</b>	8	1.04	20
<b>Letter</b>	1	0.13	0
<b>Note</b>	5	0.65	7
<b>Review</b>	63	8.17	1646
<b>Total</b>	<b>771</b>		<b>7813</b>



**Figure-I. Document wise Analysis**

**Most Preferred Publication Source:**

<b>Table III. Most preferred Publication Source</b>		
<b>Sources</b>	<b>No. of Publications</b>	<b>Percent</b>
Journal of Molecular Liquids	35	4.54
RSC Advances	35	4.54
Chemistryselect	18	2.33
Economic And Political Weekly	13	1.69
AIP Conference Proceedings	12	1.56
Journal of Biomolecular Structure And Dynamics	12	1.56
Materials Today: Proceedings	11	1.43
New Journal of Chemistry	11	1.43
ACS Omega	10	1.30
Functional Food And Human Health	9	1.17
Asian Journal of Chemistry	7	0.91
Free Radicals In Human Health And Disease	7	0.91
Pharmaceutical Applications Oo Dendrimers	7	0.91
Environmental Science And Pollution Research	6	0.78
5 papers each 8 publications	40	5.19
4 papers each 9 publications	36	4.67
3 papers each 29 publications	87	11.28
2 papers each 67 publications	134	17.38
Single paper publications	281	36.45
<b>Total</b>	<b>771</b>	

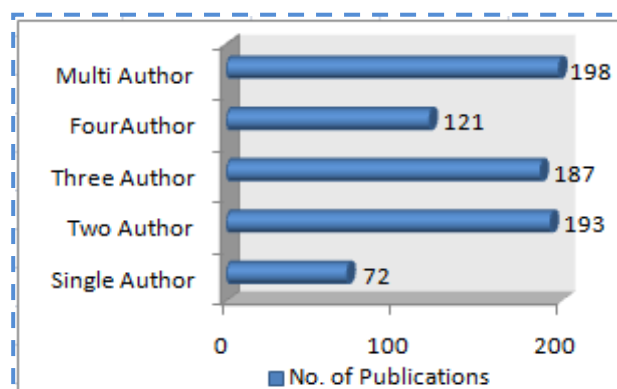


**Figure-II. Most preferred Publication Source**

Table III and Figure II shows that CUG researcher had published their various research papers in journals related with their research areas in the period of 2010-2020. It could be observed that University academicians have highest publications published in the Journal of Molecular Liquids. As shown in Fig. 6, in the density map some of the journal's font size was larger and the background color was more yellow than other journals, there are most productive journals. We can see that most productive journals includes Journal of Molecular Liquids with 35 publication contributed 4.54%, RSC Advances with 35 publications contributed 4.54% followed by Chemistryselect with 18 publications contributed 2.33% and others are seen in the table III and figure II.

#### Authorship Pattern:

Table IV. Authorship Pattern		
Authorship	No. of Publications	Productivity (%)
Single Author	72	9.34
Two Authors	193	25.03
Three	187	24.25
Four	121	15.69
Multi Authors	198	25.68
<b>Total</b>	<b>771</b>	



**Figure-III. Authorship Pattern**

Table IV and Figure III shows that the single authorship pattern has the least productive publications with 72 (9.34%) papers. Authorship pattern of CGU shows that the dominance of multi authors' work with 25.68% contributions with 198 publications followed by the two authors work with 193 publications contributed 25.03%.



### Degree of Collaborations:

The degree of collaboration in an area of scientometric studies, shows the trend in pattern of single and joint authorship work in the publication of CUG from 2010-2020, as shown in the table V. The degree of collaboration ranges from 0.75 to 1. In year 2011, 1.00 DC indicates the absence of solo work for said year. The average degree of collaboration is 0.869 during the period under study. To determine degree of collaboration in quantitative terms, the formula given by K. Subramanyam (1983) was used.

$$C = NM / NM+NS$$

Where C = Degree of collaboration

NM= Number of Multiple authors

NS = Number of Single authors

$$C = 561 / 561+72$$

In the present study the value of C = 0.728

As a result, the degree of collaboration is 0.728 which clearly indicates its dominance upon joint author contribution.

