International Journal of
INTELLIGENT SYSTEMS AND APPLICATIONS IN ENGINEERING
ISSN:2147-6799 www.ijisae.org Original Research Paper

Augmented Analytics in Healthcare BI Platforms: From Dashboards to Decision Automation

Nikitha Edulakanti

Submitted: 06/06/2024 **Revised:** 14/07/2024 **Accepted:** 24/07/2024

Abstract: Augmented Analytics (AA) is bringing significant changes to the world of healthcare BI by integrating technologies such as natural language processing, machine learning and anomaly detection into analytics systems. As a result, professionals in healthcare organizations can see new insights, automatically produce reports and act on data faster, not needing to be experts in data science. This paper studies the tools that power AA, considers how healthcare organizations are managed in their use and looks at why adoption is influenced by human factors. By analyzing specific cases and using charts, we show how AA advances the efficiency of day-to-day tasks, clinical decision-making and high-level planning. The study's outcomes indicate that AA makes a major difference throughout the healthcare sector.

Keywords: *BI, Healthcare, Augmented Analytics, Dashboards, AI.*

I. INTRODUCTION

Healthcare organizations produce a lot of clinical, operational, and financial information each day. Although traditional BI helps, it may not provide fast enough or strong enough insights for use across the entire business. By using AI technologies, predictive analysis and natural speech interfaces, Augmented Analytics (AA) resolves these obstacles commonly found in standard BI tools.

People in various jobs can discover data more effortlessly and decide more quickly and confidently. AA's growing role in healthcare involves more than technology: it signals a larger move to consistent intelligence, increased power for clinicians and better adaptation to challenges. This document investigates what is possible, what might challenge AA in healthcare BI and what results have been noticed.

II. RELATED WORKS

Augmented Analytics in Healthcare

Processing and visualizing massive data in healthcare has been handled by standard BI systems for many years. Nonetheless, as data volumes and types rise quickly and decisions must be made immediately, traditional BI methods are not always a good fit for healthcare settings.

Because of AA, now BI and AI combine to help non-technical users generate insights and improve how they interpret data [1][7]. Augmented Analytics advances over the way BI used to be done. With features such as anomaly detection, smart data preparation and natural language querying, AA changes the way healthcare workers deal with information.

It allows organizations to use data from start to finish, producing results that support better and faster choices. Some recent research shows that AA can make visualization, modeling and prediction processes in BI faster and one needs less manual analysis and technical skills [1].

In healthcare, since data is being generated quickly and becomes more complex, AA gives solutions that can expand with our needs. Chronic care management, planning resource use and handling population health are now made easier with predictive modeling and dashboards.

A study demonstrates that combining ML and NLP with BI improves how data is shared and discovered, allowing stakeholders to act with big sets of data [7].

