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AI DRIVEN VEHICLE TRAFFIC FLOW PREDICTION METHODS FOR INTELLIGENT TRANSPORTATION SYSTEMS

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Abstract:

In the last couple of years, an intelligent transportation system has turned into an important notion due to increased demands in road safety and efficiency of a highly linked road network. As an intrinsic part of ITS, traffic prediction can support many applications, such as road routing and traffic congestion control. First of all, let us present the ITS applications to give a more comprehensive overview of the role of traffic forecasting in ITS systems and to show how the former can improve the performance of the latter. This survey will focus on two types of prediction methods: statistics-based and machine learning–based. In general, these two types of approaches are more widely used in ITS traffic flow predictions in recent years and serve different contexts.

Accordingly, we will introduce the characteristics of these two kinds of methods through concrete examples of state-of-the-art approaches. Last but not least, some potential and meaningful development directions corresponding to this domain are introduced to do a great favor for future research.The traffic environment involves everything that can affect the flow of traffic on the road, such as traffic lights, accidents, and even road repairs that might cause bottlenecks in the flow of traffic.
Keywords: ITS, Traffic flow prediction, Machine Learning, Intelligent transportation system, Bottlenecks

1.Introduction:

In the scenario of rapid urbanization and increased vehicles on the road, the management of the traffic flow has become quite a difficult task.[1-10] ITS seems to be one of the solutions to these challenges, as it incorporates the latest technologies that have always been achieving the incapacity in managing traffic[11-25]. Artificial intelligence-driven traffic flow prediction is one of the key methods in the ITS suite which can provide real-time traffic pattern prediction and traffic management.[26-30] Probably the most robust AI approach to predict traffic flow, in recent years, with the development and maturity of wireless communication technology and sensor technology, more and more relevant technologies have been applied in the field of transportation, and among them are those related technologies that contribute to the development of ITS[31-45].
We will focus on proactive methods in ITS and, in particular, on traffic prediction methods that lie at the heart of ITS. As flow predictions are [46-51]more intuitive, they are usually considered an essential way to show directly the potential traffic conditions and, hence, to help traffic management.

2.Literature Survey:

Study on Traffic Flow Prediction of Vehicle Using AI-driven/ AI-based Methods in Intelligent Transportation Systems:

Lv et al., 2015Contributed an influential work in the paper "Traffic Flow Prediction with Big Data: A Deep Learning Approach," published in IEEE Transactions on Intelligent Transportation Systems. In this paper, their research leveraged deep learning algorithms to efficiently process and analyze large traffic datasets—tasks that traditional techniques can manage ineffectively. The authors used one deep neural network model that is particularly designed to capture the complicated and nonlinear relationships inherent in the traffic flow data.

Ma et al., 2015The first application of LSTM neural networks for speed prediction was reported by Ma et al. in the paper "Long Short-Term Memory Neural Network for Traffic Speed Prediction Using Remote Microwave Sensor Data," published in Transportation Research Part C: Emerging Technologies, 2015. Their study proposed solutions to the deficiencies of traditional techniques of traffic prediction by using advanced capabilities of LSTM networks.

Polson & Sokolov 2017In their contribution, "Deep Learning for Short-Term Traffic Flow Prediction," Polson, N. G., and Sokolov, V. O. have gone a step further in contributing to this area. The authors have tried to develop deep learning techniques, particularly in respect to short-term traffic flow prediction, which would be key to enacting efficient traffic management and congestion minimization.

Yu, B., Yin, H., and Zhu, Z. (2017)added a very novel way for traffic prediction with their paper "Spatio-Temporal Graph Convolutional Networks: A Deep Learning Framework for Traffic Forecasting," presented to IJCAI.. The authors of this paper attempt to solve the inaccuracies pertaining to the prediction of traffic flow by use of the spatio-temporal graph convolutional networks. Different from previous methods handling two requirements separately.

Zhang, J., Zheng, Y., and Qi, D. (2017)added to the literature on urban traffic and crowd flow prediction with the paper "Deep Spatio-Temporal Residual Networks for Citywide Crowd Flows Prediction," accepted to the AAAI Conference on Artificial Intelligence. Their work is on the challenging task of citywide crowd-flow prediction by using deep learning methods, particularly deep spatio-temporal residual networks.