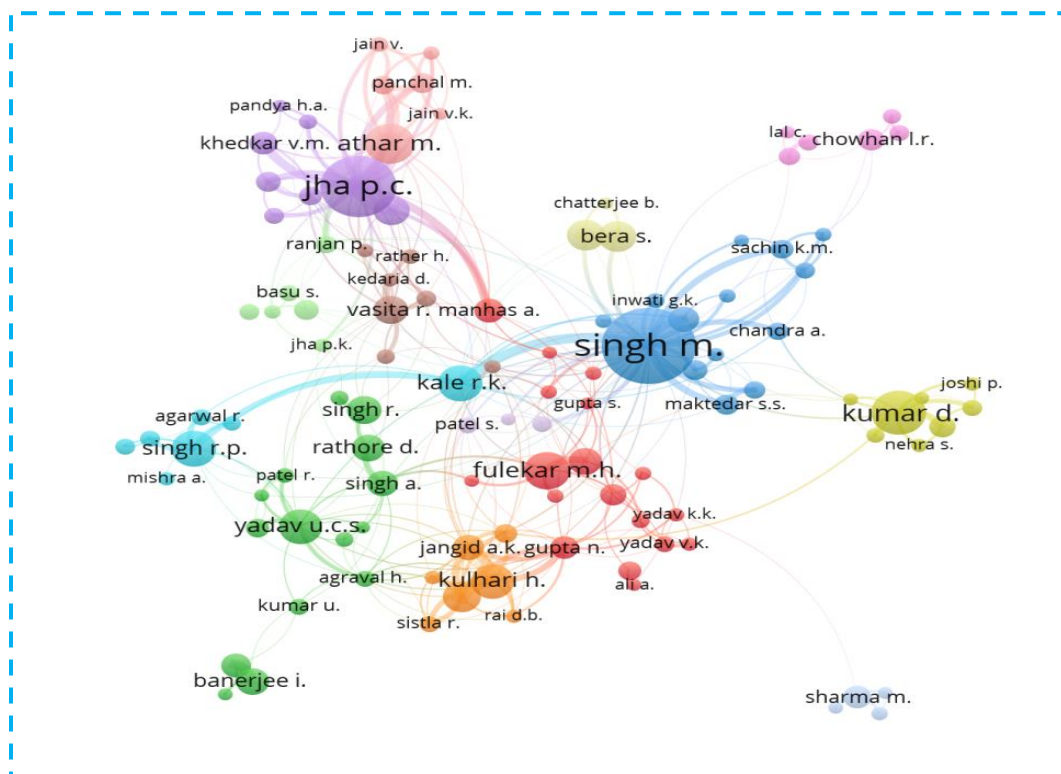
<b>Years</b>	<b>Single Author (Ns)</b>	<b>Multi Author (Nm)</b>	<b>Total No. of Author (Ns+Nm)</b>	<b>DC</b>
<b>2010</b>	1	3	4	0.750
<b>2011</b>	0	6	6	1.000
<b>2012</b>	6	10	16	0.625
<b>2013</b>	5	37	42	0.881
<b>2014</b>	8	36	44	0.818
<b>2015</b>	7	46	53	0.868
<b>2016</b>	8	75	83	0.904
<b>2017</b>	6	77	83	0.928
<b>2018</b>	10	137	147	0.932
<b>2019</b>	7	134	141	0.950
<b>2020</b>	14	138	152	0.908
<b>Total</b>	<b>72</b>	<b>561</b>	<b>771</b>	<b>0.728</b>

### Most Prolific Author:

Table VI shows the top 10 most productive authors the maximum 121 of publications were contributed by Singh, M., followed by Jha, P.C with 90 publication and Kumar, D. contributed 46 publication during the period of study. As per average citation per paper, Singh, R.P. was first rank with 40.22 followed by Yadav, U.C.S. with 38.03 and Kulhari, H. with 37.47. Figure IV shows that the most productive author under the study period. In this

map having many colours, which shows the variation of different authors. The large nodes are representing the most authoritative author. The connection between nodes revealing the association among the authors. The length between the nodes and the dimensions of the links represent the level of cooperation among authors.

