

Research Productivity of Rajarambapu Institute of Technology, Islampur, (Maharashtra), India: A Bibliometric Analysis

Vishwas Hase¹, Mahesh Gaikwad²

¹KES Rajarambapu Institute of Technology affiliated to Shivaji University Kolhapur, Islampur Maharashtra

²Sadguru Gadage Maharaj College, Karad, Affiliated to Shivaji University, Kolhapur, Maharashtra

¹vishwas.hase@ritindia.edu

²mngaikwad@sgm.edu.in

Abstract: The paper deals with the publication pattern of faculty members of Rajarambapu Institute of Technology (RIT), Islampur, (Maharashtra), India based on the research output as reflected in the Scopus database during the period from 2010 to 2020. The study examined research performance based on their publication output, using different bibliometric indicators, such as the growth of publications, authorship pattern, collaborative index, highly productive author and journal, citation pattern etc. Bibliometric techniques were applied to a total number of 402 publications for eleven years. The extracted bibliographical and citation data was analysed and evaluated using MS Excel and Bibexcel applications and the visualisation was done using VOSviewer software. Major findings of the study revealed that the number of research publications and citations at the RIT has increased over the last eleven years. Most 246 (61.19%) of the publications were published in the form of conference papers, Dr. Thorat A.R. is the most productive author having 24 publications, and 'The Journal of Engineering Education Transformations' is a prominent journal for research publication at the RIT.

Keywords: Research Productivity, Bibliometric, Authorship Pattern, Collaborative Index, Citation Analysis, RIT, Scopus.

1. Introduction

Research is a systematic scientific investigation to discover new facts and acquire knowledge to solve specific problems. It has been an integral part of scholarly society since ancient times. As a higher education establishment, the primary mission of any academic institute is to disseminate knowledge through teaching, learning, and research in key fields. The reputation of the institution is linked to the results of research, as evidenced by the publication output of its faculty members. Research productivity refers to the measure of the quantity and quality of research output generated by individuals, research groups, departments, institutions, or even entire fields or countries within a given timeframe.¹ These outputs also speak to the capabilities and dedication of the individuals working within it. The outcomes of research encompass a range of outputs such as published articles, patents, conference proceedings, databases, standards, research reports, awarded projects etc. These serve as a measure of efficiency in any production system, and within the realm of research, productivity signifies the generation of novel knowledge. It is linked to career advancement, salary increases, and societal recognition. Funding agencies evaluate the research's ability to achieve its objectives. Similarly, institution performance is measured to identify academic quality and attract

Vishwas Hase

KES Rajarambapu Institute of Technology affiliated to
Shivaji University Kolhapur, Islampur Maharashtra
vishwas.hase@ritindia.edu

students, faculty, and funding agencies. Within the context of research, productivity serves as a key indicator of efficiency at various levels, including individuals, research groups, departments, institutions, fields, and even countries.

Bibliometrics refers to the quantitative analysis of scholarly publications. It involves the use of statistical and mathematical methods to examine patterns, trends, and relationships within academic literature. Bibliometric analysis often focuses on aspects such as citation counts, co-authorship networks, publication productivity, impact factors, and collaboration patterns among researchers and institutions. By employing this approach, it becomes possible to examine the quantitative aspects of research output, ultimately revealing valuable insights into the overall research landscape of institutes.

2. Literature Survey

Many Bibliometric studies have been carried out by many researchers so far. In this, it seems to have shed light on the research work of the different institutes and universities, as well as the productivity of the department and a specific period. We review some such references.

The study analyzed the research output of the University of Gulbarga publications in Web of Science during the period of 1989 to 2014. Researchers analysed 1119 articles and found that the average number of publications published per year was 43.04%. The assessment of research productivity determines the contribution of the University and individual scientists. The author identified most (97.95%) of the authors published the research papers with co-authors. Also, it is found that the highest number of multi-authored publications (111) was found in 2009 at Gulbarga University (Jange, 2016)⁷. The research productivity of NIRF ranked in the top ten institutions of India and further analysed the productivity of first-ranked institutions, Indian Institute of Science, Bangalore, in terms of year-wise publications, prolific authors, source journals, degree of collaboration, highly cited papers, publication pattern, etc. For the period of 2014 to 2018 data was derived from the Web of Science Database. The positive (5%) growth was found in research publications during the analysis period and there are the highest 37% research publications in the Physical Science subject category (Kumar, 2019)⁸. Another study has to made examine the scientific publications