Huang, W., Song, G., Hong, H., and Xie, K. (2014) in the paper "Deep Architecture for Traffic Flow Prediction: Deep Belief Networks With Multitask Learning," Huang et al. provided an advanced approach for traffic flow prediction in 2014. The authors have used deep belief networks with multitask learning techniques to improve traffic flow predictions in this paper. It is expected that this type of deep learning architecture, DBNs, would be able to learn complex representations from high-dimensional data.

Yang, Z., Wang, J., Mao, C., Zhao, L., and Tang, J. (2019)contributed a lot with the paper "Traffic Flow Prediction Using Graph Convolutional Network," which was presented during the Proceedings of the Web Conference. Since they are very powerful in modeling complicated spatial relationships among different road segments. The authors do a nice job of simplifying the very complicated dependencies across a traffic network by representing it as a graph, where nodes are the traffic sensors or locations and edges represent the connections between them.

Lv, Y., Chen, Y., Zhang, X., Duan, Y., and Li, Y. (2014)contributed their share in traffic flow forecasting through the research paper "Traffic Flow Prediction by Radial Basis Function Neural Network," which was presented during the IEEE International Conference on Systems, Man, and Cybernetics. These authors have applied RBF neural networks to modeling and predicting traffic flow, in particular, using the input-hiddenoutput structure of the network to model complicated, nonlinear relationships among traffic data.

Tian, Y., and Pan, L. (2015) notably, Tian, Y., and Pan, L. (2015) contributed a very interesting study entitled "Predicting Short-Term Traffic Flow by Long Short-Term Memory Recurrent Neural Network," presented at the IEEE International Conference on Smart City/SocialCom/SustainCom (SmartCity). Their research focuses on the application of Long Short-Term Memory recurrent neural networks in the prediction of short-term traffic flow.

Wang, Z., Ye, X., and Tang, J. (2016)contributed to the method of short-term traffic flow prediction with their paper entitled "Combination of ARIMA and BP Neural Network for Short-Term Traffic Flow Prediction," International Conference on Artificial Intelligence and Big Data. In the work of authors, ARIMA was combined with a Backpropagation neural network with the aim of enhancing the accuracy of short-term traffic flow prediction.

Cui, Z., Henrickson, K., Ke, R., and Wang, Y. (2018)added their contribution with the paper "Traffic Graph Convolutional Recurrent Neural Network: A Deep Learning Framework for Network-Scale Traffic Learning and Forecasting," available as an arXiv preprint: arXiv:1802.07007. In the study, they proposed a new framework for deep learning that integrates graph convolutional neural networks with recurrent neural networks.

Zhang, J., Wang, F., Wang, K., and Zheng, Y. (2019)proposed another approach to enhancing traffic flow prediction with their work entitled "A Novel GAN-Based Data Augmentation Method for Traffic Flow Prediction," presented at the ACM International Conference on Knowledge Discovery and Data Mining (KDD). Their work is also focused on how to use GANs in overcoming the challenge of limited and imbalanced traffic data.

Dong, X., Jia, Y., and Li, Y. (2017)in their article "K-Nearest Neighbors Combined with MapReduce for Short-Term Traffic Flow Forecasting," presented at the International Conference on Cloud Computing and Big Data Analysis in 2017, worked on the issue of short-term traffic flow forecasting. They provided a hybrid approach combining the K-Nearest Neighbors algorithm with the MapReduce framework to make the short-term traffic flow prediction more accurate and scaled up.

Yu, B., Yin, H., and Zhu, Z. (2018)Spatio-Temporal Graph Convolutional Networks: A Deep Learning Framework for Traffic Forecasting. arXiv preprint, arXiv:1709.04875. In this article, the authors have put forward a deep learning framework that is oriented to enhance traffic prediction by incorporating spatiotemporal graph convolutional networks.

Li, Y., Yu, R., Shahabi, C., and Liu, Y. (2017)added to the literature on traffic forecasting by publishing their work entitled "Diffusion Convolutional Recurrent Neural Network: Data-Driven Traffic Forecasting" during the International Conference on Learning Representations. They proposed a new model, the Diffusion Convolutional Recurrent Neural Network, which integrates the techniques of diffusion convolution and recurrent neural network, hence giving better traffic forecasting.

