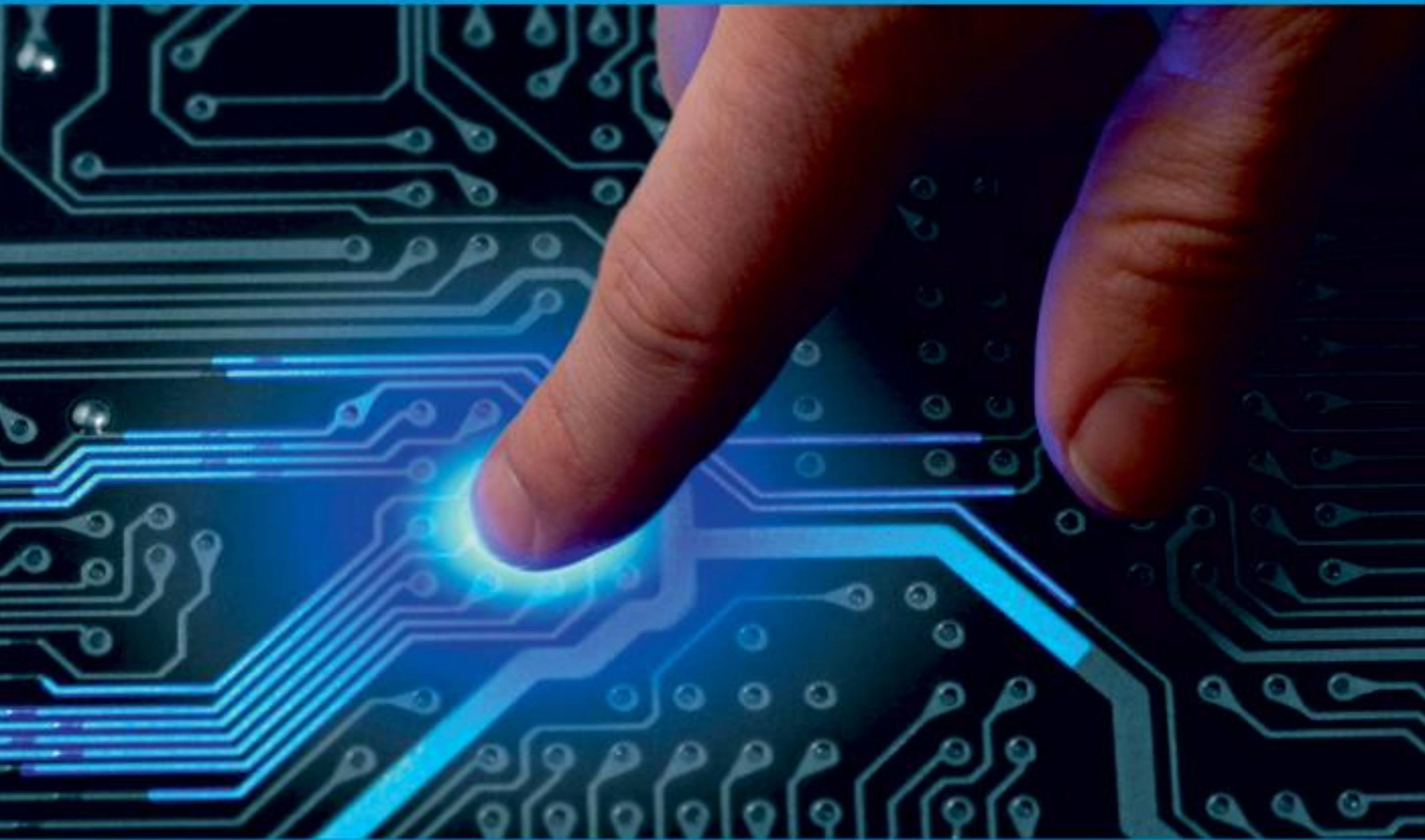
IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 11, Issue 5, May 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

A Study on Analysis of Doppler Collision Prediction using Supervised Machine Learning

Dr. K.G.S. Venkatesan[1], P. Aitha[2], Dr. S. Ravichandran[3,]

Bommideni Akanksha[4], Pagadala Shilpa[5], Sonwane Aparna[6], B. Mounika[7]

[1]Professor, Dept. of C.S.E, MEGHA Institute of Engg. & Tech. for Women, Eulabad, Telangana, India.

drkgsvenkatcse@meghaengg.ac.in ORCiD – orcid.org/0000-0003-4497-5494.

[2] Asst. Professor, Dept. of C.S.E, MEGHA Institute of Engg. & Tech. for Women, Eulabad, India

[3]Associate Professor, GITAM University, Rudram, Hyderabad, Telangana, India.

[4,5,6,7]Dept. of C.S.E, MEGHA Institute of Engg. & Tech. for Women, Eulaba, Telangana, India

ABSTRACT: Indian Space Research Organisation (ISRO) has developed navigation with Indian constellation (NavIC). Four geosynchronous and three geostationary satellites make up the NavIC satellite constellation. Numerous elements have an impact on the navigation system. One such issue that contributes to tracking mistakes caused by geostationary satellites is Doppler Collision. The geostationary satellite combination IRNSS 1C-1G, 1C-1F, and 1G-1F is where it occurs. Doppler Collision (DC) period is noticed when the relative Doppler frequency of the satellites is lower than the code tracking loop bandwidth. DC has an impact on the NavIC system's positioning accuracy. The geostationary satellite pair that is most impacted by DC is 1C-1G. The prediction of DC using machine learning methods will be highly helpful for increasing positioning accuracy and mitigating the DC. The geostationary satellite pair that is most impacted by DC is 1C-1G. The prediction of DC using machine learning methods will be highly helpful for increasing positioning accuracy and mitigating the DC. Relative Doppler, satellite position, satellite velocity, duration of occurrence, and relative Doppler are the factors taken into account for prediction. For prediction, K-Nearest Neighbours (KNN) regressor, Random Forest regressor, and linear regression are three supervised machine learning methods. Random Forest Regressor, one of these three algorithms, predicted the Doppler collision accurately.

KEYWORDS: Doppler Collision, Machine Learning, Navigation Systems, Satellite Signals.