of Shivaji University, Kolhapur, from 1989 to 2018, with data collected from the Web of Science. The findings reveal that Material Science constitutes the highest research area at Shivaji University, accounting for 30.44% of the research output. Additionally, 92% of the research papers were published as research journal articles. The Local Citation score for Shivaji University was determined to be 850, while the Global Citation Score amounted to 65,924 (Lihitkar 2019)¹¹. Research Productivity of the All-India Institute of Medical Sciences (AIIMS) reflects the growth in research literature produced from 2007 to 2016 in the Scopus database. It is found that journals are the most (69.42%) preferred publication pattern. And Indian Journal of Pediatrics, Indian Journal of Medical Research, and Indian Pediatrics were the most preferred journals among the AIMS faculties (Nishavathi, 2018)¹². The research productivity of IIT (ISM) Dhanbad analyzed the data collected from the Clarivate Analytics Web of Science (WoS) bibliographical database for the 10 years from 2000-2009. The study found the majority (5201) of the publications were published in referred research journals. Findings also indicate DST was the top research funding agency for project-based research. The average impact factor of these journals was 1.789. The study suggested that the researcher should be promoted to publish in high-impact factor journals that may help to improve the quality of research (Kumar, 2020)⁹.

3. Methodology

The current study is based on a bibliometrics analysis of research publications from Rajarambapu Institute of Technology, Islampur, Maharashtra, (India). The Scientometric method was used to assess the research productivity and bibliographic data were taken from a well-accepted bibliographic indexing database, Scopus. (<https://www.scopus.com>). The Advanced search option and bullion search strategy were used with the search string AF-ID Rajarambapu Institute of Technology 60104411, limiting the two-publication year 2020 -2020. Bibliographical details are distributed in an MS Excel worksheet for statistical analysis. Various bibliometrics and scientometric visualization tools viz. Bibexcel, VOSview etc. were used to draw a meaningful conclusion.

Rajarambapu Institute of Technology (RIT), (officially referred to as the College of Engineering) was established in 1983 and emerged as a leading

technological institute to cater to technological education in western Maharashtra. Notably, the institute has a greenfield campus of 47 acres with 07 UG programmes, 12 PG programmes and 04 Diploma (2nd Shift) programs with an annual intake of 4500 students every year. This institute, located in the state of Maharashtra, is one of the private engineering institutes that has been granted funds through the TEQIP (Technical Education Quality Improvement Programme). Additionally, it has been recognized as a Regional Centre for the Indo-Universal Collaboration for Engineering Education (IUCEE) program. The institute has been granted autonomy status by the University Grant Commission of India (UGC) and Shivaji University, Kolhapur. It holds accreditation from the National Assessment and Accreditation Council (NAAC) in Bangalore, as well as the Institution of Engineers in Kolkata, India, receiving an 'A' grade from both organizations.²⁰

4. Objectifies

The primary objective of the research is to study the RIT's research productivity from 2010 to 2020, utilising a variety of qualitative and quantitative metrics.

- To identify and analyse the annual growth of research output in RIT from 2010 to 2020.
- To analyse the country-wise collaborative sharing of the research publications.
- To investigate the types of documents produced by RIT faculties.
- To identify the journals the RIT faculties, prefer to publish their research.
- To identify the most prolific author of RIT.
- To find out the highly cited papers, and highest H-Index holder author among the RIT faculty.
- To know the funding agencies supported RIT faculties for their project-based publications.

5. Data Analysis And Interpretation

Table No. 1 reflects the year-wise publications with citations of RIT from 2010 to 2020. The research productivity has significantly grown throughout the year 2010 from just 3 papers to 71 papers in the year

Table 1 : Growth of the Publication

Sr. No.	Year	No of Publications	Percentage	Total Citation
1	2020	71	17.66%	78
2	2019	55	13.68%	94
3	2018	54	13.43%	173
4	2017	52	12.93%	252
5	2015	52	12.93%	274
6	2014	34	8.45%	253
7	2013	33	8.20%	192
8	2016	31	7.71%	319
9	2012	11	2.73%	83
10	2011	6	1.49%	47
11	2010	3	0.74%	24
Total		402	100%	1789

2020. It is observed that the research outcomes have increased in the last five years as compared to early 2014. The Statistics in the enlisted table also show that in the year, 2016 RIT got the highest (319) citations.