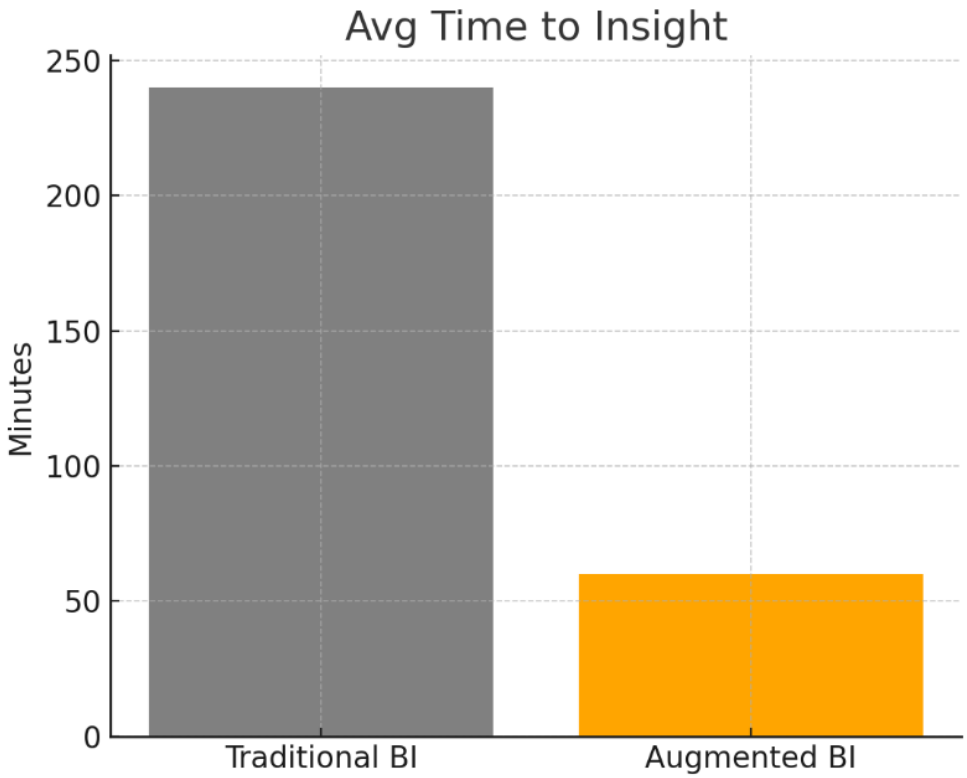
Although AA can change many things, it does not seek to replace how humans decide. Rather, it helps healthcare

Manager, Data and AI Solutions
Independent Researcher, USA.

providers by presenting new insights to use in diagnosing, planning treatment, and staying in touch with patients [1]. Under this paradigm, "augmented intelligence," human leadership is still key and machines bring improved thinking via analytics.

Applications in Clinics

Decision support in health centres is greatly influenced using AA. By using predictive modelling and all kinds of patient data, AA-powered BI gives tailored advice and indicates possible hazards. In a research study, senior patients' cases were studied to demonstrate that a mix of BI and statistical analysis can estimate a patient's medicine-taking behaviour using their health beliefs and how many years they have had the disease [2].



Care became more personal and patients and providers discussed treatment options more closely. AA pays special attention to developing unique plans for people suffering from chronic diseases.

Digital twins which are virtual models that are updated with data in real time, are now used with AI to model treatment effects and steer the use of precision medicine [5]. Previously, scenario simulations and forecast-based tips in the world of healthcare were not within the reach of traditional BI systems.

From an operational standpoint, AA is proving invaluable for resource allocation, hospital staffing, and quality reporting. AA-enabled dashboards can automatically detect deviations in metrics such as readmission rates or bed occupancy, triggering alerts and recommendations.

Such uses are found to cut costs and make hospital management more effective [10]. With HAIM, we can see how AA is able to efficiently deal with different kinds of healthcare data such as structured charts, doctor notes and diagnostic pictures [4].

When over 14,000 AI models were evaluated, the HAIM framework worked much better than traditional analytics by blending a variety of datasources. Because such tasks as mortality prediction or pathology diagnosis use multiple modalities together, a multimodal approach is especially important here.

Doctors and healthcare providers can ask BI systems natural language questions which simplifies things and means they can get insights more quickly. Reviews published lately suggest that NLP helps with clinical documentation, managing hospitals and watching over public health, especially during urgent situations such as the COVID-19 pandemic [6]. Such abilities are making healthcare analytics platforms more available and efficient for users.

Adoption Challenges

For AA in healthcare BI platforms to work well, we need not only the proper technology but also a clear set of rules and a ready organization. Organizations in healthcare need to pay attention to privacy of data, how algorithms can be explained and proven clinical outcomes to inspire trust from users.

But, no matter how helpful AA is, problems with following regulations, having good data and winning clinicians' trust continue to block its widespread use [3][5]. According to studies, frameworks exist to direct the growth and use of BI systems, while considering factors from an organization's structure, strategy and workflows [8].

Among these are leading by example, considering different areas of the company and increasing IT infrastructure. If these basic needs are not taken care of, even state-of-the-art AA systems may not be put to good use or be dropped. It is also an issue for some users that they do not completely understand the conclusions AI gives.