<b>Table VI. Prolific Authors for CUG for period 2010-20</b>				
<b>Prolific Authors</b>	<b>No. of Publication</b>	<b>Citations</b>	<b>ACPP</b>	<b>H Index</b>
Singh, M.	122	1025	8.40	20
Jha, P.C.	90	784	8.71	16
Kumar, D.	46	1282	27.87	22
Athar, M.	41	242	5.90	11
Fulekar, M.H.	38	1028	27.05	19
Kale, R.K.	35	705	20.14	16
Singh, R.P.	35	1408	40.23	25
Yadav, U.C.S.	32	1217	38.03	17
Kulhari, H.	32	1199	37.47	23
Bera, S.	27	506	18.74	13



**Figure-IV. Most Prolific Authors and Co-authorship Network**

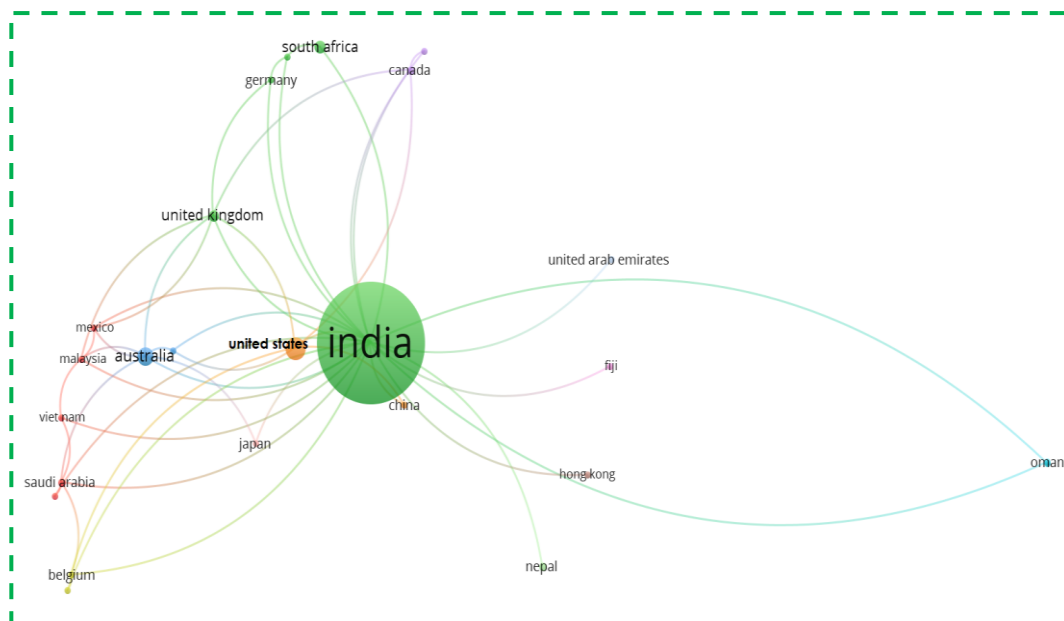
## Institutional Collaboration:

<b>Affiliation</b>	<b>No. of Papers</b>
Jawaharlal Nehru University	60
Banasthali Vidyapith	39
Gujarat University, Ahmedabad	30
Indian Institute of Chemical Technology	27
RMIT University	24
Vellore Institute of Technology	17
Central University of Punjab	17
National Chemical Laboratory India	13
The Maharaja Sayajirao University of Baroda	12
University of Delhi	12
Jaypee Institute of Information Technology	11
Indian Institute of Technology Gandhinagar	11
Ministry of Science And Technology, India	11
University of KwaZulu-Natal	10

The publications made by the researcher of Central University of Gujarat with other institutions were analyzed. It is inferred that have been Jawaharlal Nehru University have been contributed highest article 60 Banasthali Vidyapith comes to the second position contributing 39 articles, and Gujarat University, Ahmedabad in the third position 30 articles followed by Indian Institute of Chemical Technology 27 articles, RMIT University 24 articles. The overall data of the top most institution collaboration is as shown in Table VII.