Table 2 Research Collaboration Counties

Sr. No.	Year	No of Publications	Percentage
1	India	389	93.96%
2	South Korea	6	1.44%
3	Bulgaria	1	0.24%
4	France	1	0.24%
5	Singapore	1	0.24%
6	Poland	1	0.24%
7	Italy	1	0.24%
8	United Kingdom	1	0.24%
9	United States	1	0.24%
Total		402	100%

Table No. 2 shows the author's collaboration with other countries. It is observed that the RIT faculties publish a total of 402 publications out of that the highest 389 (93.96%) publications were published with Indian authors, followed by South Korea with 6 (1.44%). The RIT faculty also published 1 research with Bulgaria, France, Italy, Poland, Singapore, the UK, US respectively.

Table 3 : Type of Document published

Sr. No.	Type of Source	Total No of Published	Percentage
1	Conference Paper	246	61.19 %
2	Article	147	36.57 %
3	Review	4	1.00 %
4	Book Chapter	3	0.75 %
5	Editorial	1	0.25 %
6	Note	1	0.25 %
Total		402	100 %

Table No. 3 describes the types of documents preferred for publication of research output by the faculties of RIT during the study period. More than half of the total publications i.e., 246 (61.19%) publications published in the form of conference papers followed by articles 147 (36.57%).

Table 4 : Top Twenty Prolific Journal Sources

Source Title	Research Publications	Journal	H Index	Average Citation per	Total citations	Cite Score
Journal of Engineering Education Transformations	36 (8.96%)	4	5	21	134	0.4
Materials Today Proceedings	12 (2.99%)	3	47	47	27773	1.8
SAE Technical Papers	8 (1.99%)	3	107	39	9021	1
ARPJ Journal of Engineering and Applied Sciences	7 (1.74%)	3	32	39	3549	1.3
Advances In Intelligent Systems and Lecture Notes in Mechanical Engineering	6(1.49%)	3	41	36.5	26852	0.9
Aip Conference Proceedings	5(1.24%)	4	16	27	4517	0.6
International Journal of Applied Engineering Research	4(1.00%)	4	75	31	33397	0.7
International Journal of Applied Engineering Research	4(1.00%)		40	70	131	6.6
Microwave And Optical Technology Letters	4(1.00%)	2	76	65	6064	2.7
Procedia Computer Science	4 (1.00%)	2	76	62	24640	3
Procedia Engineering	4 (1.00%)	1	74	82	23216	4
Proceedings of the Institution of Mechanical Engineers, Part C	4 (1.00%)	2	59	68	4854	3

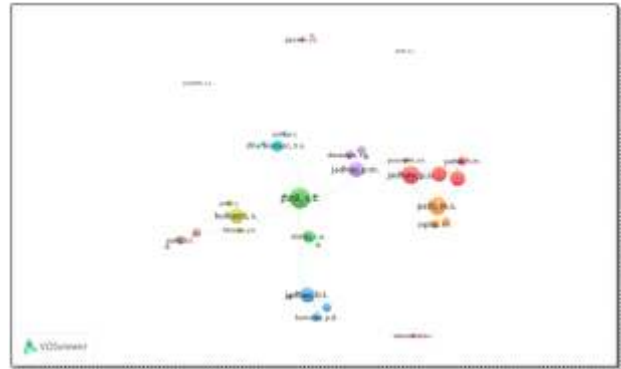
Sustainable Civil Infrastructures	4 (1.00%)	4	23	390	0.4	23
Applied Mechanics and Materials	3 (0.75 %)		33	0	0	0
Communications In Computer and Information Science	3 (0.75 %)	3	51	32	15364	0.8
International Journal of Engineering and Technology	3 (0.75 %)	4	26	63	169	1.8
Journal of the Institution of Engineers India Series C	3 (0.75 %)	2	15	55	646	1.8
Measurement Journal of The International Measurement Confederation	3 (0.75 %)	2	91	34	393	596
ACM International Conference Proceeding Series	2 (0.50 %)	3	123	41	35869	1.2
Advances In Mechanical Engineering	2 (0.50 %)	2	40	67	6604	2.6
Total	123 (30.60%)		1050	292	223193.4	653.2