I. INTRODUCTION

Navigation with Indian Constellation (NavIC), a fully operational regional satellite-based navigation system, was created by ISRO. It offers precise locating services throughout India and up to 1450 kilometres outside of national borders. Seven satellites make up the NavIC system; four of them are geosynchronous satellites and the other three are geostationary satellites [3]. IRNSS satellites 1B, 1D, 1E, and 1I are currently in geosynchronous orbit, while satellites 1C, 1F, and 1G are in geostationary orbit. There are two services offered by satellite-based navigation systems: Standard Positioning Services (SPS) and Restricted Services (RS). The NavIC system uses frequencies of 1562.42MHz, 2491.028MHz, and 1171.45MHz in the L1, S1, and L5 bands, respectively [5].

The CDMA operating system is used by the IGS receiver. Cross correlation of satellite signals causes Doppler collision. As a result, CDMA systems experience code measuring problems. Other navigation systems like GALILEO, GLONASS, and GPS are not thought to be affected by the Doppler Collision because their satellites are in a medium earth orbit and have equal Doppler frequencies, and the length of the collision will be very brief [24]. Machine learning algorithms are utilised to forecast the future incidence of Doppler collisions. To comprehend and forecast future occurrences better, machine learning is essential. A system that uses machine learning may learn things automatically and improvise based on experience without the need for outside programming [7].

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105352 |

II. RELATED WORK

1. Doppler Collision and cross correlation interference in GPS receivers
Authors: Asghar Tabatabaei Balaei, Dennis M Akos

Doppler collision is a physical effect in code-division multiple access (CDMA) systems where code measurement errors are observed due to cross-correlation effects. Doppler collision may occur when the Doppler frequency between signals from two different transmitters is smaller than the code lock loop bandwidth. In GPS, GLONASS, and Galileo, Doppler collision is rarely a problem because MEO satellites have equal Doppler frequencies for only very short periods. However, in systems where ground-based or geostationary transmitters are used for ranging the impact of this effect cannot be ignored [6].

2.Characterization of Doppler collision and its impact on carrier phase ambiguity resolution using geostationary satellites
Authors: Vimal Kumar Bhandari, Kyle O'Keefe

Doppler collision is a unique phenomenon in GNSS where tracking errors are introduced in the measurements due to cross-correlation between two or more satellites. It occurs when the relative Doppler frequencies of the satellites are less than the code loop bandwidth. Doppler collisions affect geostationary satellites for longer durations, due to their small line-of-sight velocities. This is a major concern for regional constellations such as IRNSS where geostationary satellites form a major part of the space segment. Doppler collision error resembles code multipath and if not mitigated could affect the ability to use pseudoranges of geostationary satellites in RTK positioning. We describe likely conditions for Doppler collision, derive a Doppler collision error envelope for L1 C/A code geostationary pseudorange measurements, and then demonstrate the effect using simulated and live signals. Results indicate that the error due to Doppler collision is not purely biased and varies with a mean value close to zero. The novelty includes analysis of Doppler collision effects on an RTK solution using geostationary satellites with emphasis on ambiguity convergence time. De-weighting of geostationary observations is proposed to reduce the impact of Doppler collision [3].

3.What is Doppler Collision and isit a problem in GNSS?
Doppler collision is a physical effect in code-division multiple access (CDMA) systems where code measurement errors are observed due to cross-correlation effects. Doppler collision may occur when the Doppler frequency between signals from two different transmitters is smaller than the code lock loop bandwidth.In GPS, GLONASS, and Galileo, Doppler collision is rarely a problem because MEO satellites have equal Doppler frequencies for only very short periods. However, in systems where ground-based or geostationary transmitters are used for ranging the impact of this effect cannot be ignored [27].

4.Predictive Data Optimization of Doppler Collision Events for NavIC system
AUTHORS: Sathish P, Krishna Reddy D

Navigation with Indian Constellation (NavIC) is satellite-based navigation system developed by Indian Space Research Organization (ISRO), India. It consists of seven satellites, among them, three are geostationary (GEO) satellites, and the rest are geosynchronous satellites. There are several factors that effect the positional accuracy of the NavIC system, and among them, one of the important parameter is Doppler collision (DC). The occurrence of the DC depends upon the usage of geostationary (GEO) satellites in position estimation. The DC may occur when the relative Doppler shift between two satellites is less than the bandwidth of receiver code tracking loop. To analyze the DC events, the required navigational data are collected from IRKS-GPS-SBAS (IGS) receiver located at low latitude station. There are variations in the values of Doppler shift of GEO satellites and have a significant impact on the Doppler collision prediction. To predict the DC accurately, the data optimization is very much essential for precise positioning applications. This paper presents the predictive data optimization of DC events by using various filtering methods such as moving average, Savitzky–Golay and median filter. Among three methods, Savitzky–Golay method provides better data optimization to predict short-term DC events as compared with other methods [35].
5. Understanding GPS Principles and Applications
AUTHORS: Elliott, D. Kalpan

This thoroughly updated second edition of an Artech House bestseller brings together a team of leading experts who provide a current and comprehensive treatment of the Global Positioning System (GPS). The book covers all the latest advances in technology, applications, and systems. The second edition includes new chapters that explore the

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105352 |

integration of GPS with vehicles and cellular telephones, new classes of satellite broadcast signals, the emerging GALILEO system, and new developments in the GPS marketplace. This single-source reference provides a quick overview of GPS essentials, an in-depth examination of advanced technical topics, and a review of emerging trends in the GPS industry [49].

III. EXISTING SYSTEM

In Existing system, the Most of the time additional protection is provided by the fact that each received signal has its own Doppler frequency offset as the result of each tracked satellite having a different range rate with respect to the receiver [51]. However, if the difference between the Doppler frequencies from two different satellites is small enough, the cross-correlation peaks may interfere with the primary peaks and cause tracking errors. The tracking errors are similar to multipath in that a secondary correlation peak is distorting the main peak [63].

DISADAVANTAGES :

- When two geostationary transmitters the cross-correlation amplitude creates a hyperbolic interference pattern that in low- and mid-latitudes is approximated by north-south running stripes where cross-correlation occurs.
- Doppler collision results in a multipath-like bias in the code measurement that can last for minutes to hours, using code measurements from these geostationary satellites to estimate the corresponding carrier phase ambiguities is risky.
- Algorithm: Pseudo Random Noise (PRN) codes [54].

IV. PROPOSED SYSTEM

In the proposed system Supervised Machine Learning is used in predicting the future Doppler Collision events. To train the model, supervised machine learning uses labeled data [43]. The model is trained by knowing the object features and labels in relation with those features. Three regression based supervised machine learning algorithms are used for predicting Doppler Collision events. The regression-based algorithm is used to predict a continuous output for an input based on previous data. The value of multiple predictor variables given to the model are satellite position of 1C-1G, in our model we combined both in a single dataset its velocities and occurrence period (seconds) and the relative Doppler is given as an output variable [68].