## Geographical Contributions:

It's important to recognize that Indian authors have made significant contributions all over the world. The researchers of central universities have collaborated with foreign researchers across the globe. Figure V shows that the major collaborative research work by the Indian researchers covered under the study period. In this map having many colours, which shows the variation of different path of research. The large nodes are representing the most authoritative country. The connection between nodes revealing the association among the countries. The length between the nodes and the dimensions of the links represent the level of cooperation among countries. The highest number of collaboration was from United States, followed by Australia, South Africa, United Kingdom, Canada, Nepal, Saudi Arabia, Belgium, Chile, Japan, United Arab Emirates, China, Germany, Oman, Hong Kong etc. are seen through the network line.



**Figure-V. Country Collaboration Network**

**Top Ten most cited articles:**

In Table VIII shows the characteristics of the papers received over 60 citations during the study period. As seen in Table 1, the paper of Rani V. (2016) " Oxidative stress and metabolic disorders: Pathogenesis and therapeutic strategies" has received 438 citations; therefore, it is considered as the most highly-cited paper of CUG. The paper of Khan R. (2013) "Microbial decolorization and degradation of synthetic dyes: a review" with 213 citations is ranked second. The third rank of highly-cited papers is assigned to Sabarwal A. (2018) "Hazardous effects of chemical pesticides on human health-Cancer and other associated disorders with 120 citations.

Table VIII. Highly Cited Papers					
Author	Title	Source	Published Year	Total Citations	TC per Year
Rani V.	Oxidative stress and metabolic disorders: Pathogenesis and therapeutic strategies	LIFE SCIENCE	2016	438	73
Khan R.	Microbial decolorization and degradation of synthetic dyes: a review	Reviews in Environmental Science and Bio/Technology	2013	213	23.667

Sabarwal A.	Hazardous effects of chemical pesticides on human health-Cancer and other associated disorders	Environmental Toxicology and Pharmacology	2018	120	30
Pandit P. R.	Egg shell waste as heterogeneous nanocatalyst for biodiesel production: Optimized by response surface methodology	Journal of Environmental Management	2017	101	20.2
Rathore D.	Key issues in estimating energy and greenhouse gas savings of biofuels: challenges and perspectives	Biofuel Research Journal	2016	85	14.167
Yadav K. K.	A review of nanobioremediation technologies for environmental cleanup: A novel biological approach	Journal of Materials and Environmental Science	2017	69	13.8
Singh A.	Biohydrogen production from lignocellulosic biomass: Technology and sustainability	Energies	2015	69	9.857
Nambiar D.	Effects of phytochemicals on ionization radiation-mediated carcinogenesis and cancer therapy	Mutation Research - Reviews in Mutation Research	2011	68	6.182
Fulekar M. H.	Ag incorporated nano BiPO <sub>4</sub> : Sonochemical synthesis, characterization and improved visible light photocatalytic properties	RSC Advances	2014	67	8.375
Pandit P. H.	Effect of salinity stress on growth, lipid productivity, fatty acid composition, and biodiesel properties in <i>Acutodesmus obliquus</i> and <i>Chlorella vulgaris</i>	Environmental Science and Pollution Research	2017	66	13.2

## The most productive subject area

Table IX and figure VI shows that the university has contributed in various research areas. In this study, we have extracted most prominent 20 research areas from Scopus database, where University has conducted research work in mention below subject areas. It could be observed that CUG researchers have highest publications published in the subject of Chemistry and least publications published in the subject of Health Professions as per mentioned below results of 20 research areas.