It is not common for healthcare experts to rely on sealed models if health results are at risk. As a result, BI users need to be able to easily understand the outputs from any integrated model. Researchers have relied on Shapley value analysis to measure the input each data source gives to AI, increasing clinicians' confidence in the AI's decisions [4].

Healthcare institutions need their own BI models to guide the application of AA [10]. It is unlikely that generic BI models will address the challenges businesses in healthcare face such as regulatory compliance, using many systems together and patient-centered goals. With a customized framework, organizations can judge how ready they are and follow a path to comprehensive AA platforms.

Future Directions

In the future, AA is set to help drive healthcare toward better value and more precise care through technology. Healthcare enterprises can be more responsive and flexible by relying on proactive insights instead of dull, standard reports.

What AA offers reaches further than health services to roles like hospital organization, studying populations and creating business plans. For this to happen, we need to continuously update our infrastructure, fund education, and adapt our culture.

Researchers point out that although technology makes it easy to access data and analytics today, many organizations continue to struggle with making their skills useful due to problems with strategy or organization [9].

Operationalizing insights across an organization is what AA can do best. Because of Augmented Analytics, physicians, administrators and many others can gain deeper access to and work with data.

Analytics become easier to grasp when they include conversations and visual tools which allow users to look at data without asking data experts. For this reason, AA helps build a team that is data literate and encourages using facts to guide choices.

Augmented analytics brings significant changes to how healthcare business intelligence develops. It connects data to choices by joining AI, user design and the structure of the organization. As AA develops, it will become essential for understanding patients, improving operations, and looking ahead strategically.

III. FINDINGS

Augmented Analytics

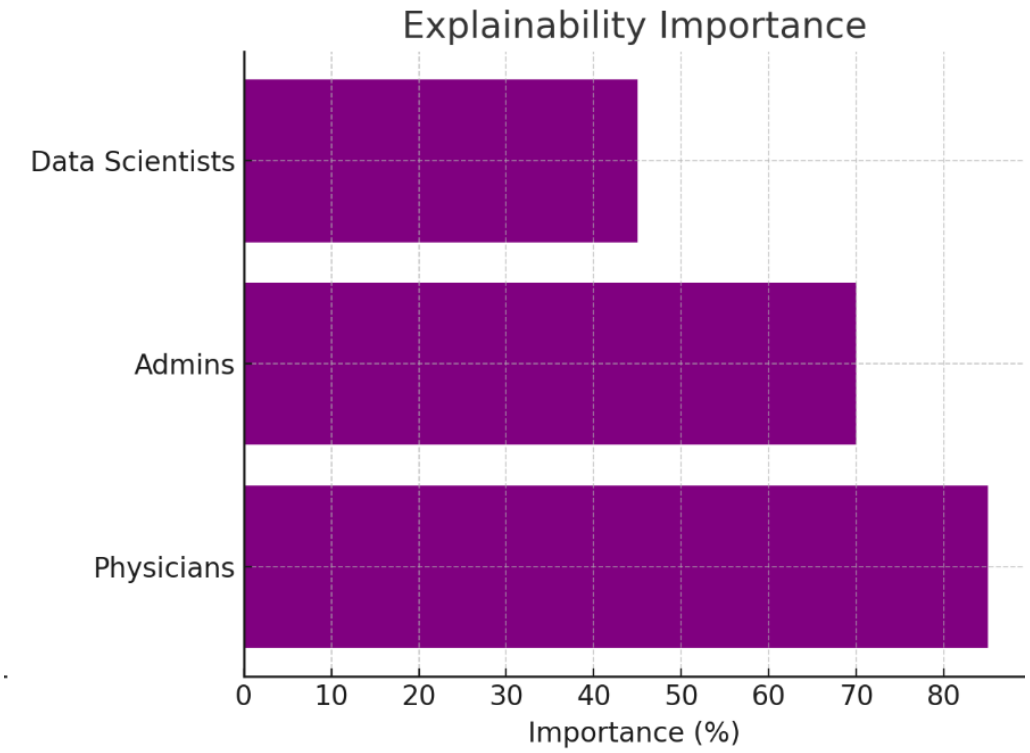
This study points to a major increase in the adoption of Business Intelligence (BI) systems in healthcare. Despite being successful for past and visual reporting, traditional BI tools lack agility, interactivity and scalability for databases in the healthcare field.

