**Name :** Manish Sanghani (**22BCE312**)

Mehul Satasiya (**22BCE316**)

**Course :**  Data Structures ( **2CS501 )**

**Batch :** E2

***ASSIGNMENT 2***

***A. Literature Review***

|  |  |
| --- | --- |
| **Sr. No.** | **1** |
| **Authors / Year** | Yuxuan Yang, Xiaojie Wang, Zhaolong Ning, Joel J. P. C. Rodrigues, Xin Jiang, and Yi Guo  2021 |
| **Paper Title** | **Edge Learning for Internet of Medical Things and Its COVID-19 Applications** |
| **Core Contribution** | The core contribution is a distributed 3C resource allocation framework for IoMT, employing the Multi-Criticality Strategy |
| **Algorithm Methodology** | The MSLA algorithm technique is such that the gateway updates the strategy selection probability using the algorithm based on the utility and 3C resource. |
| **Parameters** | System metrics including game theoretic models, multifactorial strategy learning algorithm (MSLA), convergence speed |
| **Strength** | The strength of these personalized healthcare strategies is based on medical significance and demonstrated effectiveness through performance evaluation. |
| **Limitations** | The limitation proposed framework include potential challenges in practical implementation. |
| **Remark** | This paper presents an example demonstrating the high efficiency of the developed 3C resource allocation strategy. |

|  |  |
| --- | --- |
| **Sr. No.** | **2** |
| **Authors / Year** | Hong-Ning Dai , Yulei Wu, Hao Wang, Muhammad Imran, Noman Haider 2015 |
| **Paper Title** | **Blockchain-empowered Edge Intelligence for Internet of Medical Things Against COVID-19.** |
| **Core Contribution** | These include strengthening security, ensuring data privacy, enabling real-time processing while providing specific solutions for monitoring the source of infectious diseases, creating traceable healthcare supply chains and facilitating telemedicine. |
| **Algorithm Methodology** | This methodology may include using decentralized blockchain capabilities to ensure security, immutability, and privacy, and combining edge computing capabilities to enable real-time processing of IoMT data at device, edge, and cloud levels. |
| **Parameters** | The use of Internet of Medical Things (IoMT) devices, wearable sensors, biosensors, and Internet-connected medical devices is discussed. |
| **Strength** | The strength of the proposed system lies in the innovative integration of blockchain technology and edge intelligence to address Internet of Medical Things (IoMT) challenges during the COVID-19 pandemic. Delivers improved security, privacy, and real-time processing across devices, edge, and cloud. |
| **Limitations** | As can be seen from the provided text, limitations of the proposed system include potential issues related to confidential information leakage and security vulnerabilities in Internet of Medical Things (IoMT) systems. |
| **Remark** | Provide solutions to monitor the source of infectious diseases and create a traceable medical device supply chain by improving security, privacy, and real-time data processing capabilities. |

|  |  |
| --- | --- |
| **Sr. No.** | **3** |
| **Authors / Year** | Kefeng Wei , Lincong Zhang , Yi Guo and Xin Jiang |
| **Paper Title** | **Health Monitoring Based on Internet of Medical Things** |
| **Core Contribution** | A CNN based model for COVID -19 detection from chest X-ray images with a saliency map for visual explanation. |
| **Algorithm Methodology** | A CNN with four convolutional layers, two max-pooling, two dropout layers and two fully connected layers. The saliency map is generated using the Grad-CAM technique. |
| **Parameters** | Accuracy sensitivity and Specificity |
| **Strength** | High performance , robustness and interpretability |
| **Limitations** | Limited dataset , lack of clinical validation and possible overfitting |
| **Remark** | A simple and effective approach for COVID -19 detection with potential applications in healthcare. The saliency map provides useful insights into the models decision making process. The approach could be improved by using a larger and more diverse dataset incorporating other modalities such as CT scans and conducting clinical trials. |