Table No. 5 reveals the top twenty journals preferred by the faculty members of RIT for their publications. The above analysis shows that a total of 123 articles have been published by the faculty members during the year 2010 to 2020. 'Journal of Engineering Education Transformations' secured first rank with 36 (8.96%) articles followed by 'Material Today's Proceedings' with 12 (2.99%) articles, 'SAE Technical Papers' have 8 (1.99%) articles, 'ARPJ Journal of Engineering and Applied Sciences' with 7 (1.74%), 'Advances in Intelligent Systems and Computing and Lecture Notes in Mechanical Engineering published' 6 (1.49%) papers respectively, 'ACM International Conference Proceeding Series' has received highest (35869) citations with higher (123) H index among the top twenty prolific journals.

Table 5 : Top Twenty Prolific Authors

Authors	Department	Publication (%)	H - Index	Citing articles	Total Citations Received
Thorat, A. R.	Electrical	24 (5.97%)	6	37	93
Dharwadkar, N. V.	Computer Science	17 (4.23%)	8	37	175
Adamuthe, A. C.	I.T.	13 (3.23%)	5	27	110
Patil, S. R.	Automobile	13 (3.23%)	5	19	175
Thorat, S. A.	I.T.	13 (3.23%)	6	21	133
Sawant, S. M.	Mechanical	12 (2.99%)	8	25	255
Bhattar, C.L.	Electrical	9 (2.24%)	5	85	85
Jadhav, P.S.	Mechanical	8 (1.99%)	4	12	35
Kakade, A.B.	E&TC	8 (1.99%)	8	16	127
Metri, R.A.	Electrical	8 (1.99%)	3	11	26
Patil, S.S.	Computer Science	8 (1.99%)	3	14	70
Jagtap, S.R.	E&TC	7 (1.74%)	4	10	36
Kulkarni, S.S.	Civil	7 (1.74%)	3	21	141
Mane, S.U.	Computer Science	7 (1.74%)	5	15	59
Pardeshi, S.A.	E&TC	7 (1.74%)	3	9	34
Attar, A.C.	Civil	6 (1.49%)	2	8	18
Bamane, P.D.	Electrical	6 (1.49%)	2	10	56
Kalkhambkar, V.N.	Electrical	6 (1.49%)	6	19	118
Kolekar, T.V.	Science & Humanities	6 (1.49%)	8	5	113
Patil, M.S.	E&TC	6 (1.49%)	8	2	10

Table No 7 reflects the most productive author in RIT. It is observed that Thorat A. R. got the highest rank in the table with 24 publications, with H-Index 6 and 93 total citations received followed by Dharwadkar N. V. published 17, Admuthe A. C, PATIL S. R, and Thorat S.A published 13 publications respectively. . Sawant, S. M. from the Department of Mechanical, has received the highest (255) total number of citations for their 12 publications.

**Fig. 1 : Diagram of Co-Authorship visualization**

The co-authorship analysis figure visualizes the collaboration network among the top contributing authors of the institute during 2010-2020.

Table 6 : Highly Cited paper

Sr No	Authors	Title	Year	Journal Name	Citation Received
1	Deshpande N., Londhe S., Kulkarni Sushma S.	Modelling compressive strength of recycled aggregate concrete by Artificial Neural Network, Model Tree and Non-linear Regression.	2014	International Journal of Sustainable Built Environment	78
2	Kumbhar B.K., Patil S.R., Sawant S.M.	Synthesis and characterization of magnetorheological (MR) fluids for MRbrake application.	2015	Engineering Science and Technology, an International Journal	77

3	Kumbhar S.B., Chavan S.P., Gawade S.S.	Adaptive tuned vibration absorber based on magnetorheological elastomer-shape memory alloy composite.	2018	Mechanical Systems and Signal Processing	48
4	Patil S.S., Thorat S.A.	Early detection of grapes diseases using machine learning and IoT.	2016	Proceedings - 2016 2nd International Conference on Cognitive Computing and Information Processing, CCIP 2016	47
5	Ghatage P.S., Kar V.R., Sudhagar P.E.	On the numerical modelling and analysis of multi-directional functionally graded composite structures: A review.	2020	Composite Structures	45
6	Bhagat R.C., Patil S.S.	Enhanced SMOTE algorithm for classification of imbalanced big data using Random Forest.	2015	Souvenir of the 2015 IEEE International Advance Computing Conference, IACC 2015	42