ADVANTAGES OF PROPOSED SYSTEM:

- K-Nearest Neighbors model gives a constant relative Doppler as an output as there is a class imbalance in the input parameters [57].
- Random Forest model improves its accuracy by using averaging technique for predicting Doppler Collision [48].
- Linear Regression model gives negative relationship between the parameters as value of independent variable increases, the value of dependent variable decreases.
- Algorithm: Logistic Regression, Random Forest, KNN [32].

V. IMPLEMENTAION

User:

The User can register the first. While registering he required a valid user email and mobile for further communications. Once the user register then admin can activate the user. Once admin activated the user then user can login into our system. User can upload the dataset based on our dataset column matched. For algorithm execution data must be in float format. Here we took doppler collision dataset. User can also add the new data for existing dataset based on our Django application. User can click the Classification in the web page so that the data calculated MAE, MSE, R2-score, RMSE based on the algorithms [54].

Admin:

Admin can login with his login details. Admin can activate the registered users. Once he activate then only the user can login into our system. Admin can view the overall data in the browser. Admin can click the Results in the web page so calculated MAE, MSE, R2-score, RMSE based on the algorithms is displayed. All algorithms execution complete then admin can see the overall accuracy in web page [76].

International Journal of Innovative Research in Computer and Communication Engineering

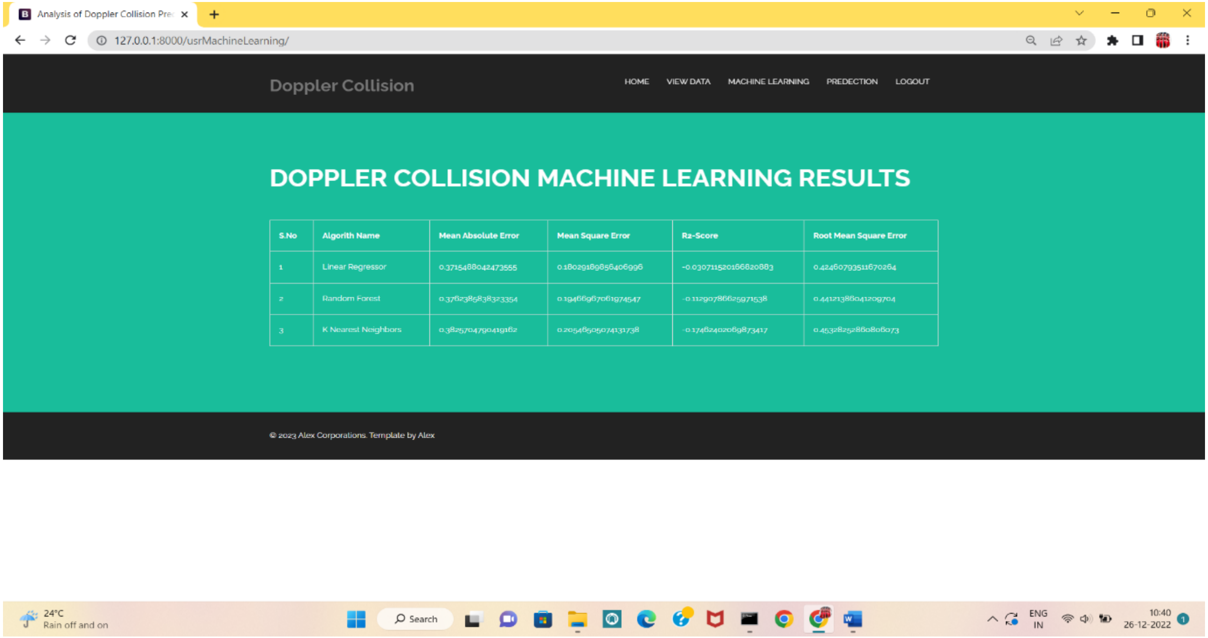
| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105352 |

Data Pre-processing:
A dataset can be viewed as a collection of data objects, which are often also called as a records, points, vectors, patterns, events, cases, samples, observations, or entities. Data objects are described by a number of features that capture the basic characteristics of an object, such as the mass of a physical object or the time at which an event occurred, etc. Features are often called as variables, characteristics, fields, attributes, or dimensions. The data preprocessing in this forecast uses techniques like removal of noise in the data, the expulsion of missing information, modifying default values if relevant and grouping of attributes for prediction at various levels [82].

Machine Learning Results:
Based on the split criterion, the cleansed data is split into 60% training and 40% test, then the dataset is subjected to six machine learning regressor such as Random Forest (RF), K-Nearest Neighbour(KNN), Linear Regression (LR). The accuracy of the classifiers was calculated and displayed in my results. The classifier which bags up the highest MSE could be determined as the best regression [97].



VI. CONCLUSION AND FUTURE WORK

In the analysis of predicting Doppler Collision, it has been found that Random Forest Regression has the least RMSE value which means that it is more efficient when compared to other two algorithms [109]. The RMSE of Linear Regression model is 1.15 for first Doppler Collision period and RMSE for second Doppler Collision period is 3.43. The RMSE value for first, second Doppler Collision period is 0.56, 0.47 respectively using Random Forest regressor model. The RMSE value of K-Nearest Neighbors regressor model is 0.51 for first Doppler Collision period and RMSE for second Doppler Collision period is 0.46. The Doppler Collision occurrence between 1C & 1G for event 1 is 1 hour 3 minutes 25 seconds and for Doppler Collision event 2 is 1 hour 13 minutes and 13 seconds. It is observed that Time and Satellites position, velocity are in correlation with relative Doppler. Further, this work can be extended by applying digital filters with Machine Learning algorithms to improve RMSE value.