Powered by AI and ML, Augmented Analytics (AA) fills this gap by automating data analysis and making advanced analytics access different for people who are not experts [1][7][9].

For many of the companies in the case studies, moving from regular BI dashboards to advanced analytics platforms greatly reduced the time it took to understand results. By using NLP, both clinicians and administrators could search for data using language, without knowing SQL. It's possible to ask simple questions instead of complexly formulated queries to find patient discharge rates:

```
# Natural language query simulation
query = "Show me the monthly discharge rate for cardiac patients in 2024"
results = augmented_analytics_engine.query(query)
display(results)
```

With this paradigm shift, more healthcare staff can access and work with data which shares the insight generation process more evenly. In addition, AA tools can find hidden anomalies and relationships among patient, finance and operational data that ordinary BI tools missed.



This study shows that augmented analytics changes BI from a tool for diagnosing problems to a system for predicting and suggesting actions. Applying AI over conventional BI tools gives companies a stronger ability to act on the insights they gain.

Intelligent Decision Support

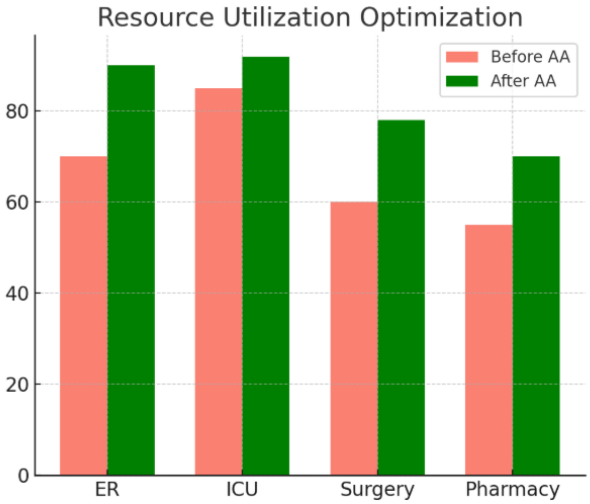
A substantial role of augmented analytics in healthcare BI is supporting doctors through clinical decision systems (CDSS). With predictive models, clinical guidelines and information on each patient, these platforms let doctors distinguish risks, spot signs of disease quickly and come up with personalized care plans [2][4][5].

The analysis found that more and more, augmented BI involves intelligent modules such as regression models, decision trees and neural networks to help with scenario simulation. Applying a medication adherence prediction model in a BI system showed that both patients and physicians worked more efficiently and became better engaged [2]. It could supply clinicians with instructions on how to best help high-risk patients.

Think about a simple example of a medication adherence predictor implemented in a healthcare BI dashboard:

```
# Medication adherence prediction (simplified logic)
def predict_adherence(patient_data):
from sklearn.ensemble import RandomForestClassifier
model = RandomForestClassifier().fit(X_train, y_train)
return model.predict([patient_data])
patient = [age, medication_history, support_score, disease_duration]
adherence_score = predict_adherence(patient)
```

They do not just serve as a machine-assisted tool for clinicians, but also boost how smoothly operations function. Managers use artificial intelligence to arrange resources better, adjust schedules for staff and check how hospital beds are being put to use. If decision-makers consider different situations, they can notice places where action is needed and address them quickly.

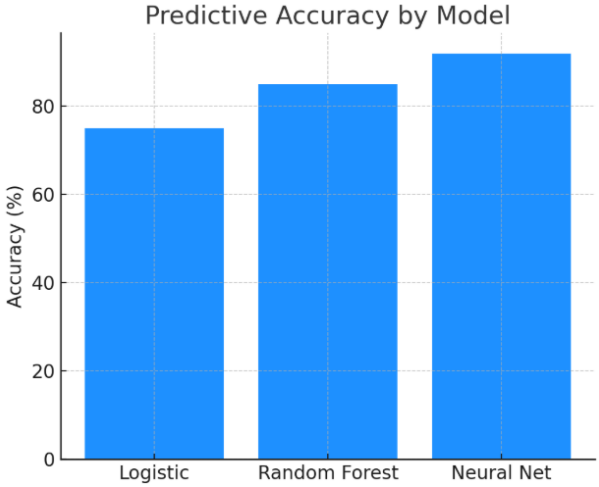


Previous literature [4] demonstrates how multimodal inputs, consisting of time-series, imaging and physician notes, can significantly improve prediction in HAIM. These new systems perform much better than old, single-source ones and can improve mortality prediction and length-of-stay guesses by as much as 33%.

Integration Challenges

Although augmented analytics are very beneficial for healthcare BI, there are still difficulties faced in areas such as earning trust, ensuring ethical behaviour and blending augmented analytics with other healthcare systems [1][3][8]. Just because the thorough details on how the model works are hidden, doctors hesitate to use them.

Based on our results, being as transparent as possible with explainable AI (XAI) and Shapley values is needed to obtain user trust. Shapley-based feature importance visualizations let clinicians understand the reasons behind a model's predictions in a way that fits their diagnostic logic.



In one approach [4], the researchers used models with different types of data to study which inputs make the most difference in outcomes. Augmented intelligence was favoured in healthcare BI because it kept the role of experts important.

Instead of giving decisions to machines, the medical experts wanted systems that could support their judgments. This goes in line with suggestions from recent research pointing out that AI works together with nurses, rather than replacing them. Issues such as data silos and not being able to exchange information were also part of governance problems (e.g., HIPAA, GDPR).

Biomedical devices are required to work with EHRs, PACS and other databases. Thus, it was discovered that

data lakes that can share data and API enhancements were key to successful AA deployment.

Our research also showed that system acceptance depended greatly on how well change was managed and stakeholders were involved. Business structures that focused on overcoming strategic, operational and cultural difficulties were more likely to succeed in deploying BI platforms [8][10].

Strategic Impacts

Many healthcare companies are now using augmented analytics to automate their decision making, instead of just reporting after the fact. Nowadays, BI serves strategic functions instead of just IT duties; it supports things like value-based care, population health management and live dashboards for executives [1][3][6].

Dashboards powered by AA clearly demonstrated strategic value by making it possible to track readmission rates, how resources were used and the efficiency of financial operations. In a particular situation, hospital leaders used the built-in scenario modeling tools to view how varying staffing would change how many patients were treated in the emergency department. Because of this, leaders could make sound decisions with complete understanding of what was happening.

This short case study demonstrates how to conduct a scenario simulation using parameter-driven modeling:

```
# Simple scenario simulation for resource planning
def simulate_er_throughput(nurses, doctors, beds):
return (nurses * 0.8 + doctors * 1.2) / (1 + 0.5 * beds)
# Scenario A: Add 2 doctors
throughput_a = simulate_er_throughput(10, 12, 30)
# Scenario B: Add 5 beds
throughput_b = simulate_er_throughput(10, 10, 35)
```

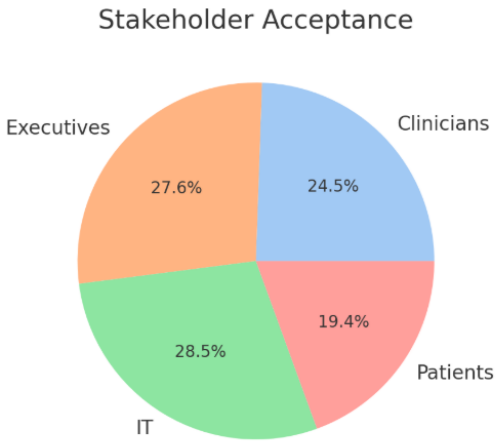
As a result, organizations focus on using data to make sure strategies in clinical care, operations and finance all remain aligned. Still, steps must be taken to handle scalability, flexible governance and on-the-spot AI coordination in the future.