Table IX. Prominent Research Area	
Subject	No. of Publications
Chemistry	280
Materials Science	178
Biochemistry, Genetics and Molecular Biology	164
Physics and Astronomy	121
Chemical Engineering	119
Engineering	112
Environmental Science	106
Social Sciences	92
Pharmacology, Toxicology and Pharmaceutics	60
Medicine	54
Agricultural and Biological Sciences	51
Energy	37
Economics, Econometrics and Finance	34
Immunology and Microbiology	32
Computer Science	27
Business, Management and Accounting	24
Arts and Humanities	23
Multidisciplinary	16
Earth and Planetary Sciences	15
Health Professions	13

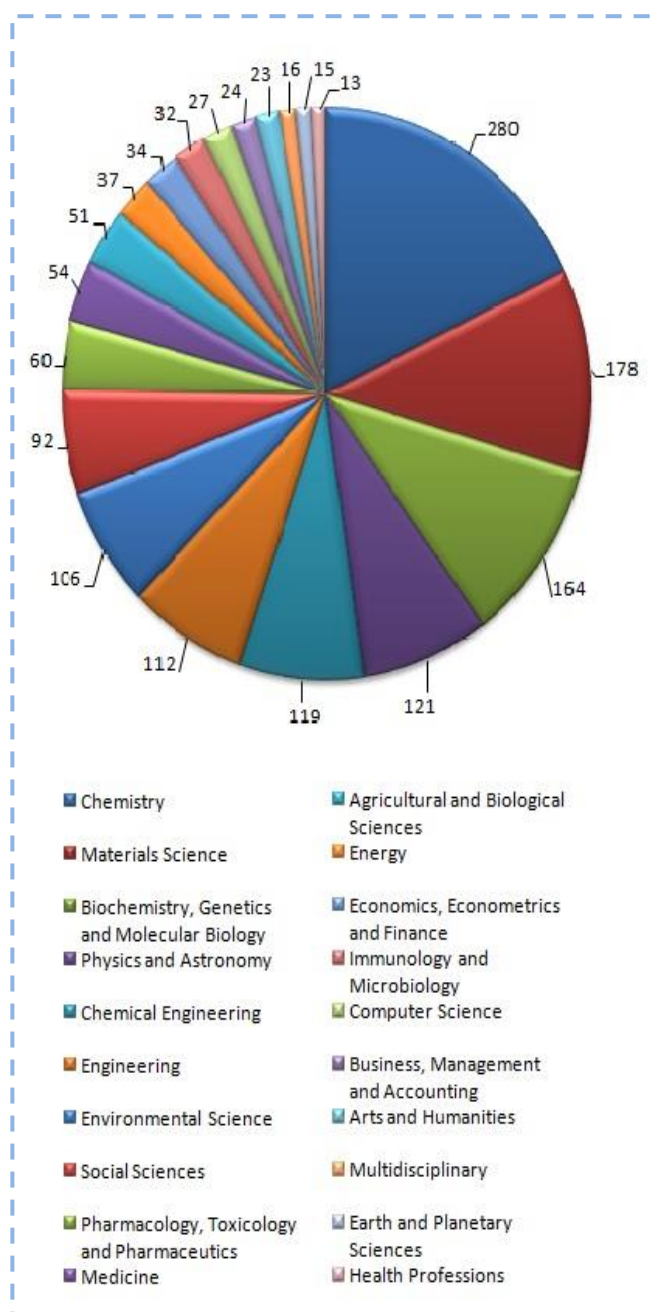


Figure-VI. Prominent Research Area

## Factorial analysis:

Top 50 keywords were used to generate the conceptual structure map between the concepts of research work during the study period. Understanding the thematic expansion of research fields in the knowledge world requires an understanding of research trends. The data analysis reveals that just a few subjects appear to be key subjects, and that they are becoming combined into broader subject disciplines. Fig. VII that the relationship of two major keyword clusters with multiple nested hierarchical clusters and two broad level clusters have emerged as a result of factorial analysis.