VII. ACKNOWLEDGMENT

The author would like to thank the Founder Chairman Mr. N. Mohan Reddy garu Vice-Chairperson Smt. Kasireddy Malathi Reddy of MEGHA Institute of Engineering & Technology for Women, (Affilated to Jawaharlal Nehru Technological University, Hyderabad) Edulabad (V), Ghatkesar (M), Medchal Dist.,Telangana – 501 301, for their motivation and constant encouragement, over the years our college has been become synonymous with quality education, infrastructure and practice. “When a Women is a graduate every home will be a University” beyond providing a sound education, our chairman is to provide our students a holistic learning experience for life. The author would like to specially thank Dr. Vivek Dubey, Professor, Dept. of CSE, Oriental Instittute of Science & Technology,

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105352 |

(Affilated to Rajiv Gandhi Proudyogiki Vishwavidayalaya), Bhopal, Madhya Pradesh, Dr. Ar. Arunachalam, Dean Academics, School of Computing, Dr. M.G.R. Educational Research Institute, Dr.K.P. Thooyamani, Pro Vice-Chancellor, Bharath University, Chennai, Prof. Dr.S.Sivasubramanian, Principal, Dept. of CSE, DhanaLakshmi College of Engg., Chennai, Dr. A. Chandrasekar, Professor, Dept. of CSE, St. Joseph College of Engineering, (Affiliated to Anna University), Chennai, T.N, Dr. Chandra Sekhar Pattnaik, Omega P.G. College, (Affiliated to Osmania University) Telangana, Dr. K.V. Madhumuthy, Professor, Dept. of C.S.E, S.V. University, Tirupathi, A.P, Dr. Ashok Kumar, Professor & Head, Don Basco Institute of Technology, (Affiliated to Visvesraraya University), Bangalore, Karnataka for his guidance and for critical review of this manuscript and for his valuable input and fruitful discussions in completing the work and the Faculty Members of Department of Computer Science & Engineering. Also, he takes privilege in extending gratitude to his parents and family members who rendered their support throughout this Research work. Thanks for all those who helped me during the writing and reviewing process of the paper. Sincere thanks goes to the editors for their Industrious hard work. Special thanks goes the anonymous reviewers for their valuable suggestions and comments, which make the paper more complete.

REFERENCES

1. Asghar Tabatabaei Balaei, Dennis M Akos, “Doppler Collision and cross correlation interference in GPS receivers”, IGNSS Symposium 2009, December 1 to December 3, 2009.
2. Vimal Kumar Bhandari, Kyle O’Keefe, "Characterization of Doppler collision and its impact on carrier phase ambiguity resolution using geostationary satellites", GPS Solutions, Volume 21, Issue 4, Page number 1707, October 2017.
3. “What is Doppler Collision and isit a problem in GNSS?”, Inside GNSS, January 18,2016.
4. Vijayalakshmi K, Yoshitha G, Sahithi B, Sathish P, “Preliminary Analysis of Doppler Collision Occurrence in various Kinematic Conditions for NavIC system”.
5. Sathish P, Krishna Reddy D, “Predictive Data Optimization of Doppler Collision Events for NavIC system”.
6. Elliott, D. Kalpan, “Understanding GPS Principles and Applications”, Artech House Publishers, Boston & London 1996. ISBN 0-0890006-793
7. IRNSS “Signal In Space Interface Control Document for Standard Positioning Service”, version 1.0, ISRO, June 2014.
8. K.G.S. Venkatesan. Dr. V.Khanna, Dr. A.Chandrasekar, “Autonomous system for mesh network by using packet transmission & failure detection”, Inter. Journal of Innovative Research in computer & comm. Engineering, Vol. 2, Issue 12, December - 2014.
9. G. Bianchi, “Performance analysis of the IEEE 802.11 distributed coordination function,” IEEE J. Sel. Areas Commun., Vol. 18, No. 3, pp. 535–547, Mar. 2000.
10. K.G.S. Venkatesan, “Comparison of CDMA & GSM Mobile Technology”, Middle-East Journal of Scientific Research, 13 (12), PP. 1590 – 1594, 2013.
11. P. Indira Priya, K.G.S.Venkatesan, “Finding the K-Edge connectivity in MANET using DLTRT, International Journal of Applied Engineering Research, Vol. 9, Issue 22, PP. 5898 – 5904, 2014.
12. K.G.S. Venkatesan and M. Elamurugaselvam, “Using the conceptual cohesion of classes for fault prediction in object-oriented system”, International journal of Advanced & Innovative Research, Vol. 2, Issue 4, pp. 75 – 80, April 2013.
13. Ms. J.Praveena, K.G.S.Venkatesan, “Advanced Auto Adaptive edge-detection algorithm for flame monitoring & fire image processing”, International Journal of Applied Engineering Research, Vol. 9, Issue 22, PP. 5797 – 5802, 2014.
14. K.G.S. Venkatesan. Dr. V.Khanaa, “Inclusion of flow management for Automatic & dynamic route discovery system by ARS”, International Journal of Advanced Research in computer science & software Engg., Vol.2, Issue 12, PP. 1 – 9, December – 2012.
15. Needhu. C, K.G.S.Venkatesan, “A System for Retrieving Information directly from online social network user Link ”, International Journal of Applied Engineering Research, Vol. 9, Issue 22, PP. 6023 – 6028, 2014.
16. K.G.S. Venkatesan, R. Udayakumar, “DOS Primarily based attacks in service level parameters”, Journal of Chemical & Pharmaceutical Science, JCPS Vol.9, Issue 2, pp. E-385=E-387, April-June 2016.
17. K.G.S. Venkatesan, R. Resmi, R. Remya, “Anonymizimg Geographic routing for preserving location privacy using unlinkability and unobservability”, International Journal of Advanced Research in computer science & software Engg., Vol. 4, Issue 3, PP. 523 – 528, March – 2014.
18. Selvakumari. P, K.G.S.Venkatesan, “Vehicular communication using Fvmr Technique”, International Journal of Applied Engineering Research, Vol. 9, Issue 22, PP. 6133 – 6139, 2014.
19. K.G.S. Venkatesan, G. Julin Leeya, G. Dayalin Leena, “Efficient colour image watermarking using factor

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105352 |

Entrenching method", International Journal of Advanced Research in computer science & software Engg., Vol. 4, Issue 3, PP. 529 – 538, March – 2014.