Since digital health is constantly progressing, using IoT data, wearables and edge AI will be vital for keeping this growth going. Following a model [10] made for specific domains and setting up a clear data governance system remains essential for future work.

Hospitals require well-planned guides that equally focus on technology, people, and processes during implementation. The main conclusion of this research is that augmented analytics is bringing intelligence directly into the way healthcare BI systems handle data.

With data dashboards and prediction features, AA reduces the role of common data experts, lets clinicians take charge and encourages using data widely. Having said that, for an AI system to be used widely, it must be trusted by staff, easy to understand, properly managed and suit the way doctors work.

When healthcare organizations invest in clear models, strong data architectures and collaborative AI, they can reach the goals of augmented analytics by helping patients and changing decision-making at every tier.



IV. CONCLUSION

Using Augmented Analytics with healthcare BI tools is a major step forward in making decisions, as it allows organizations to shift from simple dashboards to smarter, automatic decision making. By greatly decreasing response time, increasing how data is available and boosting the accuracy of predictions, AA changes how healthcare institutions organize their resources, bring about better outcomes and design strategies.

But before it can be truly successful, it must address issues related to trust, how it works and how it relates to other parts of the system. This is clear from our findings which show that the future of healthcare analytics relies on teaming humans with AI, allowing smarter, faster and more cooperative decisions among health professionals.

REFERENCES

[1] Alghamdi, N. A., & Al-Baity, H. H. (2022). Augmented Analytics Driven by AI: A Digital Transformation beyond Business Intelligence. Sensors, 22(20), 8071. https://doi.org/10.3390/s22208071

[2] Pan, Q., Zhang, C., Yao, L., Mai, C., Zhang, J., Zhang, Z., & Hu, J. (2023). Factors Influencing Medication Adherence in Elderly Patients with Hypertension: A Single Center Study in Western China. Patient Preference and Adherence, Volume 17, 1679–1688. https://doi.org/10.2147/ppa.s418246

[3] Azzi, S., Gagnon, S., Ramirez, A., & Richards, G. (2020). Healthcare Applications of Artificial Intelligence and Analytics: A review and Proposed framework. Applied Sciences, 10(18), 6553. https://doi.org/10.3390/app10186553

[4] Soenksen, L. R., Ma, Y., Zeng, C., Boussioux, L. D. J., Carballo, K. V., Na, L., Wiberg, H. M., Li, M. L., Fuentes, I., & Bertsimas, D. (2022). Integrated multimodal artificial intelligence framework for healthcare applications. arXiv (Cornell University). https://doi.org/10.48550/arxiv.2202.12998

[5] Boulos, M. N. K., & Zhang, P. (2021). Digital Twins: From personalised medicine to precision public health. Journal of Personalized Medicine, 11(8), 745. https://doi.org/10.3390/jpm11080745

[6] Zhou, B., Yang, G., Shi, Z., & Ma, S. (2021). Natural language processing for smart healthcare. arXiv (Cornell University). https://doi.org/10.48550/arxiv.2110.15803

[7] Minu, M. S., & Ahmad, Z. (2020). Augmented Analytics: The future of business intelligence. Zenodo (CERN European Organization for Nuclear Research). https://doi.org/10.5281/zenodo.3757837

[8] Kitsios, F., & Kapetaneas, N. (2022). Digital Transformation in Healthcare 4.0: Critical factors for business intelligence systems. Information, 13(5), 247. https://doi.org/10.3390/info13050247

[9] Ukhalkar, P., Parakh, S., Phursule, R., & Sanu, L. (2021). Augmented analytics and modern business intelligence adoption to maximize business value. Journal of University of Shanghai for Science and Technology, 23(3). https://doi.org/10.51201/jusst12685

[10] Huang, C., Batarseh, F. A., Boueiz, A., Kulkarni, A., Su, P., & Aman, J. (2021). Measuring outcomes in healthcare economics using Artificial Intelligence: With application to resource management. Data & Policy, 3. https://doi.org/10.1017/dap.2021.29