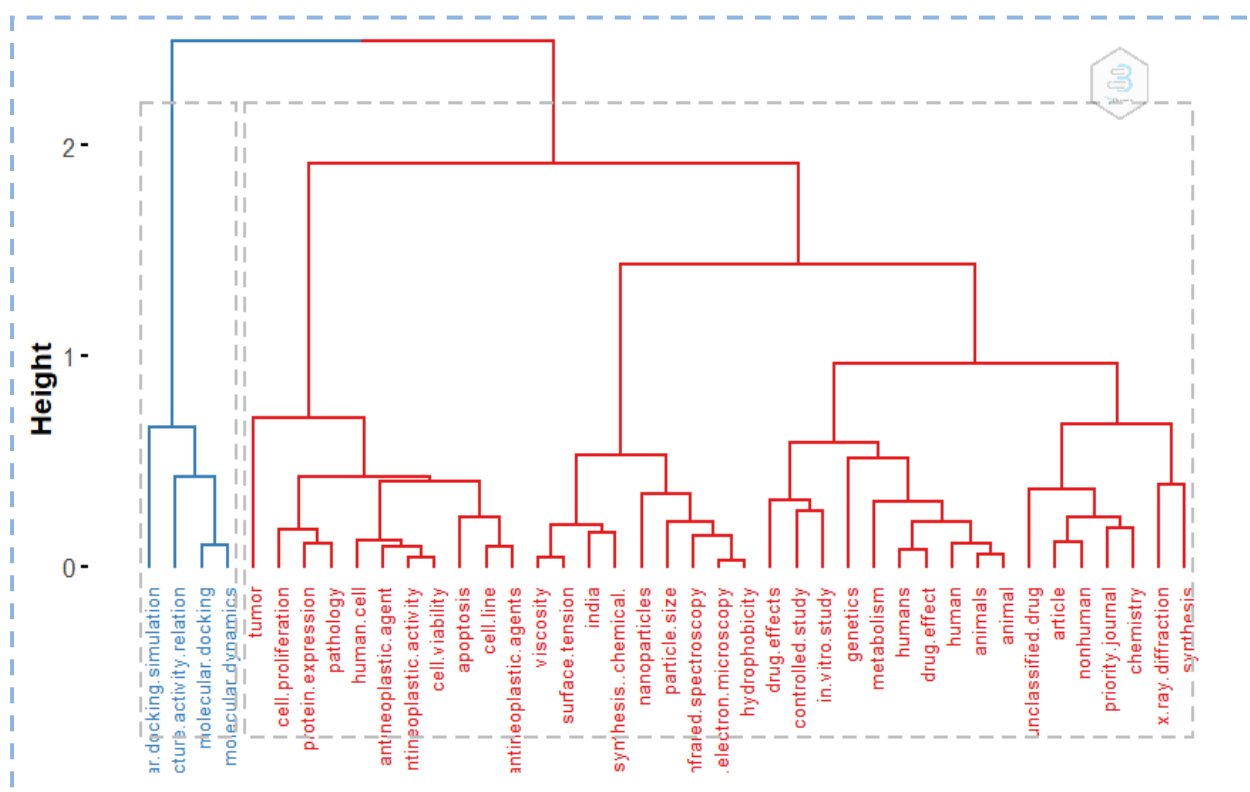


Figure-VII. Topic Dendrogram

## Findings and Conclusion:

This research study demonstrates the Mapping the Scholarly publications of Central University of Gujarat during 2010 to 2020. During this period, 771 research papers in different forms were published by 874 authors and it's received 7813 citations. Study show positive growth trend is observed during the study period. There were 38 countries collaborated with CUG to produce research publications. The study revealed that the highest number of international collaboration was from United States and major institutional collaborations with Jawaharlal Nehru University with 60 publications. The majority of papers were found in the subject of "Chemistry" with 280 publications. CUG has to make more effort to promote research and develop quality culture, attention of developing better policies to enhance and enrich the research performance.

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