20. P. Indira Priya, K.G.S.Venkatesan, "Finding the K-Edge connectivity in MANET using DLTRT, International Journal of Applied Engineering Research, Vol. 9, Issue 22, PP. 5898 – 5904, 2014.
21. K.G.S. Venkatesan. Kausik Mondal, Abhishek Kumar, "Enhancement of social network security by Third party application", International Journal of Advanced Research in computer science & software Engg., Vol. 3, Issue 3, PP. 230 – 237, March – 2013.
22. Annapurna Vemparala, K.G.S. Venkatesan, "Routing Misbehavior detection in MANET'S using an ACK based scheme", International Journal of Advanced & Innovative Research, Vol. 2, Issue 5, PP. 261 – 268, 2013.
23. K.G.S. Venkatesan. Kishore, Mukthar Hussain, "SAT : A Security Archicture in wireless mesh networks", International Journal of Advanced Research in computer science & software Engg., Vol. 3, Issue 3, PP. 325 – 331, April – 2013.
24. Annapurna Vemparala, K.G.S. Venkatesan, "A Reputation based scheme for routing misbehavior detection in MANET"S ", International Journal of computer science & Management Research, Vol. 2, Issue 6, June - 2013.
25. K.G.S.Venkatesan, "Planning in FARS by dynamic multipath reconfiguration system failure recovery in wireless mesh network", International Journal of Innovative Research in computer & comm. Engineering, Vol. 2, Issue 8, August - 2014.
26. .Dr. Shaik Rehana Banu, Balaj Ramkumar Rajagopal, Er. Sidharth, Dr, K.G.S. Venkatesan, "Smart Financial Management system based on Integrated Artificial Intelligence and Big Data", A Journal of New Zealand Herpetology, Vol. 12, Spl Issue 1, PP. 64-74, 2023
27. K.G.S.Venkatesan, M. Mohan Rao, M. Venu Gopal, V. Sandhiya "A Study on Multi-Cloud methodology of trusted third party in Mulitple double Encryption security Mechansism", International Journal of Innovative Research in computer & comm. Engineering, Vol. 7, Issue 1, pp. 40 – 48, Jamuary - 2019.
28. R. Karthikeyan, K.G.S. Venkatesan, A. Chandrasekar, "A comparison of strengths & weakness for Analytical Hierarchy process", Journal of Chemical & Pharmaceutical Science, JCPS Vol.9, Issue 3, pp. S-12=S-15, July-Sept. 2016.
29. K.G.S. Venkatesan, V. Khanaa, R. Udayakumar, "Wireless communication enables information transfer in ad-hoc network", Journal of Chemical & Pharmaceutical Science, Vol. 9, Issue 2, pp. E-388 – E-391, April-June, 2016
30. .Dr. Shaik Rehana Banu, Balaj Ramkumar Rajagopal, Er. Sidharth, Dr, K.G.S. Venkatesan, "Smart Financial Management system based on Integrated Artificial Intelligence and Big Data", A Journal of New Zealand Herpetology, Vol. 12, Spl Issue 1, PP. 64-74, 2023
31. B.V.V. Siva Prasad, G. Scharitha, K.G.S. Venkatesan " Optimisation of the Execution Time using Hadoop-Based parallel Mahcine Learning on computing cluster", Computer Networks, Big data & IoT, Lecturer Notes on Data Engg. & Comm. Tech., Vol. 117, pp. 233-244, Springer, Singapore, May 2022. https://link.springer.com/chapter/10.1007/978-981-19-0898-9_18
32. Vijayalakshmi K, Yoshitha G, Sahithi B, Sathish P, "Preliminary Analysis of Doppler Collision Occurrence in various Kinematic Conditions for NavIC system".
33. Sathish P, Krishna Reddy D, "Predictive Data Optimization of Doppler Collision Events for NavIC system".
34. Elliott, D. Kalpan, "Understanding GPS Principles and Applications", Artech House Publishers, Boston & London 1996. ISBN 0-0890006-793
35. K.G.S. Venkatesan, R. Udayakumar, "Univariate Analysis for information Agglomeration ", Journal of Chemical & Pharmaceutical Science, Vol. 9, Issue 2, pp. E-392 – E-395, April-June, 2016.
36. .Dr. Shaik Rehana Banu, Balaj Ramkumar Rajagopal, Er. Sidharth, Dr, K.G.S. Venkatesan, "Smart Financial Management system based on Integrated Artificial Intelligence and Big Data", A Journal of New Zealand Herpetology, Vol. 12, Spl Issue 1, PP. 64-74, 2023
37. K.G.S. Venkatesan, R. Udayakumar, "DOS primarily based attacks in service level parameters", Journal of Chemical & Pharmaceutical Science, Vol. 9, Issue 2, pp. E-385 – E-387, April-June, 2016.
38. K.G.S. Venkatesan, "Comparison of CDMA & GSM Mobile Technology", Middle-East Journal of Scientific Research, 13 (12), PP. 1590 – 1594, 2013.
39. K.G.S. Venkatesan, V. Khanaa, "Decoupling the location identity split from active network in the Turning Machine", International Journal of Pharmacy and Technology, Vol. 8, Issue 4, pp. 23300 – 23304, December - 2016.
40. K.G.S. Venkatesan, V. Khanaa, "Partitional Agglomeration calculations attempts & Territorially enhance on exact foundation", International Journal of Pharmacy and Technology, Vol. 8, Issue 3, pp. 18514 – 18520, September - 2016.
41. R. Karthikeyan, K.G.S. Venkatesan, A. Chandrasekar, "A comparison of strengths & weakness for Analytical

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105352 |

Hierarchy process", Journal of Chemical & Pharmaceutical Science, JCPS Vol.9, Issue 3, pp. S-12=S-15, July-Sept. 2016.