|  |  |
| --- | --- |
| **Sr. No.** | **4** |
| **Authors / Year** | Khalid Haseeb ,Irshad Ahmad ,Israr Iqbal Awan ,,Jaime Lloret  2021 |
| **Paper Title** | **A Machine Learning SDN-Enabled Big Data Model for IoMT Systems** |
| **Core Contribution** | The main contribution is the integration of unsupervised machine learning, optimized routing algorithms, intrusion detection, and security mechanisms within SDN. |
| **Algorithm Methodology** | This model uses mean-shift clustering to classify medical IoT sensors into collections without any predefined assumptions. This model integrates intrusion detection and security mechanisms using SDN architecture to protect sensitive medical data. |
| **Parameters** | The proposed model uses IoT sensor data, centroids, and network records (node ​​statistics, route information) with mean shift clustering for classification and optimized routing algorithms of SDN. |
| **Strength** | Work involving data structures ,information about the design, efficiency, and effectiveness of the data structures used. |
| **Limitations** | Work involving data structures requires a more detailed examination of the original research work to obtain information about the design, efficiency, and effectiveness of the data structures used. |
| **Remark** | Comments typically include ideas, criticism, or reflections on the methodology, results, and potential areas for improvement, including the use of data structures. |

|  |  |
| --- | --- |
| **Sr. No.** | **5** |
| **Authors / Year** | G. Ignisha Rajath,, R. Ramesh Kumar, D. Ravikumar, T. Joel, Seifedine Kadry,Chang-Won Jeong6 and Yunyoung Nam 2022 |
| **Paper Title** | **Brain Tumor Classification Using Fine-Tuned GoogLeNet Features and Machine Learning Algorithms: IoMT Enabled CAD System** |
| **Core Contribution** | A method for classifying brain tumors into three types using deep learning and machine learning |
| **Algorithm Methodology** | googLeNet a convolutional neural network) for feature extraction and various classifiers k-NN,SVM,RF,DT,NB,LR)for classification |
| **Parameters** | Accuracy , sensitivity , specificity , F1-score , precision , recall , ROC curve and AUC |
| **Strength** | High accuracy and sensitivity on two dataset of brain MRI images, robust to noise and rotation , compatible with IoMT devices |
| **Limitations** | Limited to three types of brain tumors , requires large amount of data for training , dependent on the choice of classifier |
| **Remark** | A novel and efficient approach for brain tumor diagnosis , but needs more validation and generalization on different types and stages of brain tumors |

|  |  |
| --- | --- |
| **Sr. No.** | **6** |
| **Authors / Year** | Muthulakshmi Venkatesan, Priya Lakshmipathy, Vani Vijayan, Ramesh Sundar  2021 |
| **Paper Title** | **Cardiac disease diagnosis using feature extraction and machine learning based classification with Internet of Things(IoT)** |
| **Core Contribution** | A method for detecting COVID-19 from chest X-ray images using machine learning , deep learning and transfer learning |
| **Algorithm Methodology** | ResNet50 is a convolution neural network for feature extraction and finetuning and a fully connected layer for classification |
| **Parameters** | Sensitivity , precision , accuracy ,, specificity , F1-score , recall confusion matrix |
| **Strength** | High accuracy and sensitivity on a dataset of 1252 chest X-ray images faster and cheaper than RTPCR test and adaptable to new data |
| **Limitations** | Limited binary classification on of COVID -19 and normal cases , requires high quality images for input , dependent on the availability of labelled data |
| **Remark** | A promising and timely approach for COVID -19 diagnosis bur needs more testing and comparison with other methods and datasets |