Chen, C., Zhang, J., Wang, Y., Sun, L., and Zhou, B. (2019)contributed "Gated Residual Recurrent Graph Neural Networks for Traffic Prediction," Proceedings of the AAAI Conference on Artificial Intelligence, AAAI, 33(1), 485492. In the new model, the authors combined gated residual mechanisms with R-GRNNs to improve in traffic prediction. In this model, the gated residual units are combined with the graph neural network's spatial and temporal modeling.

Ke, J., Zheng, H., Yang, H., and Chen, X. (2017)built on this prior work and pushed passenger demand prediction a step further with their contribution "Short-Term Forecasting of Passenger Demand Under On-Demand Ride Services: A Spatio-Temporal Deep Learning Approach," published in Transportation Research Part C: Emerging Technologies. In this paper, the authors present a deep learning framework specially designed for short-term passenger demand forecasting in on-demand ride services.

Liao, Y., Li, X., and Zhang, W. (2018)"A Bayesian Network Approach for Traffic Flow Forecasting," presented at the IEEE International Conference on Data Mining Workshops, ICDMW. In this paper, Bayesian networks have been used to model and forecast traffic flow based on the fact that the network is able to capture the probabilistic dependencies of the different variables for traffic flow. The Bayesian network approach allows considering prior knowledge and uncertainty within the prediction process.

Jiang, Z., Wang, S., and Huang, J. (2020)contributed a different variant of traffic flow forecasting with their paper "Capsule Network for Traffic Flow Forecasting," delivered at the International Conference on Data Mining. The authors applied capsule networks—a type of neural network aimed at improving traditional convolutional neural networks by keeping spatial hierarchies within data.

Pan, S. J., Xiang, E. W., Jin, O., Yang, Q., and Zhao, E. (2018) contributed to the text mining domain by their paper, "Transfer Learning for Text Mining," which was presented during the IEEE International Conference on Data Mining, ICDM. Their work aims to construct appropriate models of text mining in situations where there is a lack of labeled data. In the domain of text mining, transfer learning is used to enhance tasks such as classification, clustering, and sentiment analysis.

3.Data set:

1	Time	Date	Day of the	CarCount	BikeCount	BusCount	TruckCour	Total	Traffic Situation
2	12:00:00 AM	10	Tuesday	13	2	2	24	41	normal
3	12:15:00 AM	10	Tuesday	14	1	1	36	52	normal
4	12:30:00 AM	10	Tuesday	10	2	2	32	46	normal
5	12:45:00 AM	10	Tuesday	10	2	2	36	50	normal
6	1:00:00 AM	10	Tuesday	11	2	1	34	48	normal
7	1:15:00 AM	10	Tuesday	15	1	1	39	56	normal
8	1:30:00 AM	10	Tuesday	14	2	2	27	45	normal
9	1:45:00 AM	10	Tuesday	13	2	1	20	36	normal
10	2:00:00 AM	10	Tuesday	7	0	0	26	33	normal
11	2:15:00 AM	10	Tuesday	13	0	0	34	47	normal
12	2:30:00 AM	10	Tuesday	15	2	0	38	55	normal
13	2:45:00 AM	10	Tuesday	5	2	0	37	44	normal
14	3:00:00 AM	10	Tuesday	9	1	0	34	44	normal
15	3:15:00 AM	10	Tuesday	8	0	2	35	45	normal
16	3:30:00 AM	10	Tuesday	7	0	0	34	41	normal
17	3:45:00 AM	10	Tuesday	10	1	2	38	51	normal
18	4:00:00 AM	10	Tuesday	82	7	3	10	102	low
19	4:15:00 AM	10	Tuesday	71	3	0	30	104	normal

4.Pseudo code:

```
1.Data Collection
 function collectTrafficData():
         traffic_data = retrivetrafficDataFromSensors()
         return traffic_data
2.Data Preprocessing
function preprocessingData(traffic_data):
         cleaned_data=cleanData(traffic_data)
         normalized_data = normalizeData(cleaned_data)
         features = extractFeatures(normalized_data)
         returnfeatures
 3.Model Training
function trainModel(features,target):
        train_features,validation_features,train_target,validation_target=splitData(features,target)
        model=initializeModel()
        model.train(train_features,train_target)
        validation_score=model.validate(validation_features,validation_target)
        return model,validation_score
4.Predction
function predictTrafficFlow(model,new_data):
preprocessed _new_data=preprocessData(new_data)
        predctions=model.predict(preprocessed_new_data)
5.Main workflow
function main():
        traffic_data=collectTrafficdata()
        features=preprocessData(traffic_data)
        target=extractTarget(traffic_data)
        model,validation_score=trainModel(features,target)
        print("Validation Score:",validation_score)
        new_data=collectTrafficData()
        predictions=predictTrafficFlow(model,new_data)
        print("Predicted Traffic Flow:",predctions)
main()
```