42. K.G.S. Venkatesan, R. Udayakumar, "DOS Primarily based attacks in service level parameters", Journal of Chemical & Pharmaceutical Science, JCPS Vol.9, Issue 2, pp. E-385=E-387, April-June 2016.
43. K.G.S. Venkatesan, V. Khanaa, "Contrasting Flip-Flop gates & Agents", International Journal of Pharmacy and Technology, Vol. 8, Issue 3, pp. 17410 – 17414, September - 2016.
44. B.V.V. Siva Prasad, G. Scharitha, K.G.S. Venkatesan " Optimisation of the Execution Time using Hadoop-Based parallel Mahcine Learning on computing cluster", Computer Networks, Big data & IoT, Lecturer Notes on Data Engg. & Comm. Tech., Vol. 117, pp. 233-244, Springer, Singapore, May 2022. https://link.springer.com/chapter/10.1007/978-981-19-0898-9_18
45. M. Poongodi, Sami Bourouis, Ahmed Najat Ahmed, K.G.S. Venkatesan, "A Novel secured Multi-Access edge computing based VANET with Neuro fuzzy systems based blockchain Framework", ScienceDirect, Elsevier, Computer Communications, May 2022. https://doi.org/10.1016/j.comcom.2022.05.014, https://www.sciencedirect.com/science/article/abs/pii/S0140366422001669
46. K.G.S.Venkatesan, A. Rama Prathap Reddy, N. Madhava Reddy, M. Sreenandan Reddy, K. Varun Kumar Reddy, "An Analytical study Implementation of multi-path file sharing on distributed Network", International Journal of Innovative Research in Science, Engineering & Tech., Vol. 5, Issue 12, December - 2016.
47. P. Indira Priya, K.G.S.Venkatesan, "Finding the K-Edge connectivity in MANET using DLTRT, International Journal of Applied Engg. Research, Vol. 9, Issue 22, PP. 5898 – 5904, 2014.
48. K.G.S. Venkatesan, "Comparison of CDMA & GSM Mobile Technology", Middle-East Journal of Scientific Research, 13 (12), PP. 1590 – 1594, 2013.
49. R. Karthikeyan, K.G.S. Venkatesan, A. Chandrasekar, "A comparison of strengths & weakness for Analytical Hierarchy process", Journal of Chemical & Pharmaceutical Science, JCPS Vol.9, Issue 3, pp. S-12=S-15, July-Sept. 2016.
50. V.M. Jothi Prakash, S. Venu Gopal, G. Chakravarthi, Dr. S.Prasana Raj Yadav, "A Study on Design and Fabrication of Screw Jack Lifter using Ratchet and Pawl Mechanism", International Journal of Innovative Research Science, Engineering & Technology, Vol. 8, Issue 1, pp. 262-271, January 2019.
51. S Murali, V M Jothi Prakash, S Vishal, "Modelling and Prototyping of Automatic clutch system for light vehicles", IOP Conference Series: Materials Science & Engg., Vol. 183, Conference 1, 2017, 012019.
52. V.M. Jothi Prakash, B. Elumalai, Dr. A. Ramadoss, Dr. S. Sathish, "A Survey on Bioplastics from Non-edible Tamarind Seed Strach", International Journal of Innovative Research Science, Engineering & Technology, Vol. 7, Issue 12, pp. 12377 – 12383, December 2018.
53. S. Venugopal, R. Baburajan, S. Baskar, V.M. Jothi prakash, "Testing of Helical spring using composite materials", International Journal of Management, Technology and Engg., Vol. 8, Issue XII, December/2018, pp. 4923 – 4932.
54. "What is Doppler Collision and isit a problem in GNSS?", Inside GNSS, January 18,2016.
55. Vijayalakshmi K, Yoshitha G, Sahithi B, Sathish P, "Preliminary Analysis of Doppler Collision Occurrence in various Kinematic Conditions for NavIC system".
56. Dr. Shaik Abdul Subhahan, Nazeer Shaik, Dr. K.G.S. Venkatesan, V.M. Jothiprakash, "A study on connecting Social media to E-Commerce mechanism, IJIRSET, Vol.8, Iss 11, Novem 2019.
57. K.G.S. Venkatesan, V. Khanaa, "Contrasting Flip-Flop gates & Agents", International Journal of Pharmacy and Technology, Vol. 8, Issue 3, pp. 17410 – 17414, September - 2016.
58. K.G.S. Venkatesan, "Comparison of CDMA & GSM Mobile Technology", Middle-East Journal of Scientific Research, 13 (12), PP. 1590 – 1594, 2013.
59. S. Ravichandran, K.G.S. Venkatesan, " Design & Development of code generation procedures in compiler scheme : Theoretical & Essential Appraise", Journal of Network Communications & Emerging Tech. (JNCET), Vol. 12, Issue 6, pp. 1-8, June 2022.
60. K.G.S. Venkatesan, V. Khanaa, "Decoupling the location identity split from active network in the Turning Machine", International Journal of Pharmacy and Technology, Vol. 8, Issue 4, pp. 23300 – 23304, December - 2016.
61. K.G.S. Venkatesan, V. Khanaa, "Partitional Agglomeration calculations attempts & Territorially enhance on exact foundation", International Journal of Pharmacy and Technology, Vol. 8, Issue 3, pp. 18514 – 18520, September - 2016.
62. .Dr. Shaik Rehana Banu, Balaj Ramkumar Rajagopal, Er. Sidharth, Dr, K.G.S. Venkatesan, "Smart Financial Management system based on Integrated Artificial Intelligence and Big Data", A Journal of New Zealand Herpetology, Vol. 12, Spl Issue 1, PP. 64-74, 2023