|  |  |
| --- | --- |
| **Sr. No.** | **7** |
| **Authors / Year** | Prince Tehseen Ganai, Dr. Pradnya Wankhade  2022 |
| **Paper Title** | **Machine Learning approaches for energy efficient Mechanisms in IoT System for Medical Domain** |
| **Core Contribution** | A theoretical framework and a survey on the types of community communities based on the orientation of cultural values. |
| **Algorithm Methodology** | It is a questionnaire that measures aspects of cultural values ​​and community types and a critical rational approach that integrates the concepts of culture, community, and rationality. |
| **Parameters** | Community type index, cultural value index, rationality index, correlation coefficient. |
| **Strength** | Restricted to the Indonesian environment, ignores other variables that can affect the sorts of communities, and offers no suggestions or real-world applications for community development |
| **Limitations** | It is limited to the context, does not take into account other community types, and does not provide practical implications or recommendations for community development. |
| **Remark** | A valuable and original contribution to the field of cultural psychology, but needs more empirical and comparative studies and more applications to real-world problems |

|  |  |
| --- | --- |
| **Sr. No.** | **8** |
| **Authors / Year** | Ahmadreza Montazerolghaem |
| **Paper Title** | **Software-Defined Internet of Multimedia Things: Energy-Efficient and Load-Balanced Resource Management** |
| **Core Contribution** | A modular energy and load management system in IoT using networking software and virtual resource concepts. |
| **Algorithm Methodology** | It is a two-step algorithm that first assigns media requests to optimal virtual resources and then distributes the virtual resources to physical servers and switches. |
| **Parameters** | Energy consumption, load balancing, QoS, QoE, delay, throughput, packet loss |
| **Strength** | Improves QoS and QoE for IoMT users by minimizing the number of active servers and switches and balancing the load between them. |
| **Limitations** | That the multimedia requests are homogeneous and independent |
| **Remark** | The algorithm is complex and requires a centralized controller to manage the virtual resources. The system can be improved by considering the heterogeneity and dependency of the multimedia requests and using a distributed or hierarchical controller. |

|  |  |
| --- | --- |
| **Sr. No.** | **9** |
| **Authors / Year** | Murtaza Cicioglu, Ali Calhan  2021 |
| **Paper Title** | **A Multiprotocol Controller Deployment in SDN-Based IoMT Architecture** |
| **Core Contribution** | A novel SDN-based IoMT architecture that supports multiple wireless protocols and machine learning-based algorithms for time-aware load balancing and prioritization. |
| **Algorithm Methodology** | A multiprotocol controller using Protocol Abstraction Layer (PAL) and Protocol Adaptation Layer (PAdL), and two machine learning-based algorithms using SVM and fuzzy logic. |
| **Parameters** | Throughput, delay, packet loss ratio, bit error rate, user density |
| **Strength** | Performance and efficiency improvements compared to existing SDN and non-SDN-based IoMT architectures enable high-density and dynamic IoMT networks. |
| **Limitations** | Simulation programs may not reflect all real-world IoMT network problems and scenarios, and ML-based algorithms may require more data for training and testing. |
| **Remark** | This paper presents a new and promising approach for managing heterogeneous and complex IoMT networks, but may require further validation and optimization in terms of complexity and scope for improvement. |

|  |  |
| --- | --- |
| **Sr. No.** | **10** |
| **Authors / Year** | Margi Engineer, Razma Tusha, Ankit Shah; Dr. Kinjal Adhvaryu  2019 |
| **Paper Title** | **Insight into the Importance of Fog Computing in Internet of Medical Things (IoMT)** |
| **Core Contribution** | In this paper, we propose a new approach to image caption generation that uses machine reinforcement learning to optimize the quality and diversity of captions. |
| **Algorithm Methodology** | In this paper, we use a policy network based on CNN-LSTM architecture to generate signatures and use a value network based on CNN-GRU architecture to evaluate the signatures. Additionally, this paper presents a reward function that combines CIDEr-D, SPICE, and diversity metrics. |
| **Parameters** | This paper uses the MSCOCO dataset for training and testing and the Flickr30k dataset for validation. In this paper, we use the Adam optimizer with a learning rate of 0.0001, batch size of 64, and beam size of 5. |
| **Strength** | This paper obtains state-of-the-art results on the MSCOCO dataset and shows that the proposed approach can generate more diverse and informative signatures than existing methods. |
| **Limitations** | In this paper, we do not compare the proposed approach with other reinforcement learning methods for image captions or perform qualitative analysis on the generated captions. |
| **Remark** | This paper presents a new and efficient approach to image caption generation based on deep reinforcement learning, but it could be improved by conducting more comprehensive experiments and providing more information about the caption generation process. |

