Applications Review

**Application Survey and Review of Viz.ai for Stroke Risk Detection**

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# 1 Abstract

Every year, millions of people suffer from strokes, making it one of the most common causes of death and long-term disability. The key to saving lives and minimizing brain damage is early detection and rapid treatment. However, traditional stroke diagnosis is time-consuming because it depends on radiologists manually analyzing medical images. This process can take 30 minutes or longer, leading to critical delays in patient care.

The biggest challenge in stroke treatment is that time is everything. Large vessel occlusions (LVOs), which occur when a major brain artery is blocked, require immediate medical intervention. If treatment is delayed, patients can suffer from irreversible brain damage, paralysis, or even death. However, with limited hospital resources and staff, ensuring rapid stroke diagnosis is often difficult.

To address this issue, solutions like Viz.ai have emerged as game changers in stroke detection. Viz.ai is an FDA-cleared system that analyzes CT and MRI scans in real time, detects potential strokes within seconds, and instantly alerts medical teams so they can take action faster. Instead of waiting for manual review, doctors receive automatic notifications, reducing door-to-treatment time and increasing the chances of positive outcomes.

Although Viz.ai has the potential to revolutionize stroke care, medical systems like this still come with challenges, such as ensuring high accuracy, minimizing biases, and integrating seamlessly with hospital workflows. This study evaluates how Viz.ai improves stroke triage efficiency, how it compares to traditional methods, and what challenges must be addressed for widespread adoption.

# 2 Introduction

Stroke is one of the leading causes of death and disability worldwide, affecting millions of people each year. Rapid intervention is crucial to preventing long-term neurological damage, yet many healthcare systems struggle with delays in diagnosis and treatment. Traditional stroke assessment relies on radiologists manually analyzing CT and MRI scans, a process that can take 30 minutes or longer, delaying life-saving care. Given that every minute without treatment results in the loss of millions of brain cells, improving stroke detection speed is a major priority for medical institutions.

One of the most dangerous types of strokes is a large vessel occlusion (LVO), where a major artery supplying blood to the brain becomes blocked. LVOs require urgent endovascular intervention to restore blood flow, yet in many hospitals, identifying these cases quickly remains a challenge due to imaging bottlenecks and communication inefficiencies. With limited specialists available and high patient loads, stroke care teams often struggle to coordinate timely responses, which can negatively impact patient outcomes.

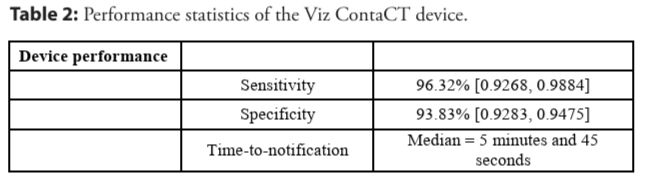
Viz.ai is an AI-powered stroke triage system designed to address these critical gaps in stroke diagnosis and coordination. The platform uses advanced deep learning models to analyze medical imaging in real time, detecting suspected LVOs within seconds. Upon detection, Viz.ai automatically alerts stroke specialists, allowing them to review images and make rapid decisions regarding treatment. This system significantly reduces the time required to confirm a stroke, enabling hospitals to cut down on door-to-treatment delays and improve survival rates.

Beyond stroke detection, Viz.ai also streamlines communication among healthcare professionals. The platform integrates with electronic health records (EHRs) and features a HIPAA-compliant messaging system, allowing medical teams to collaborate instantly. Hospitals using Viz.ai have reported measurable improvements in efficiency, including reduced hospital stays, faster access to specialists, and improved Modified Rankin Scores (mRS) for patients. However, while Viz.ai offers a promising solution, its widespread adoption faces challenges, including ensuring equitable performance across diverse populations, integrating seamlessly into existing hospital workflows, and maintaining high accuracy under various imaging conditions. This report explores the strengths and limitations of Viz.ai and proposes potential enhancements to further optimize stroke care.

# 3 Assessment of available solutions and techniques

As the need for faster and more accurate stroke diagnosis grows, various methods have been developed to enhance triage efficiency. Traditionally, stroke diagnosis relies on manual image interpretation by radiologists, a process that, while effective, is often time-consuming and subject to human limitations. Radiologists must carefully analyze CT or MRI scans to identify signs of stroke, which can take 30 minutes or longer depending on hospital workflow and resource availability. These delays can be critical, as timely intervention is essential to minimizing brain damage and improving patient outcomes.