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105352 |

63. K.G.S. Venkatesan, V. Khanaa, Partitional Agglomeration calculations Attempt & Territorially enhance an exact Foundation ", International Journal of Pharmacy and Technology, IJPT, Vol. 8, Issue 3, pp. 18514 – 18520, ISSN : 0975 – 766X, CODEN : IJPTFI, 2016.
64. S. Ravichandran, K.G.S. Venkatesan, "Design & Development of can & Flex ray protocols for Real-Time System", Inter Jour. of Advanced Science & Research., Vol-5, Issue 5, Page 41-47, 2020
65. K.G.S. Venkatesan, V. Khanaa, Implementation of Golem based mostly Mobile Learning applied on as a versatile Learning Media", International Journal of Pharmacy and Technology, IJPT, Vol. 8, Issue 3, pp. 17280 – 17288, ISSN : 0975 – 766X, CODEN : IJPTFI, Sept 2016.
66. K.G.S. Venkatesan, V. Khanaa, "Decoupling the Location-Identity split from active Network in the Turning Machine", International Journal of Pharmacy and Technology, IJPT, Vol. 8, Issue 3, pp. 2300 – 2304, ISSN : 0975 – 766X, CODEN : IJPTFI, 2016.
67. K.G.S. Venkatesan, V. Khanaa, Contrasting Flip-Flop Gates & Agents", International Journal of Pharmacy and Technology, IJPT, Vol. 8, Issue 3, pp. 2300 – 2304, ISSN : 0975 – 766X, CODEN : IJPTFI, 2016.
68. S. J. Pimo, K. Priyadarsini, D. S. S. Satyanarayana and K. G. S. Venkatesan, "A Deep Neural Network based efficient Software-Hardware Co-design Architecture for Sparsity Exploration," *2021 International Conference on Artificial Intelligence and Smart Systems (ICAIS)*, Coimbatore, India, 2021, pp. 632-639, doi: 10.1109/ICAIS50930.2021.9395805.
69. A. N. Gnana Jeevan, K. Keerthika, S. Rao Terli, S. T. Naitik, K. G. S. Venkatesan and G. Manikandan, "A Novel Approach for Predicting wide range of traffic congestion using deep learning Technique," *2022 International Conference on Innovative Computing, Intelligent Communication and Smart Electrical Systems (ICSES)*, Chennai, India, 2022, pp. 1-6, doi: 10.1109/ICSES55317.2022.9914313.
70. K.G.S. Venkatesan, Dr. V. Khanaa, "On the construction of SMPS", International Journal of Pharmacy and Technology, IJPT, Vol. 8, Issue 3, pp. 17280 – 17288, ISSN : 0975 – 766X, CODEN : IJPTFI, 2016.
71. J. Dhiyaneswaran, S. Senthil Kumar, A. Mohan, M.Jemimah Carmichael,Anand Mohan, T.C. Manjunath, Markarand Upadhaya, V.M. Jothiprakash, "Design and Development of rescue robot in borewell environment", ELSEVIER-Materials Today: Proceedings, https://doi.org/10.1016/j.matpr.20201.10.768,March 2021.
72. Dr.K.G.S. Venkatesan,. Dr. M.Venu Gopal, V.Sandhiya,"A Study on Multi-Cloud methodology of Trusted third party multiple double encryption security mechanism", Inter. Journal of Inno. Research computer comm. Engg, Vol. 7, Issue 1, pp.40-48, Dec-2019.
73. S. John Pimo, Priyadarsini K, Dr. K.G.S. Venkatesan, Damaraju Sri Satyanarayana, "A Deep Neural network based efficient software & hardware co-design architecture for sparsity exploration", IEEE XPLORE, doi:10.1109/ICAIS50930.2021.9395805, 2021.
74. S. Vijayanand, Rajani Boddepalli, K.G.S. Venkatesan, Makarand Upadhyaya, J. Karthika, "Inspection of Dynamic power in Micro-Grid system during impedance-based compensation", ELSEVIER-Material Today: Proceedings, https://doi.org/10.1016/j.matpr.20201.10.628, December 2020.
75. C. Pavithra, Pooja Singh, Venkatesa Prabhu Sundramurthy, K.G.S. Venkatesan, T.S. Karthik, P,R, Karthikeyan, John T. Abraham, "A brief overview of maximum power point tracking algorithm for solar PV System", ELSEVIER-Material Today: Proceedings, https://doi.org/10.1016/j.matpr.2021.01.220, Feb 2021.
76. "What is Doppler Collision and isit a problem in GNSS?", Inside GNSS, January 18,2016.
77. Vijayalakshmi K, Yoshitha G, Sahithi B, Sathish P, "Preliminary Analysis of Doppler Collision Occurrence in various Kinematic Conditions for NavIC system".
78. Dr. K.G.S. Venkatesan, Nazeer shaik, Jaga Jeevan Rao Lingampallli, "A Guide for Software Testing-A Comprehensive Description",BlueRose Publihsers, ISBN:978-93-90034-20-8, Mar-20.
79. .Dr. Shaik Rehana Banu, Balaj Ramkumar Rajagopal, Er. Sidharth, Dr, K.G.S. Venkatesan, "Smart Financial Management system based on Integrated Artificial Intelligence and Big Data", A Journal of New Zealand Herpetology, Vol. 12, Spl Issue 1, PP. 64-74, 2023
80. Dr. K.G.S. Venkatesan, Nazeer shaik, P. Chitralingappa, "Trending Software Tools for Business Analytics:(In a Nutshell) Vol-2", BUUKS Publihsers, ISBN-10: 9390025478, June-2020.
81. S. Ravichandran, K.G.S. Venkatesan, "Design & Development of can & Flex ray protocols for Real-Time System", Inter Jour. of Advanced Science & Research., Vol-5, Issue 5, Page 41-47, 2020
82. K.G.S. Venkatesan, Nazeer shaik, P. Chitralingappa, "Trending Software Tools for Business Analytics:(In a Nutshell) ", BUUKS Publihsers, ISBN-10: 9390025281, May-2020.
83. Dr. K.G.S. Venkatesan, "A Brevity & Descriptive view on Big Data & Data Science", ISBN NO. 978-93-90290-55-0, Shashwat Publication, Bilsapur, Chhatisgarth, 2020.
84. S. Ravichandran, K.G.S. Venkatesan, "Design & Development of can & Flex ray protocols for Real-Time

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105352 |

System", Inter Jour. Of Advanced Scie & Research., Vol-5, Iss 5, Page 41-47, 2020