7	Jadhav H.T., Sharma U., Patel J., Roy R.	Brainstorm optimization algorithm based economic dispatch considering wind power.	2012	PECon 2012 - 2012 IEEE International Conference on Power and Energy	39
8	Patil S.R., Powar K.P., Sawant S.M.	Thermal analysis of magnetorheological brake for automotive application.	2016	Applied Thermal Engineering	39
9	Chavan D., Pise A.T.	Performance investigation of an automotive car radiator operated with nanofluid as a coolant.	2013	Journal of Thermal Science and Engineering Applications	37
10	Jadhav H.T., Baman P.D.	Temperature dependent optimal power flow using g-best guided artificial bee colony algorithm.	2016	International Journal of Electrical Power and Energy Systems	37

Table no. 8 reveals the top 10 highly cited papers of the RIT faculty members during the period of 2010 to 2020. The paper titled 'Modelling compressive strength of recycled aggregate concrete by Artificial Neural Network, Model Tree and Non-linear Regression' received the highest citation i.e. 78, published in the International Journal of Sustainable Built Environment in the year 2014, 'Synthesis and characterization of magneto-rheological (MR) fluids for MR brake application' received the second highest citation i.e. 77 published 'Engineering Science and

Technology, an International Journal' during the year of 2015.

Table 7 : Research Funding Agencies

Name of the Funding Sponsors	Publications	%
AICTE	6	35.29
Department of Science and Technology, Ministry of Science and Technology, India	2	11.76
University Grants Commission	2	11.76
Department of Science and Technology, Government of Kerala	1	5.88
Ministry of Land, Infrastructure and Transport	1	5.88
Rajiv Gandhi Science and Technology Commission, Government of Maharashtra, India	1	5.88
RIT	1	5.88
RPS	1	5.88
Science and Engineering Research Board, India	1	5.88
Science for Equity, Empowerment and Development Division	1	5.88

Table No. 9 reveals the top 10 agencies that have supported/sponsored the RIT faculties for their research publications from 2010 to 2020. Data retrieved from the Scopus database shows that most 6 (35.29 %) of the papers were financially supported by the AICTE, New Delhi, and 2 (11.73%) research publications of RIT faculties received grants from the DST, Ministry of Science and Technology, India and the UGC respectively.

5. Result and Discussion

The following important observation could be drawn to summarize the productivity of RIT by interpreting the data retrieved from the SCOPUS database.

- Research productivity of RIT has increased substantially since 2010, from 3 articles to 71 articles in 2020. In addition, the average number of citations has increased with the number of publications except last two years.

- As compared with the international level, most (94%) of the RIT faculty members worked on research with the collaboration of Indian authors during the year 2010-2020.
- More than 60% of RIT research is published in the form of Conference papers. The 'Journal of Engineering'.
- Education Transformations' is a prominent journal for research publication at the RIT. This Journal published 36 research papers between 2010 to 2020.
- AICTE was the top research funding agency for project-based research, and India was the most collaborating country during the year 2010-2020.
- Prof. Dr. Thorat A.R. is the most productive author among the RIT faculty. He has authored 24 research papers between 1990 to 2020, and a total of 5 authors i.e., Prof. Dharwadkar, N. V., Prof. Sawant, S. M., Prof. Kakade, A.B., Prof. Kolekar, T.V. and Prof. Patil, M.S. having highest H-Index i.e., 8.
- It is found that 'Modelling compressive strength of recycled aggregate concrete by Artificial Neural Network, Model Tree and Non-linear Regression' is a highly cited paper with 78 citations published in 2014.
- Major research grant funding agencies are different departments/agencies of the Government of India and very few research grants were received from foreign agencies during 2010-2020.

6. Conclusion

Assessing the productivity of institutional research and developmental activities underscores the contributions of both the institution and the individuals involved in research. Measuring research productivity of an institution reflects its scientific and technological developments and progress. Evaluating the productivity of institutional research and developmental activities highlights the contribution of the institution and the individual scientists engaged in research. The improved research quality reflects dedication and expertise, positioning RIT as a key player in the research community. The analysis reveals that authors affiliated with RIT disseminate their research outputs through diverse channels, including journal articles, conference papers, reviews,

book chapters, and other forms of publications. Authors affiliated with RIT exhibit a strong preference for conference papers, constituting over 61% of their total publications. While the current assessment emphasizes the quantity and types of publications, it is recommended to incorporate other qualitative indicators such as citations and impact factors to assess the institution's global standing.