To address these challenges, stroke triage systems such as Viz.ai have been introduced to automate the detection process and reduce the time needed for diagnosis. By using advanced algorithms, these systems analyze medical images in real-time, identifying stroke cases within seconds and automatically alerting medical teams. This rapid response capability helps doctors make quicker treatment decisions and significantly reduces door-to-treatment time, which is crucial for improving survival rates.



As shown in Table 2, the Viz ContaCT system achieves a sensitivity of 96.32% and a specificity of 93.83%, demonstrating its high accuracy in stroke detection. Additionally, the median time-to-notification is only 5 minutes and 45 seconds, significantly reducing the delay compared to traditional radiologist-based diagnosis.

While AI-driven stroke detection offers numerous advantages, it is not without limitations. Challenges such as ensuring high diagnostic accuracy, overcoming biases in training data, integrating AI into existing hospital workflows, and meeting regulatory standards must be addressed to enable broader adoption. This section explores the pros and cons of both traditional stroke diagnosis and AI-based triage solutions, evaluating their effectiveness in real-world applications.

## 3.1 Pros and Cons

Stroke diagnosis methods can be divided into traditional radiologist-based diagnosis and AI-powered triage systems, each with distinct advantages and limitations.

Traditional diagnosis relies on radiologists manually interpreting CT or MRI scans. This method ensures expert oversight and does not require new IT integration. However, it is time-consuming, often taking 30 minutes or more, which can delay treatment. Additionally, the availability of specialists is limited, especially in rural or understaffed hospitals, leading to further delays. Human interpretation also varies, introducing the risk of inconsistencies and diagnostic errors. AI-powered triage systems like Viz.ai address these challenges by analyzing scans in real time and automatically alerting medical teams. This significantly reduces door-to-treatment time, improving patient outcomes. As shown in Table 2, Viz ContaCT achieves a sensitivity of 96.32% and a specificity of 93.83%, demonstrating high accuracy.

Additionally, its median time-to-notification is just 5 minutes and 45 seconds, a significant improvement over traditional methods. AI also optimizes hospital workflows by prioritizing urgent cases and reducing radiologists’ workload. Despite these advantages, AI systems have limitations. False positives and false negatives require human verification, and integrating AI with hospital IT systems can be complex. Regulatory approval and compliance remain hurdles for widespread adoption. Additionally, AI performance depends on high-quality imaging, meaning hospitals with limited resources may face challenges in implementation.

While AI-powered triage offers faster and more efficient stroke detection, hospitals must consider integration challenges, regulatory requirements, and accuracy concerns when adopting these systems. Combining AI with traditional methods may provide the most effective approach to improving stroke care.

# 4 Potential project approach

To enhance AI-driven stroke triage and improve overall patient outcomes, this project will focus on integrating real-time physiological data, enhancing AI interpretability, and addressing bias issues.

A key improvement is incorporating real-time patient vitals, such as heart rate, blood pressure, and oxygen saturation, into the AI model. Currently, Viz.ai relies primarily on imaging data, but by adding physiological parameters from wearable devices, the system can provide a more comprehensive risk assessment. This integration can help reduce false positives and improve the precision of stroke predictions.

Another important aspect is enhancing explainability in AI predictions. Many clinicians remain skeptical of AI-driven diagnoses due to a lack of transparency in decision-making. Implementing Explainable AI (XAI) techniques, such as SHAP (Shapley Additive Explanations), can provide insights into why the model flagged a case as high risk. This added transparency increases trust in the system and helps clinicians make informed decisions.

Bias mitigation is another focus area. AI models can exhibit biases depending on the training data used, potentially leading to disparities in stroke detection across different demographic groups. To address this, the project will incorporate fairness-aware AI techniques and a more diverse dataset to ensure equitable performance across populations.

Finally, seamless integration with existing hospital workflows is critical for adoption. AI-based stroke detection systems must work smoothly with electronic health records (EHRs) to ensure effective data exchange and minimize disruptions to current medical practices. Developing interoperability solutions will be a priority to enable efficient hospital-wide implementation.

By implementing these improvements, the project aims to enhance stroke prediction accuracy, improve clinical decision-making, and ensure equitable healthcare outcomes.

# References

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