

EDGE COMPUTING ASSIGNMENT

SUBMITTED BY :

CB.SC.U4CSE23208

1. How are edge computing metrics in healthcare affected by interoperability and cybersecurity problems?

Answer:

In healthcare, many devices and systems are used. When proper data sharing is not done between these systems, interoperability is said to be affected. Different data formats and communication styles are used by different devices. Because of this, smooth data exchange is not allowed. Important patient data may be delayed or missed. As a result, system performance is affected, and patient care is slowed down.

Cybersecurity issues are also faced in edge computing. Since edge devices are kept near patients and not inside secured servers, they are easily attacked. If proper protection is not given, patient data can be stolen or changed. Devices can also be made to stop working. When this happens, privacy and trust are lost. Rules like HIPAA and GDPR may also be broken if data is leaked. Because of these issues, latency, uptime, and reliability are affected badly.

2. Which performance indicators should be used to measure edge computing's effect on latency and accuracy?

Answer:

In healthcare edge computing, two important performance indicators are latency and accuracy.

- Latency is the time taken for a response to be given after data is received. In medical care, very low latency is needed. Delays must not be allowed in emergency cases. With edge computing, data is processed near the patient, so delay is reduced and faster response is given.
- Accuracy is the correctness of the result given by the system. Wrong predictions must not be made because they may lead to wrong treatment. So, high accuracy must be ensured through proper testing and training.

Other indicators that should be measured include:

- Inference Time: The time taken by the AI model to give an output after processing is completed. Fast results should be preferred.
- False Positives and False Negatives: These are errors that are made by the system. When a problem is shown but not actually present, a false positive is made. When a real problem is missed, a false negative is made. Both errors should be reduced.

- Power Usage: Since edge devices are often battery-powered, less energy should be used. High power consumption should be avoided.
- Response Time: The total time taken from receiving data to taking action must be measured. Short response time is required for timely care.

By checking all these values, the system's speed and correctness can be measured in a proper way.

3. How can the reliability of edge AI models for patient diagnosis be checked?

Answer:

To make sure that edge AI models are reliable for diagnosis, different tests must be performed.

- Precision and Recall: These scores should be calculated. Precision shows how many correct results were given when problems were predicted. Recall shows how many real problems were found by the system. Both values must be made high.
- F1 Score: This score is created by combining precision and recall. A high F1 Score should be aimed for.
- Confusion Matrix: A table is used to show true and false predictions. This table should be studied to understand the system's mistakes.
- AUC-ROC Curve: A graph is created to show how well the system separates healthy and sick patients. A high area under the curve should be targeted.
- Execution Time: The time taken to complete the process must be measured. Shorter execution time should be maintained to support real-time diagnosis.
- Cross-Device Testing: The AI model should be tested on different edge devices. Good performance should be shown on all devices, not just one.

When all these tests are completed and passed, the model can be called reliable and safe for healthcare use.

4. Why should metrics like latency, throughput, uptime, accuracy, privacy, and cost be measured in edge healthcare systems?

Answer:

In edge-based healthcare systems, these metrics must be measured to make sure the system is fast, safe, and useful.

- Latency: This is the time taken to respond after data is received. Very low latency is expected so that patient help is not delayed.
- Throughput: The amount of data that can be handled in a short time should be measured. High throughput should be maintained, especially when many patients are being monitored.

- Accuracy: The correctness of results should be checked. Mistakes in diagnosis must be avoided, so high accuracy is needed.
- Uptime: The amount of time the system is working without stopping must be measured. Maximum uptime should be ensured.
- Reliability: A system that works well under pressure and does not fail should be used. Reliable performance must be delivered all the time.
- Privacy and Security: Patient data must be protected. Data leaks should be prevented. Privacy rules like HIPAA and GDPR must be followed.
- Cost-effectiveness: The system must be affordable. If costs are reduced and good results are given, cost-effectiveness is said to be achieved.

By measuring all these values, the quality of edge systems in healthcare can be understood and improved.

CITATIONS

<https://doi.org/10.1109/JIOT.2017.2750180>

<https://doi.org/10.1109/MC.2017.9>

<https://doi.org/10.3390/fi11030066>

<https://doi.org/10.1016/j.pmcj.2017.06.018>

<https://doi.org/10.1109/ACCESS.2020.3030197>

<https://doi.org/10.1016/j.future.2019.02.034>