***B. Research Gap***

**Implementation Issues:** Several articles mention potential implementation issues with the proposed framework. Research can focus on solving these problems, finding solutions, and conducting real-world testing of the proposed system.

**Security and privacy issues:** Several articles mention concerns about security vulnerabilities and sensitive information being leaked. Future research could focus on improving the security mechanisms of IoMT systems, especially in the context of sensitive health data.

**Real world application:** Some articles lack practical implications or recommendations for practical application. Future research could focus on translating the theoretical framework into practical solutions, providing practical insights for application in healthcare settings. Data requirements for machine learning.

***C. Objective***

**Develop implementation strategy:** Explore and propose strategies to overcome real-world implementation challenges identified in existing literature. This may include developing a framework that is not only theoretically sound but also suitable for implementation in real-world healthcare settings.

**Enhanced security and privacy measures. :** We explore and implement advanced security mechanisms to address vulnerabilities and privacy issues in IoMT systems. This may include new encryption methods, secure data transmission protocols, and ways to protect sensitive health information.

**Perform Benchmarking :** Conduct a comprehensive benchmarking study to compare the proposed solution with existing state-of-the-art methods. This includes identifying appropriate indicators to measure effectiveness and ensuring fair and equitable comparisons with alternative approaches.

**Optimize ML algorithms for small data sets :** We develop methods to optimize machine learning algorithms for scenarios with limited data availability. This may include exploring transfer learning, data augmentation, and other strategies that improve the performance of models trained on small datasets.

**Algorithm verification and optimization:** Improve existing algorithms, methodologies, and frameworks based on extensive validation studies. This involves iteratively improving the proposed solution to improve reliability, efficiency, and applicability.

***D. Your proposed algorithm/approach***

**propose**: **Practical implementation issues**: **Approach:** **Developing a practical framework**: Identify and analyze specific issues that impede actual implementation. Develop structures to address these issues and meet the needs of the health care system. Test usability by incorporating feedback from stakeholders and potential end users.

**propose**: **Security and Privacy Concerns:**

**Approach: Advanced Security Measures** :Learn about the latest encryption technologies and secure communication protocols. Implement strong access control mechanisms and data anonymization strategies. We perform thorough security audits and penetration testing to identify and remediate vulnerabilities.

**propose**: **Curate Comprehensive Datasets:**

**Approach: Collaborative Dataset Creation :** Partner with healthcare organizations to access diverse, representative data sets. Develop data pipelines to ensure quality, diversity, and ethical considerations. Implement a strategy for ongoing maintenance and expansion of data sets.

**propose**: **Perform Comparative Analyses:**

**Approach: Benchmarking and Comparative Studies :** Determine appropriate performance metrics to compare with existing methods. Conduct benchmarking experiments while ensuring fairness and statistical rigor. Publish your results in peer-reviewed journals and conferences.

***E. Time Complexity***

Implementations of encryption and secure communication protocols can have varying time complexities. Modern encryption algorithms often have polynomial time complexity, but the actual impact depends on the data size and the specific algorithm used.

The time complexity of dataset curation includes tasks such as data cleaning, preprocessing, and data enrichment. This will depend on the size and complexity of your data set as well as the specific tasks involved.

Conducting clinical research involves coordinating with health care providers, recruiting patients, and collecting and analyzing data. Here, time complexity is influenced by the trial duration, number of participants, and complexity of data analysis.