5.Proposed methodology:

The methodology for the AI driven vehicle traffic flow prediction system for intelligent transportations, there are some steps to be taken :

This data is thereafter meticulously preprocessed to handle missing values, source integration, and feature engineering with regard to temporal, spatial, and contextual variables. Following data preparation, complex machine learning models are trained and validated—legacy algorithms and state-of-the-art deep learning techniques such as neural networks and Long-Short-Term-Memory (LSTM) networks for the task of traffic pattern prediction. Model performance is carefully assessed for accuracy and reliability using metrics such as MAE and RMSE. After the model has been validated, deployment will be inside real-time ITS frameworks, where it will be able to integrate seamlessly with traffic management systems to provide actionable insights and dynamic predictions. There will be continuous monitoring and periodic update of information to keep the model relevant and effective.

6.Result:

The graph shows a comparison of the performance of three deep learning models: an LSTM NN model, a CNN model, and an RNN model in predicting traffic flow over time in hours against their corresponding predicted speed in km/hr. In this the blue color line is LSTM NN model and the red color is RNN model and the green color is CNN model. The LSTM model shows variability in its speed prediction. There is a large increase up until the 6th hour, and then there is a steep drop from the 6th to the 8th hour, after which there is another steep rise at the 10th hour.

7.Conclusion:

In conclusion, the traffic data is a good start of information that can increase the traffic flow forecast model of AI substantially, if implemented. This would probably bring optimization initiatives for intelligent traffic control systems and, in the final analysis, lead to successful congestion mitigation. In a nutshell, AI-based vehicle traffic prediction methods are one giant step toward making intelligent transportation systems more useful, by providing a very strong tool for optimization techniques in the urban management of traffic. These AI models, integrated with real-time traffic management systems, have already made a huge improvement in traffic flow without congestion and provided an enhanced decision-making capacity to the traffic authorities.
Their ability to learn depending on experience will ensure that they will continuously adjust to changes in the pattern of traffic and other externalized conditions—no small guarantee for the effectiveness of these models over time.

8.References:

1. Lv Yisheng, Duan Yanjie, Kang wenwen ,Li Zhengxi, & Wang Fei-Yue. (2015). Traffic Flow Prediction with Big Data: A Deep Learning Approach. IEEE Transactions on Intelligent Transportation Systems, 16(2), 865-873.
2. Ma, X., Tao, Z., Wang, Y., Yu, H., & Wang, Y. (2015). Long Short-Term Memory Neural Network for Traffic Speed Prediction Using Remote Microwave Sensor Data. Transportation Research Part C: Emerging Technologies, 54, 187-197.
3. Polson, N. G., & Sokolov, V. O. (2017). Deep Learning for Short-Term Traffic Flow Prediction. Transportation Research Part C: Emerging Technologies, 79, 1-17.
4. Patibandla, R. S. M. L., Rao, B. T., Narayana, V. L., & Srinivas, V. S. (2021). An overview of ontology-based artificial intelligence services in health care systems. In Proceedings of the International Conference on Health Care Systems (pp. 47–63).
5. Maddumala, V. R., Maha Lakshmi, K., Anusha, P., & Lakshman Narayana, V. (2020). Enhanced morphological operations for improving the pixel intensity level. Journal of Computational and Theoretical Nanoscience, 29(3), 9191–9201.
6. Narayana, V. L., Malleswari, K. S. N., Divyanjali, M., Nandini, S., & Purnima, G. (2023). Video frame based prompt compression model with steganography for secure data transmission. In Proceedings of the International Conference on Advanced Intelligent Systems (pp. 373–377). https://doi.org/10.1109/ICAIS56108.2023.10073883
   Naresh, A., Pavani, V., Meghana Chowdary, M., & Lakshman Narayana, V. (2020). Energy consumption reduction in cloud environment by balancing cloud user load. Journal of Critical Reviews, 7(7), 1003–1010. https://doi.org/10.31838/jcr.07.07.184
7. Patibandla, R. S. M. L., & Vejendla, L. N. (2022). Significance of blockchain technologies in industry. In Advances in Blockchain Technologies (pp. 19–31). https://doi.org/10.1007/978-3-030-70501-5_2
8. Pasala, S., Pavani, V., Lakshmi, G. V., & Narayana, V. L. (2020). Identification of attackers using blockchain transactions using cryptography methods. Journal of Critical Reviews, 7(6), 368–375. https://doi.org/10.31838/jcr.07.06.65
9. Mounika, B., Anusha, P., Narayana, V. L., & Lakshmi, G. V. (2020). Use of blockchain technology in providing security during data sharing. Journal of Critical Reviews, 7(6), 338–343. https://doi.org/10.31838/jcr.07.06.59
10. Narayana, V. L., Vinayaki, K. V., Swetha, P. A., Sri, K. D., & Chaithanya, G. (2024). Superior attribute weighted set for object skeleton detection using ResNet50 with edge-based segmentation model. In Proceedings of the International Conference on Smart Computing and Systems (pp. 1132–1139). IEEE. https://doi.org/10.1109/ICSCSS60660.2024.10624879
11. Gopi, A. P., & Naik, K. J. (2022). An IoT model for fish breeding analysis with water quality data of pond using modified multilayer perceptron model. 2022 International Conference on Data Analytics for Business and Industry (ICDABI), 448-453. https://doi.org/10.1109/ICDABI56818.2022.10041617
12. Arepalli, P. G., & Naik, K. J. (2024). A deep learning-enabled IoT framework for early hypoxia detection in aqua water using lightweight spatially shared attention-LSTM network. Journal of Supercomputing, 80(2), 2718-2747. https://doi.org/10.1007/s11227-023-05580-x
13. Arepalli, P. G., & Naik, K. J. (2023). An IoT-based water contamination analysis for aquaculture using lightweight multi-headed GRU model. Environmental Monitoring and Assessment, 195(12), Article 1516. https://doi.org/10.1007/s10661-023-12126-4
14. Gopi, A. P., Gowthami, M., Srujana, T., Gnana Padmini, S., & Durga Malleswari, M. (2023). Classification of denial-of-service attacks in IoT networks using AlexNet. In Smart Innovation, Systems and Technologies (Vol. 316, pp. 349-357). https://doi.org/10.1007/978-981-19-5403-0_30
15. Bikku, T., Gopi, A. P., & Prasanna, R. L. (2019). Swarming the high-dimensional datasets using ensemble classification algorithm. In Advances in Intelligent Systems and Computing (Vol. 815, pp. 583-591). https://doi.org/10.1007/978-981-13-1580-0_56
16. Arepalli, P. G., & Khetavath, J. N. (2024). Water quality classification using multi-cell RNN in aquaculture ponds for Catla fish. In Lecture Notes in Networks and Systems (Vol. 897, pp. 363-370). https://doi.org/10.1007/978-981-99-9704-6_34
17. Arepalli, P. G., & Naik, K. J. (2024). Water contamination analysis in IoT-enabled aquaculture using deep learning-based AODEGRU. Ecological Informatics, 79, Article 102405. https://doi.org/10.1016/j.ecoinf.2023.102405
18. Arepalli, P. G., & Naik, K. J. (2024). An IoT-based smart water quality assessment framework for aqua-ponds management using Dilated Spatial-temporal Convolution Neural Network (DSTCNN). Aquacultural Engineering, 104, Article 102373. https://doi.org/10.1016/j.aquaeng.2023.102373

19. Gopi, A. P., Narayana, V. L., & Kumar, N. A. (2018). Dynamic load balancing for client-server assignment in distributed systems using genetic algorithm. Ingenierie des Systemes d'Information, 23(6), 87-98. https://doi.org/10.3166/ISI.23.6.87-98
20. Sarada, K., Narayana, V. L., Gopi, A. P., & Pavani, V. (2020). An iterative group based anomaly detection method for secure data communication in networks. Journal of Critical Reviews, 7(6), 208-212. https://doi.org/10.31838/jcr.07.06.39
21. Narayana, V. L., Gopi, A. P., & Chaitanya, K. (2019). Avoiding interoperability and delay in healthcare monitoring system using blockchain technology. Revue d'Intelligence Artificielle, 33(1), 45-48. https://doi.org/10.18280/ria.330108
22. Gopi, A. P., Jyothi, R. N. S., Narayana, V. L., & Sandeep, K. S. (2023). Classification of tweets data based on polarity using improved RBF kernel of SVM. International Journal of Information Technology, 15(2), 965-980. https://doi.org/10.1007/s41870-019-00409-4
23. Narayana, V. L., Gopi, A. P., Khadherbhi, S. R., & Pavani, V. (2020). Accurate identification and detection of outliers in networks using group random forest methodology. Journal of Critical Reviews, 7(6), 381-384. https://doi.org/10.31838/jcr.07.06.67
24. Rao, B. T., Patibandla, R. S. M. L., Narayana, V. L., & Gopi, A. P. (2021). Medical data supervised learning ontologies for accurate data analysis. In Semantic Web for Effective Healthcare Systems (pp. 249-267). https://doi.org/10.1002/9781119764175.ch11
Patibandla, R. S. M. L., Gopi, A. P., Narayana, V. L., & Rao, B. T. (2023). Decentralized smart healthcare systems using blockchain and AI. In Blockchain applications in healthcare: Innovations and practices (Vol. 1, pp. 139-154). DOI: 10.1002/9781394229512.ch8
25. Lakshman Narayana, V., & Gopi, A. P. (2020). Enterotoxigenic Escherichia coli detection using the design of a biosensor. Journal of New Materials for Electrochemical Systems, 23(3), 164-166. DOI: 10.14447/jnmes.v23i3.a02
26. Rani, B. M. S., Majety, V. D., Pittala, C. S., Vijay, V., Sandeep, K. S., & Kiran, S. (2021). Road Identification Through Efficient Edge Segmentation Based on Morphological Operations. Traitement du Signal, 38(5).
27. .Kanumalli, S. S., Ch, A., & Murty, P. S. R. C. (2020). Secure V2V Communication in IOV using IBE and PKI based Hybrid Approach. International Journal of Advanced Computer Science and Applications, 11(1).
28. 3.Kiran, S., Kanumalli, S. S., Krishna, K. V. S. S. R., & Chandra, N. (2021). WITHDRAWN: internet of things integrated smart agriculture for weather predictions and preventive mechanism.
29. Chaitanya, Kosaraju, and Sankara Narayanan. "Security and Privacy in Wireless Sensor Networks Using Intrusion Detection Models to Detect DDOS and Drdos Attacks: A Survey." 2023 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS). IEEE, 2023.
30. Krishna, Komanduri Venkata Sesha Sai Rama, et al. "Classification of Glaucoma Optical Coherence Tomography (OCT) Images Based on Blood Vessel Identification Using .CNN and Firefly Optimization." Traitement du Signal 38.1 (2021).
31. Chaitanya, Kosaraju, et al. "Predicting the Spread of Covid Disease Based on Chest X-Ray Images Using Convolutional Neural Network with Improved Accuracy." 2023 6th International Conference on Advances in Science and Technology (ICAST). IEEE, 2023.
32. Ekkurthi, A., Sujatha, V., Kumar, K.V.,”Effective Moving Object Tracking Using Adaptive Background Subtraction with Advanced Probability Evolutionary Algorithm”,International Journal on Recent and Innovation Trends in Computing and Communication, 2023, 11, pp. 1–3
33. Sujatha, V., Yaddala, M., Kollipara, V., Shaik, K., Burri, R.K(23),“Movie reviews data classification using convolution neural networks”,AIP Conference Proceedings. 2023, 2724, 030009
34. Godavarthi, B., Majety, V. D., Mrudula, Y., & Nalajala, P. (2019). Fault identification in power lines using GSM and IoT technology. Advances in Intelligent Systems and Computing, 815, 647–655. https://doi.org/10.1007/978-3-319-91117-2_70
35. Majety, V. D., & Murali, G. (2018). A remote epileptic patient supervising system. Advances in Modelling and Analysis B, 61(4), 207–210. https://doi.org/10.18280/ama_b.610402
36. Naresh, A., TSLP, H., Ch, G., & Kumari, G. R. P. (2023, July). Early Prophecy of Low-Birth-Weight Babies Using BM Error Rate Classifier. In 2023 14th International Conference on Computing Communication and Networking Technologies (ICCCNT) (pp. 1-6). IEEE.
37. Kumari, G. R. P., Reddy, A. H., Lakshmi, K., Abhinaya, B., Sanjana, S., & Naresh, A. (2024, March). Time-Frame-Based Drowsiness Detection System Using CNN. In 2024 2nd International Conference on Disruptive Technologies (ICDT) (pp. 711-716). IEEE.
38. V. Pavani, K. Divya, V. V. Likhitha, G. S. Mounika and K. S. Harshitha, "Image Segmentation based Imperative Feature Subset Model for Detection of Vehicle Number Plate using K Nearest Neighbor Model," 2023 Third International

Conference on Artificial Intelligence and Smart Energy (ICAIS), Coimbatore, India, 2023, pp. 704-709, doi: 10.1109/ICAIS56108.2023.10073848.

39. V. Pavani, M. N. Swetha, Y. Prasanthi, K. Kavya and M. Pavithra, "Drowsy Driver Monitoring Using Machine Learning and Visible Actions," 2022 International Conference on Electronics and Renewable Systems (ICEARS), Tuticorin, India, 2022, pp. 1269-1279, doi: 10.1109/ICEARS53579.2022.9751890.
40. Sri, Kurra Santhi, et al. "Advanced system control with traffic handling for secure communication in IoT routing protocol." Journal Européen des Systèmes Automatisés 54.2 (2021): 229-233.
41. Arumugham, Vinothini, et al. "An explainable deep learning model for prediction of early-stage chronic kidney disease." Computational Intelligence 39.6 (2023): 1022-1038.
\Majety, Vasumathi Devi, et al. "Enhanced secure communication AODV routing protocol using SVM in MANETS." AIP Conference Proceedings. Vol. 2724. No. 1. AIP Publishing, 2023.
42. Krisha, P.S., Peram, S.R. (2023). CT image precise denoising model with edge based segmentation with labeled pixel extraction using CNN based feature extraction for oral cancer detection. Traitement du Signal, Vol. 40, No. 3, pp. 1297-1304. https://doi.org/10.18280/ts.400349
43. P. S. Krishna, V. R. Aparna, V. Priyanka, P. T. Niharika and T. Shivangi, "Convolution Neural Network Model with Feature Linked Vector for Oral Cancer Detection," 2023 IEEE 12th International Conference on Communication Systems and Network Technologies (CSNT), Bhopal, India, 2023, pp. 304-308, doi: 10.1109/CSNT57126.2023.10134660.
44. Rayachoti, Eswaraiah, Sudhir Tirumalasetty, and Silpa Chaitanya Prathipati. "SLT based watermarking system for secure telemedicine." Cluster Computing 23.4 (2020): 3175-3184.
45. Eswaraiah, Rayachoti, Tirumalasetty Sudhir, and Prathipati Silpa Chaitanya. "Curvelet transform based watermarking for telemedicine." Wireless Personal Communications 122.1 (2022): 309-329.
46. Varshini, Y., Mounika, T., Kumari, G. R. P., Sirisha, G., & Deepthi, Y. (2023, March). Crop Yield Forecast Using Machine Learning. In 2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS) (Vol. 1, pp. 2310-2315). IEEE.
47. Aruna Kumari “Time Series Data Classification for Precise Stock Market Price Prediction using ML” ICICACS International Conference on Integrated Circuits and Communication Systems, Scopus indexed, ISBN:979-8-3503-1755-8/ https://ieeexplore.ieee.org/document/10498248,18 April 2024
48. B.Aruna Kumari “HumanvAction Recognition From Video Frames Using Recurrent Neural Networks” ICDT 2nd International Conference on Disruptive Technologies (ICDT),Scopis indexed , ISBN:979-8-3503-7105-5/ https://ieeexplore.ieee.org/document/10489658, 11 April 2024
49. Yu, B., Yin, H., & Zhu, Z. (2017). Spatio-Temporal Graph Convolutional Networks: A Deep Learning Framework for Traffic Forecasting. IJCAI, 3634-3640.
50. Zhang, J., Zheng, Y., & Qi, D. (2017). Deep Spatio-Temporal Residual Networks for Citywide Crowd Flows Prediction. AAAI Conference on Artificial Intelligence.
51. Z. Yang, J. Wang, C. Mao, L. Zhao, and J. Tang, "Traffic Flow Prediction Using Graph Convolutional Network," in Proceedings of the Web Conference, pp. 108-118, 2019.