85. G. Sasikala, V.M. Jothiprakash, Bhaskar Pant, R. Subalakshmi, M. Thirumal Azhagan. "Optimization of process parameters for Friction stir welding of different Aluminum Alloys AA2618 to AA5086 by Taguch Method", Hindawi, Advances in Material Sciences & Engg., Vol. 2022, Article ID 3808605, https://doi.org/10.1155/2022/3808605
86. S. Vijayanand, Rajani Boddepalli, K.G.S. Venkatesan, et al., "Inspection of Dynamic power in Micro-Grid system during impedance- based compensation", Materials Today : Proceedings, https://doi.org/10.1016/j.matpr.2021.01.628, **Elsevier,** accepted 22-9-2020.
87. C. Pavithra, Pooja Singh, T.S. Karthik, P.R. Karthikeyan, K.G.S. Venkatesan., "A brief overview of maximum power point tracking algorithm for solar PV System**", Elsevier, Materials Today : Proceedings**, accepted 10-1-2021, https://doi.org/10.1016/j.matpr.2021.01.220
88. K.G.S. Venkatesan., "A Deep Neural network based efficient software & Hardware co-design architecture for sparsity exploration", IEEE Digital XPLORE, ISBN 978-1-7281-9537-7**,** 2021.
89. S.Venkateswara Rao, Dr. K.G.S. Venkatesan, "Natural Language processing Algorithms for public sentiment in India on COVID-19 Pandemic", ZKG International, Vol. 6, Issue 1, ISSN No. 2366-1313, Page No. 61-70, May-21.
90. S. Ravichandran, K.G.S. Venkatesan, " Design & Development of code generation procedures in compiler scheme : Theoretical & Essential Appraise", Journal of Network Communications & Emerging Tech. (JNCET), Vol. 12, Issue 6, pp. 1-8, June 2022.
91. S. J. Pimo, K. Priyadarsini, D. S. S. Satyanarayana and K. G. S. Venkatesan, "A Deep Neural Network based efficient Software-Hardware Co-design Architecture for Sparsity Exploration," *2021 International Conference on Artificial Intelligence and Smart Systems (ICAIS)*, Coimbatore, India, 2021, pp. 632-639, doi: 10.1109/ICAIS50930.2021.9395805.
92. A. N. Gnana Jeevan, K. Keerthika, S. Rao Terli, S. T. Naitik, K. G. S. Venkatesan and G. Manikandan, "A Novel Approach for Predicting wide range of traffic congestion using deep learning Technique," *2022 International Conference on Innovative Computing, Intelligent Communication and Smart Electrical Systems (ICSES)*, Chennai, India, 2022, pp. 1-6, doi: 10.1109/ICSES55317.2022.9914313.
93. "What is Doppler Collision and isit a problem in GNSS?", Inside GNSS, January 18,2016.
94. Dr. P.A. Abdul Saleem, Dr. K.G.S. Venkatesan, V.M. Jothi Prakash, "A Study on Traffic prediction for Intelligent Transportation System mechanism using Machine Learning", 3.International ANTALYA Scientific Research & Innovative Studies Congress, Antallya, TURKEY, ISBN no. 978-625-6404-64-9,, 13th-14th , Feb, 2023
95. Vijayalakshmi K, Yoshitha G, Sahithi B, Sathish P, "Preliminary Analysis of Doppler Collision Occurrence in various Kinematic Conditions for NavIC system".
96. Dr. K.G.S. Venkatesan, S.Akhila, "Multi-Owner based privacy enabled group data sharing in cloud computing", ZKG International, Vol. 6, Issue 1, ISSN No. 2366-1313, Page No. 61-70, May-21.
97. S.Venkateswara Rao, Dr. K.G.S. Venkatesan, "Natural Language processing Algorithms for public sentiment in India on COVID-19 Pandemic", ZKG International, Vol. 6, Issue 1, ISSN No. 2366-1313, Page No. 61-70, May-21.
98. Dr. K.G.S. Venkatesan, V.M. Jothi Prakash, Dr. K.P. Thooyamani, Dr. T. Nalini, V. Vanaja, Dr. S. Ravichandran, "An Analytical study on improvement of cloud provider optimizations of cost-effectivness and scalability for multiple users mechanism", International Journal of Innovative Research Science, Engg & Tech., Vol. 11, Issue 1, pp. 141– 152, January 2022.
99. M. Poongodi, Sami Bourouis, Ahmed Najat Ahmed, K.G.S. Venkatesan, "A Novel secured Multi-Access edge computing based VANET with Neuro fuzzy systems based blockchain Framework", ScienceDirect, Elsevier, Computer Communications, May 2022. https://doi.org/10.1016/j.comcom.2022.05.014, SCI, https://www.sciencedirect.com/science/article/abs/pii/S0140366422001669
100. B.V.V. Siva Prasad, G. Scharitha, K.G.S. Venkatesan " Optimisation of the Execution Time using Hadoop-Based parallel Mahcine Learning on computing cluster", Computer Networks, Big data & IoT, Lecturer Notes on Data Engg. & Comm. Tech., Vol. 117, pp. 233-244, Springer, Singapore, May 2022. https://link.springer.com/chapter/10.1007/978-981-19-0898-9_18
101. G. Sasikala, V.M. Jothiprakash, Bhaskar Pant, R. Subalakshmi, M. Thirumal Azhagan. "Optimization of process parameters for Friction stir welding of different Aluminum Alloys AA2618 to AA5086 by Taguch Method", Hindawi, Advances in Material Sciences & Engg., Volume 2022, Article ID 3808605, https://doi.org/10.1155/2022/3808605
102. S.Venkateswara Rao, Dr. K.G.S. Venkatesan, "Deep Learning Based Financial Data Prediction Method Using Long Short-Term Memory ", International Journal of Research, Vol. X, Issue XII, pp. 270-277, Dec 2021

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105352 |

103. Dr. K.G.S. Venkatesan, S.Venkateswara Rao, "Deep learning-based Parkinson's Disease prediction using Recurrent Neural Networks", International Journal of Research, Vol. X, Issue XII, pp. 262-269, Dec 2021

104. T. Vino, S.S. Sivaraju, R.V.V. Krishna, T. Karthikeyan, Yogesh kumar Sharma, K.G.S. Venkatesan, G. Manikandan, R. Selvameena, Mebratu Markos, "Multicluster Analysis and Design of Hybrid wireless sensor Networks using solar Energy', Hindawi, International Journal of Photoenergy, Volume 2022, Article ID 1164613, https://doi.org/10.1155/2022/1164613, 8 pages

105. S.Ravichandran, V.M. Jothiprakash, K.G.S. Venkatesan, "Finite element Analysis optimizes material selection & 3D printing of lower Limb Exoskeletons", Intern Journal of Scientific Methods in Engineering & Management, IJSMEM, Vol.1, Issue 3, 2023. https://ijsmem.com/admin/assets/article/pdf/27_pdf.pdf

106. G. Sunil Kumar, K.G.S. Venkatesan, "An Investigation of Heterogenous Embedded CPU & GPU Architecture", Intern Journal of Scientific Methods in Engg. & Manage, Vol.1, Issue 3, 2023. https://ijsmem.com/admin/assets/article/pdf/26_pdf.pdf

111.George Chellin Chandran J, P. Madhuri, S. Lakshmi, Balu Mahandiran S, K.G.S. Venkatesan, " An IOT & cloud-Based Database for Monitoring Manufacturing Operation process Data", Journal Eurpopean Chemical Bulletin, ISSN 20663-5346, May 2023

112.Yashwanth N, u. Nilabar Nisha, M. Arun, Anushya K, K.G.S. Venkatesan, " Developing an Energy-Efficient Scheme for connected coverage in Wireless Sensor Networks", Journal Eurpopean Chemical Bulletin, ISSN 20663-5346, May 2023

113.Dr. Vijaya Lakshmi V, Manjushree T L, Dr. Umesh Segal, Dr, K.G.S. Venkatesan, "A study in Apprehending the application of Machine Learning tools in Forecasting the Employee performance", A Journal of New Zealand Herpetology, Vol. 12, Spl Issue 1, PP. 64-74, 2023

114.Dr. Shaik Rehana Banu, Balaj Ramkumar Rajagopal, Er. Sidharth, Dr, K.G.S. Venkatesan, "Smart Financial Management system based on Integrated Artificial Intelligence and Big Data", A Journal of New Zealand Herpetology, Vol. 12, Spl Issue 1, PP. 64-74, 2023

INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.379

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING