International Journal of
INTELLIGENT SYSTEMS AND APPLICATIONS IN ENGINEERING
ISSN:2147-6799 www.ijisae.org Original Research Paper

Investigating the Modern Tamil Grammar of Vallinam and Mellinam Used by Tamil Lyricists Between 1952 and 2023 Using the Latin Square Design and the Levenshtein Distance.

Saviour Prakash Gnana Prakasam Louis Raja*[1], Dr. Ramalingam Viswanathan Venkatesan[2]

Submitted: 15/09/2023 **Revised**: 16/11/2023 **Accepted**: 28/11/2023

Abstract: This paper focuses on how the grammatical categories of a topologically generalised Tamil language emerge and are organised. The study of grammatical categories is explained by the notion of grammaticalization. The Levenshtein distance is a string metric used to quantify the dissimilarity between two se- quences in the fields of information theory, linguistics, and computer science? The amount of single-character changes needed to transform one word into another is the informal definition of the Levenshtein distance between those words. In this effort, we have tried to learn the linguistic intricacies of the Meyyeluttukal in Tamil language. Researchers in managed languages have made strides toward these ends by employing quantitative techniques for de- riving reliable conclusions of the Latin Square Design was used to compare the frequency of occurrence of Vallinam, Mellinam, and Idaiyinam in the work of several Tamil lyricists. The emphasis is on how the aforementioned grammatical framework is employed in both written and spoken conversation. Furthermore, we have investigated ANOVA for all of the factors involved in the development of language. In light of the findings, we have arrived at some realistic conclusions.

Keywords: *ANOVA, Latin Square Design, Mellinam, Tamil Grammar, Vallinam*

1. Introduction

There are 12 Vowels (Uyireuttu, “soul-letters”), 18 Consonants (Meyyeluttukal, “body letters”), and one special character (Aythaeuttu) in the Tamil script. This is known as “akku”, and is classified as neither a Meyyeluttukal nor a vowel in Tamil orthography. It is, however, mentioned near the end of the vowel list. It is a syllabic script, not an alphabetic one. The entire script thus consists of 31 independent letters plus an extra 216 combined letters, for a total of 247 combinations (Uyirmeyyeuttu, ”soul body letters”) of a Meyyeluttukal and a vowel, a mute Meyyeluttukal, or a vowel alone (Uyirmeyyeuttu, “soul body letters”). A vowel marker is added to the meyyeluttukal to create the combined letters. Some vowels require you to modify the meyyeluttukal bass form in a way that is specific to that vowel. A vowel-specific suffix is added to meyyeluttukal in some cases, a prefix is added in others, and some require both a prefix and a suffix. The vowel marker is distinct from the vowel feature in both cases. From left to right, Tamil letters are written.

2. Literature Study

In the preceding 120 years, many statisticians from all around the world have employed statistical approaches to analyse languages. It is crucial to highlight that [1] [2] [3] [4] [5] and [6] and [7] made significant contributions to the study of language using statistical approaches in the earlier years. Subbarayan 1995 tried fitting the Warrens–Herdan for distribution with a sample of Peyarccolkal utilised by three authors from the Muvar Tevaram, a well-known Tamil epic.[8] Emphasised the importance of quantitative methods in the study of languages. [9]The problems attempted are using special letters or consonant-vowel ligatures. All other vowels are attached to the con- sonant letter. All other vowels are appended to the consonant letter using special letters or consonant-vowel ligatures [10]. The usage of style punctu- ation and previously underused consonant clusters has resulted in literature and speech. Analyse the newly evolved alphabets that are employed [11] [12]. [13] The grammaticalization and evolution of the current Tamil gram- mar form were thoroughly investigated. The Dravidian language family’s compound grammar form was studied. The nature of Tamil lyrics in terms of lyricists is revealed through analysis. It is worth noting that researchers made substantial contributions to the application of statistical methodolo- gies in the early years. [14], [15], [16].According to the t-test and Analysis of Covariance can be used to examine linguistic structures. The use of Analysis of Covariance and Multiple Analysis of Covariance for analysing mean differences in the use of grammatical structures was thoroughly discussed[11] [17]. This is a great description of how to use analytical statistics to examine language structure. For a more in-depth examination, the

[1] *Department of computing technologies, SRM institute of science and technology,, Kattankulathur, Chengalpattu, 603203, Tamilnadu, INDIA ORCID ID : 0000-0001-9335-5430*
[2] *aDepartment of computing technologies, SRM institute of science and technology,, Kattankulathur, Chengalpattu, 603203, Tamilnadu, INDIA ORCID ID : 0000-0003-2193-6644*
** Corresponding Author Email: saviourgl@live.com*

discussion based on the analytical approach covers model formation, model selection, and so on.

3. Materials

3.1. Tamil Language

Tamil is a Dravidian language that is mostly spoken in India. It is the official language of Tamil Nadu, India's state, and Pondicherry, a Union Ter- ritory (Pondicherry). A large number of people in Sri Lanka, Singapore, Malaysia, Mauritius, Fiji, and South Africa also speak it. Tamil was desig- nated as an Indian classical language in 2004, indicating that it meets three criteria: ancient origins, autonomous tradition, and a large body of ancient literature. Tamil was speaking by 74 million people in the early twenty-first century. Tamil written horizontally from left to right, with a core set of 18 consonants and 12 vowels. All consonants have an inherent vowel, and they written in a syllabic alphabet.

3.2. Lyricist significantly contributed to Tamil grammatical framework

Mahakavi Subramanya Bharathiyaar is a Tamil writer, poet, journalist, Indian independence activist, and social reformer who have written in several languages. He is regarded as a pioneer of contemporary Tamil poetry and one of the finest Tamil literary personalities of all time. His popular moniker was"Mahakavi Bharathi." Bharathidasan, or Kanagasabai Subbu, was a Tamil poet and rationalist who wrote primarily about socio-political themes during the twentieth century. Arunachalam is an Indian film composer, musician, and lyricist. Bhoothapandi Chidambaranathan A. Maruthakasi was a Tamil poet and lyricist who contributed over 4,000 lines of dialogue to more than 250 Tamil films. Ku.Ma.Balasubramaniam, often known as Ku.Ma.Balasubramaniam, was a Tamil poet and writer who wrote 263 songs for 54 Tamil films. Kannadasan was an Indian philosopher, poet, and lyricist for film songs, as well as a producer, actor, playwright, editor, and philan- thropist. He is widely regarded as one of India's greatest and most influential lyricists. Alangudi Somu was a Tamil cinema lyricist from India who wrote

Numerous popular songs for various films. From 1960 to the late 1990s, he worked in the field. Muthulingam is a songwriter who has about 1,500 Tamil film songs to his credit. Avinashi Mani is a film director and composer. Gnanathesikan, best known by his stage name Ilaiyaraaja, is a Tamil film composer, conductor-arranger, performer, and lyricist. Gangai Amaran is a composer, singer, songwriter, and scriptwriter from India. M. G. Vallabhan was a journalist as well as a poet, vocalist, and songwriter. Kuruvikkarambai Shanmugam is a film composer. Pa. Vijay is a lyricist, poet, writer, director, and actor in Tamil films in India. Pulavar Pulamaipithan was a lyricist and poet. Vairamuthu Ramasamy is a lyricist, poet, and novelist who work in "Tamil cinema". For our study, we have randomly selected the following lyri- cists: The contributions made by these lyricists are significant for a deeper understanding of Tamil culture and social outlook. In this approach, we have used the term "authors" instead of "lyricist" for understandable aspects and given names to lyricists accordingly. Table 1 shows the details of the authors and Table 2 shows basic statistics about the characteristics of the lyric.

Table 1. Details of Authors

S.no	Lyricists	Given Name
1	Pulavar Pulamaipithan.	A1
2	Gangai Amaran	A2
3	Kannadasan	A3
4	Panchanathan Arunachalam	A4
5	Vairamuthu Ramasamy	A5
6	Muthulingam	A6

3.3. Dataset for lyricist

In the early years of the Talkies, from 1952 to 2022, Tamil lyrics played a significant role. Over 6,500 films have made in Tamil cinema, with only 45 of them being without music. We have selected lyrics from each of the Six Tamil lyricists for study. We decided to separate each of the 20 songs into Meyyeluttukal sequences using https://www.tamil2lyrics.com/in the last six months. The following is a quick rundown of lyric characteristics.

Table 2. Statistics about the lyric's characteristics

Years range	1952-2023
Lyrics	150
Words	8032
Lyricists	6
Average songs/ Lyricists	20
Average words / Lyrics	136
Minimum words / Lyrics	39
Maximum words / Songs	170

3.4. A Description of Meyyeluttukal

The Meyyeluttukal are categorised into three groups: Vallinam (chest), Mellinam (nose) and Idaiyinam (neck) based on the nature of the sound. To find the variety in the usage of words

(Meyyeluttukal). Consonants can be classified into three 1.Vallinam - Hard Tone from CHEST

2. Mellinam - Soft Tone from NOSE 3.Idaiyinam - Medium Tone form NECK

Meyyeluttukal – 18

K, n˙ - The first part of the tongue appears by touching the food.

c, n˜ - The middle tongue appears to be touching the middle nostril t., n. - I felt his tip touch the tip of it.

t, n - Two cutaways have been incorporated into the top match for easy access to the high frets.

p, m - The upper lip appears to match the lower lip

y - The tongue appears to match the base of the upper mouth at the base r, l - The upper lip is born by rubbing the tip of the tongue

l - The base of the upper tooth is born as the tongue approaches thicker at the edges.

l - The upper lip is born by rubbing the edges of the tongue.

v - Two cutaways have been incorporated into the top match for easy access to the high frets.

r, n - Two cutaways have been incorporated into the top match for easy access to the high frets.

Essentially, stating that the output distance between the two is the cumulative sum of the single character modifications. The higher the output distance suggests that more adjustments were necessary to make the two words equal each other, and the shorter the output distance implies fewer changes were necessary. In this research article, we have analyzed the newly developed alphabets that are currently in use in the Tamil language.

This involves three aspects.

1. Feature extraction and categorization

2. Character segmentation for feature extraction and

3. Comparison with enhancement in the validation of outcomes.

”Soul” and “Body” are Tamil terms for the vowels and consonants. The basis for the grammar is how a soul and a body interact to create sound. Based on ancient Tamil grammar, Vallinam is one of the three classes of consonants in Tamil. The other two classes are soft and intermediate. The Tolkappiyam and the later Tamil grammars such as the Nannul and the six letters are called the Vallina script. These got their names because of their strong sounds. These are also called pain, violence, and cruelty. The teenager’s commentary on Tolkappiyat is that, it was called Vallezhuthu because it was played by Val and was born with the title Val”.

4. Methods

4.1. Levenshtein distance of Meyyeluttukal

There are various approaches to discovering the lexical similarities be- tween pieces of text. the one which we will be examining with Meyyelut- tukal is the Levenshtein distance. An algorithm devised in 1965 by Vladimir

Levenshtein, a Soviet mathematician Tyurin. Levenshtein distance is partic- ularly significant since it does not require two strings to be of similar length for them to be compared. Intuitively speaking, the Levenshtein distance is pretty straightforward to grasp. Informally, the Levenshtein distance a two words is the lowest number of single-character modifications (insertions, dele- tions, or replacements) necessary to turn one word into the other.

Algorithm 1: Levenshtein Distance for Meyyeluttukal

```
Levenshtein Min Dist (word1, word2);
Vector<int>dp [ word1.size () + 1
                word2.size () + 1 ]
For i, ← 0 to dp.size()
dp [i] [0] = i
For j, ← 0 to dp.size()
dp [i] [0] = j
For row ← 1 to dp.size ():
For row ← 1 to dp.size ():
If word 1 [col1] = = word 2 [row]:
dp [row] [col] = dp [row-1] [col-1]
Else:
dp [row] [col] = min (dp[row] [col-1],
                dp [row] [col],
                dp[row-1] [col-1]) +1
```

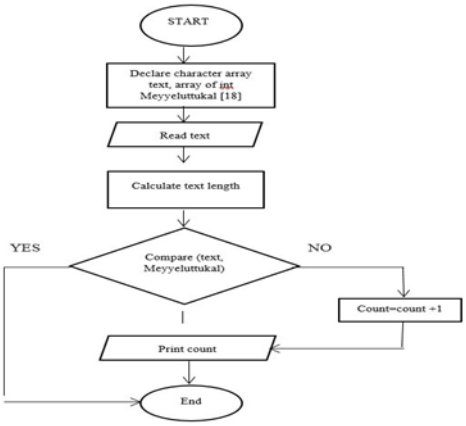
Calculating Levenshtein Distance Output of Vallinam and Mellinam

Levenshtein (’K’,’c’,’t.’,’t’,’p’,’r], [’N’,’n’,’n’,’n’,’m’,’n’]) 6.0

4.2. Data structure of Meyyeluttukal

The procedure of the algorithm is used to count the letters in the words. The lyrics are stored in the text file named Tamilsong.txt and are called a string array as read from the file. In addition, grammatical structure is counted through the style and usage of authors and their differences.

Flowchart 1: Counting Procedure of Meyyeluttukal



Algorithm 2: Counting Procedure of Vallinam and Mellinam

```
Procedure Meyyeluttukal Count:

readFIleFileRead
("TamilSong.txt", "r")

Song []
StringArray(readFile)S Song
[]

Vallinam[] ['K','c','t','t','p','r']

Mellinam[] ['N','n','n','n','m','n']

CharecterCount(Song, Vallinam)
```

4.3. Data Representation of Latin Square Design

This module creates designs in Latin Square. There are designs for three to ten treatments available. Latin Square designs are similar to randomised block designs, but instead of removing one blocking variable, these patterns are meticulously crafted to allow the removal of two. They accomplish this while reducing the number of experimental units required conducting the re- search. When adopting the Latin Square design, it is critical to understand the assumptions that are made. This design assumes that the magnitudes of the interaction terms are minimal enough that they can be ignored, result- ing in a significant reduction in the number of experimental units required. As an example, the Latin Square design is solely for main effects. Another way to put it is that the treatments, the row factor, and the column factor all have their own effect on the response. When making probability claims during the analysis of experimental data, the randomization process must be followed to the letter. The procedure for randomization is as follows: Pick a design at random from the available orthogonal designs. Assign levels of the row factor to the rows at random. Assign the levels of the column factor to the columns at random. Assign treatments to the treatment letters at random (or numbers, as the case may be). Designs with up to six treatments have been included. The number of squares available is proportional to the number of treatments. The number of orthogonal squares stored in this pro- cedure shown in the table 2. The letters A1, A2, A3, A4, A5 and A6 in the table.3 denote the six treatments. The letters are order in such a way that each letter only appear once in each row and column. It is worth noting that a simple random design would necessitate 216 experimental units (6 x 6 x 6). This Latin Square only requires 36 experimental units, a 75 percentage de- crease. A sixth component can also be eliminating from the design by using a different set of letters, this time in lower case. The Latin Square is the name given to this design. Six factors at six levels would typically necessitate 1298 experimental units, but our design only necessitates 36— a nearly 94 percent- age reduction in experimental units. Combine two orthogonal Latin Squares. Except for six, Latin Squares are available for all treatment numbers. The following is a six-treatment Latin Square experiment. The following is the experimental layout that the figure 1 is given below.

Table 3: Latin Square with Six Treatments

GS	C1	C2	C3	C4	C5	C6
R1	A1	A2	A3	A4	A5	A6
R2	A2	A3	A4	A5	A6	A1
R3	A3	A4	A5	A6	A1	A2
R4	A4	A5	A6	A1	A2	A3
R5	A5	A6	A1	A2	A3	A4
R6	A6	A1	A2	A3	A4	A5

GS denotes the grammatical structure of the above aspects. Figure 2 is depicted as the author's usage of the grammar structures.

5. Empirical Analysis

Vallinam and Mellinam

Vallinam ['K','c','t.','t','p','r'] Hard (CHEST TONE)

Mellinam ['N','n','n','n','m','n'] Soft (NOSE TONE)

The data represented is present below.

Row wise information related to the Vallinam.

Columns information related to the Mellinam.

The authors' names, Vallinam and Mellinam, used with their permission.

Table 4: The data structure in respect of Vallinam and Mellinam

Authors	Vallinam						Mellinam					
	V1	V2	V3	V4	V5	V6	M1	M2	M3	M4	M5	M6
A1	256	69	230	194	150	26	183	40	493	186	587	461
A2	276	82	225	185	114	20	122	33	369	177	522	306
A3	187	35	119	151	100	28	158	29	424	185	486	401
A4	267	46	140	194	98	35	132	58	413	198	595	406
A5	239	97	167	145	145	61	89	30	402	136	409	434
A6	221	44	110	153	83	33	148	51	463	185	567	430

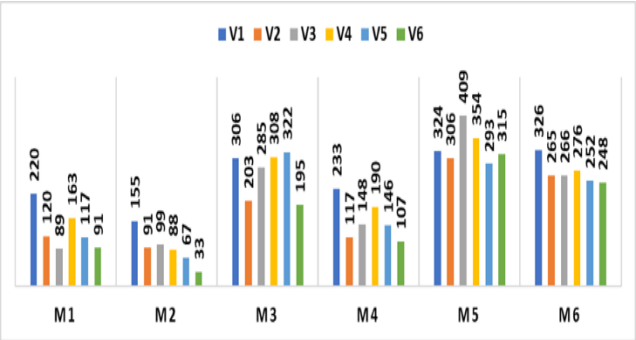
The data structure in respect of Vallinam and Mellinam given in the following table.

Table 5: The average data structure of Vallinam and Mellinam

GS	M1	M2	M3	M4	M5	M6
V1	326	220	155	306	233	324
V2	265	120	91	203	117	306
V3	266	89	99	285	148	409
V4	276	163	88	308	190	354
V5	252	117	67	322	146	293
V6	248	91	33	195	107	315

The average data structure in respect of Vallinam and Mellinam given in the following table 5.

Fige 1: Parent data of Vallinam and Mellinam The steps involved in the analysis are:



N= Number of Observations =36

G= Grant total of Observations = 7509

Correction Factors = (7509)2/ 36

Total sum of squares = 340555

Between Rows sum of squares (Vallinam) = 35970.92
Between Columns sum of squares (Mellinam) = 279238.60
Between Authors sum of squares = 8292.92

Error Sum of squares = 17052.40

6. Result and Discussion

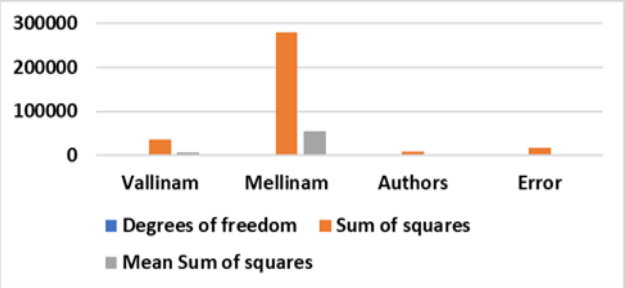
The data is spread across six columns. The Vallinam (row) value is in the first Mellinam (column). The column value is found in the second column. The therapy letter is found in the third column. To use this idea, you would set up your experiment using the rules for randomization mentioned above. After you have completed your experiment, you will replace the random values in A6 with the ones you got from it. The data would next be analysed using the LM technique. Factor 1 (row) would be fixed (or random, as the case may be), Factor 2 (column) would be fixed (or random, as the case may be), and treatment (Treatment 1) would be fixed. A6 would be the response variable. Set which model terms to "Up to 1-Way" in the Model window of the LM ANOVA method. This compels the tool to make an error term out of all interaction terms. The outcomes would be present in this style. The analysis of variance in respect is presented below.

Table 6: Analysis of Variance Table (based on section 5.1)

Sources of variation	Degrees of freedom	Sum of squares	Mean Sum of squares	F_0	F_e
Vallinam	5	35970.9	7194.2	8.43	2.7
Mellinam	5	279239	55848	65.5	2.7
Authors	5	8292.92	1658.6	1.94	2.7
Error	20	17052.4	852.62	*	*
Total	35	340555	*	*	*

The sum of squares, mean squares, and F-ratios will not be the same as those shown. The number of degrees of freedom, however, will be equal to below. It is worth noting that the error term has only six degrees of freedom (S). A Latin Square design with only six levels has this severe constraint. Frequently, you would repeat the experiment in order to increase the number of mistakes. It is also worth noting that the expected mean square values are calculated based on the entire model assumptions. These numbers are erroneous because the Latin Square is not full (it does not include all row- by-column-by-treatment combinations). The ANOVA Table of Vallinam, Idaiyinam, and Authors is shown in Figure 2.

Fig 2: ANOVA Table of Vallinam, Mellinam and Authors



6.1. Inference

Based on the results in ANOVA Table 6, we can draw the following conclusions about the sources of variation:

1. 1.In respect of Between Rows (Vallinam), we find Fo = 8.43 and Fe = 2.71. Because Fo > Fe, we can say that there is a big difference in how Vallinam words are used.

2. 2.In respect of Between Columns (Mellinam), we find Fo = 65.50 and Fe = 2.71. Since Fo > Fe, we can assume that there is a very big difference in how Mellinam words are used.

3. 3.In respect of Between Authors, we note that Fo = 1.94 and Fe = 2.71. We can conclude from Fo < Fe that there is no significant difference in the usage of Vallinam and Mellinam words.

7. Conclusion

The study has revealed interesting results, and the conclusions are based on looking at how Tamil lyricists have used grammatical structures through- out the last 50 years. The lyricist's grammatical structure is based on Vallinam, Mellinam, and Idaiyinam. These form elements help shape the words. In this approach, we have considered the works of six lyricists whose contributions have been significant over the long term. The data system is specially organized. It should be noted that over the past few years, only a limited number of studies have been carried out for the quantitative analysis of grammatical structure. We used the Levenshtein Distance and the Latin Square

Design Model as a basis for a detailed study of the grammatical structure. From the Levenshtein distance, we identify a distance of 6.0 for each evaluation between Vallinam and Mellinam. There is a significant difference in the usage of grammatically structured words between Vallinam and Mellinam, In terms of grammatical structures, there is no discernible difference between the usage authors, namely Vallinam and Mellinam, The study shows very clearly that there are big differences in how lyricists in the Tamil language use grammar.

Acknowledgements

This research was supported by SRMIST. We thank our colleagues from SRMIST who provided insight and expertise that greatly assisted the research, although they may not agree with all of the interpretations/conclusions of this paper. We thank Professor Dr.Subbarayan A. for assistance with particular technique, methodology and Dr. Ramalingam Viswanathan Venkatesan, Associate Professor S|RMST for comments that greatly improved the manuscript.

Author contributions

Saviour Prakash Gnana Prakasam Louis Raja: Conceptualization, Methodology, Software, Field study, Data creation, Writing-Original draft preparation, Software, Validation. Field study

Dr. Ramalingam Viswanathan Venkatesan: Visualization, Investigation, Writing-Reviewing and Editing

Conflicts of interest

The authors declare no conflicts of interest.

References

[1] G. U. Yule, The statistical study of literary vocabulary, 1944, p. 306.

[2] G. S. Watson, Review: Frederick Mosteller, David L. Wallace, Inference and Disputed Authorship: The Federalist, The Annals of Mathematical Statistics 37 (1) (1966) 308 – 312. doi:10.1214/aoms/1177699628.

URL https://doi.org/10.1214/aoms/1177699628

[3] G. HERDAN, Quantitative linguistics or generative gram- mar?, semanticscholar 2 (4) (1964) 56–65 [cited 2023-06-23]. doi:doi:10.1515/ling.1964.2.4.56.

URL https://doi.org/10.1515/ling.1964.2.4.56

[4] F. Dolezal, Introduction: The Bibliography of Words and Notions, International Journal of Lexicography 2 (3) (1989) 167–175. arXiv:https://academic.oup.com/ijl/article-pdf/2/3/167/9820384/167.pdf, doi:10.1093/ijl/2.3.167.

URL https://doi.org/10.1093/ijl/2.3.167

[5] D. H. Wu, T. Bulut, Chapter nine - the contribution of statistical learning to language and literacy acquisition, in: K. D. Federmeier, H.-W. Huang (Eds.), Adult and Second Language Learning, Vol. 72 of Psychology of Learning and Motivation, Academic Press, 2020, pp. 283–318. doi:https://doi.org/10.1016/bs.plm.2020.02.001. URL https://www.sciencedirect.com/science/article/pii/S0079742120300013

[6] M. Mepham, Introduction to the mathematics of

language study, by barron brainerd. (mathematical linguistics and automatic language pro- cessing, 8). new york: American elsevier, 1971. pp. ix 313., Canadian Journal of Linguistics/Revue canadienne de linguistique 18 (2) (1973)

181–183. doi:10.1017/S0008413100007428.

[7] D. W. Reed, A statistical approach to quantita- tive linguistic analysis, WORD 5 (3) (1949) 235–247.arXiv:https://doi.org/10.1080/00437956.1949.11659355, doi:10.1080/00437956.1949.11659355.

URL https://doi.org/10.1080/00437956.1949.11659355

[8] S. T. Gries, Statistics for Linguistics with R, De Gruyter Mouton, Berlin, Boston, 2021 [cited 2023-06-23]. doi:doi:10.1515/9783110718256.

URL https://doi.org/10.1515/9783110718256

[9] R. Bani, S. Amri, L. Zenkouar, Z. Guennoun, Toward natural language processing approaches for text, in: L. Azrar, A. Jalid, S. Lamouri, A. Sia- dat, M. Taha Janan, F. Chaari, M. Haddar (Eds.), Advances in Integrated Design and Production II, Springer International Publishing, Cham, 2023, pp. 175–183.

[10] S. T. Gries, Statistics for Linguistics with R, De Gruyter Mouton, Berlin, Boston, 2013 [cited 2023-06-23]. doi:doi:10.1515/9783110307474.

URL https://doi.org/10.1515/9783110307474

[11] C. V. Nakassis, Social dimensions of modern tamil by e. annamalai. chennai, india: Cre-a:, 2011. 196 pp., Jour- nal of Linguistic Anthropology 22 (3) (2012) 261–263. arXiv:https://anthrosource.onlinelibrary.wiley.com/doi/pdf/10.1111/j.1548- 1395.2012.01126.x, doi:https://doi.org/10.1111/j.1548-1395.2012.01126.x. URL https://anthrosource.onlinelibrary.wiley.com/doi/abs/10.1111/j.1548-1395.

[12] N. R. Prashanth, B. Siddarth, A. Ganesh, V. N. Kumar, Handwrit- ten recognition of tamil vowels using deep learning, IOP Conference Series: Materials Science and Engineering 263 (5) (2017) 052035. doi:10.1088/1757-899X/263/5/052035.

URL https://dx.doi.org/10.1088/1757-899X/263/5/052035

[13] B. C. Lust, K. Wali, J. W. Gair, K. V. Subbarao (Eds.), Lex- ical Anaphors and Pronouns in Selected South Asian Languages:, De Gruyter Mouton, Berlin, New York, 2000 [cited 2023-07-12]. doi:doi:10.1515/9783110818888.

URL https://doi.org/10.1515/9783110818888

[14] D. R. McCullough, Sinclair, A. R. E. The african buffalo: a study of resource limitation of population. Univ. Chicago Press, Chicago, xii + 355 pp., 1977. Price 20.00, Journalof Mammalogy60 (2)(1979)438 439. arXiv : https : //academic.oup.com/jmammal/article pdf /60/2/438/2582080/60 2 438.pdf, doi : 10.2307/1379830.

URLhttps://doi.org/10.2307/1379830

[15] D. V. Lindley, Subjective Probability, Decision Analy- sis and Their Legal Consequences, Journal of the Royal Statistical Society Series A: Statistics in Society 154 (1) (2018) 83–92. arXiv:https://academic.oup.com/jrsssa/article-pdf/154/1/83/49758877/jrsssa 154 1 83.pdf, doi:10.2307/2982697.

URL https://doi.org/10.2307/2982697

[16] K. R. G. S. P. G. P. L. R. K. S. S. R, In A Statistical Approach For Tamil Pulavarkal From The 3rd Bc To The 3rd Ad, The Grammars Mellinam And Idaiyinam Were Used, Journal of Positive School Psychology (JPSP) 6 (11) (2022) 756–768. doi:http://journalppw.com. URL https://journalppw.com/index.php/jpsp/article/view/14032

[17] Y. Zhang, B. Zhang, Z. Li, Z. Bao, C. Li, M. Zhang, Syn GEC: Syntax- enhanced grammatical error correction with a tailored GEC-oriented parser, in: Proceedings of the 2022 Conference on Empirical Methods in Natural Language Processing, Association for Computational Linguis- tics, Abu Dhabi, United Arab Emirates, 2022, pp. 2518–2531. URL https://aclanthology.org/2022.emnlp-main.162