References

- [1] Abramo, G., and D'Angelo, C. A. (2014). How do you define and measure research productivity? *Scientometrics*, 101, 1129-1144.
- [2] Angadi, M., Koganuramath, M., Kademani, B. S., and Ramesha, B. (2012). Scientometric Dimensions of Innovation Communication Productivity of the University of Madras: A Study based on Web of Science Database. In A. Osswald & Z. Ahmed (Eds.), *Dynamics of Librarianship in the Knowledge Society* (pp. 1120–1132). B.R. Publishing Corporation <http://eprints.rclis.org/17519/>
- [3] Bankar, R., and Lihitkar, S. (2023). Scientometric Benchmarking of Rashtrasant Tukadoji Maharaj Nagpur University and Sant Gadge Baba University Amravati: A Comparative Study. *Journal of Indian Library Association*, 59(1). Retrieved from <https://ilaindia.net/jila/index.php/jila/article/view/1076/394>
- [4] Borah, N. (2023). Research Output on Altmetrics: A Scientometric Analysis. *Journal of Indian Library Association*, 58(4), 1-12.
- [5] Hendrix, D. (2008). An analysis of bibliometric indicators, National Institutes of Health funding, and faculty size at Association of American Medical Colleges medical schools, 1997–2007. *Journal of the Medical Library Association: JMLA*, 96(4), 324.
- [6] Hosamani, S. C., and Krishnamurthy, C. (2023). Authorship Patterns in Endocrinology Literature: A Scientometric Study. *Journal of Indian Library Association*, 59(1). Retrieved from <https://www.ilaindia.net/jila/index.php/jila/article/view/1714>
- [7] Jange, S., Angadi, M., and Bandi, S. (2016). Publication Productivity and Impact of Research in University Environment: A Scientometric View. *International Research: Journal of Library and Information Science*, 6(1).
- [8] Kumar, S. and Senthilkumar, R. (2019). Scientometric mapping of research output of NIRF first ranked institute of India: IISc, Bangalore. *Library Philosophy and Practice*, 1-22.
- [9] Kumar, S. (2020). Scientometric analysis of research productivity of IIT (ISM) Dhanbad. *Library Philosophy and Practice*, 1-18. Retrieved from <https://digitalcommons.unl.edu/libphilprac/4288> on 19.4.2023
- [10] Kumbhar, S. S., Gadade, M. D., and Pawar, S. R. (2023). Research Contribution of Savitribai Phule Pune University (SPUU): A Bibliometric Analysis. *Journal of Indian Library Association*, 59(1).
- [11] Lihitkar, S., and Bankar, R. (2019). Scientific publications of Shivaji University, Kolhapur (1989-2018): A scientometric study. 'Research Journey', (103), 410-418.
- [12] Nishavathi, E., and Jeyshankar, R. (2018). Research Productivity of All India Institute of Medical Sciences (AIIMS): A Scientometric Analysis. *Library Philosophy and Practice*, 1-20.
- [13] Senthilkumar, R., and Ulaganathan, G. (2019). Research Productivity and Citations of Authors in All India Institute of Medical Sciences New Delhi: A Study. *International Journal of Law, Human Rights and Constitutional Studies*, 1 (1&2), 3-8.
- [14] Sharma, P., Gupta, B. M., and Kumar, S. (2002). Application of growth models to science and technology literature in research specialties. *DESIDOC Journal of Library & Information Technology*, 22(2), 17-25.
- [15] Sharma, R. M. (2009). Research Publication Trend among Scientists of Central Potato Research Institute: A Bibliometric Study.

- Annals of Library and Information Studies, 56(3), 29–34.
- [16] Subramanyam, K. (1993). Bibliometric Study of Research Collaboration: A Review. *Journal of Information Science*, 6(1), 33-38.
- [17] Van Raan, A. F. (2004). Statistical Properties of Bibliometric Indicators. *Journal of the American Society for Information Science & Technology*, 1–34. Retrieved from <http://www.cwts.nl/TvR/documents/AvRStatProp.pdf>. on 15.4.2023.