



MONITAU

Healthcare Case Study

Every hospital in America commits significant time and resources towards the reduction of readmissions. Not only are reduced readmissions a sign of effective care but successfully improving readmissions has significant profit implications as a result of a decrease cost. In order to effectively reduce readmissions, some hospitals are creating machine learning models to optimize care. These models offer great potential to improve the patient experience and work related to readmissions; however, they also present certain risks that the hospital needs to intentionally manage, such as bias<sup>1</sup>. Failure to do so can lead to significant risks and exposures. By following the **CRISP-DMA framework** in conjunction with our **Top 10 Machine Learning Controls**, powered by Monitaur, assurance around machine learning models can be obtained.<sup>2,3</sup>

Before a machine learning algorithm is created, a **Business Understanding** of the problem should occur. Questions should be asked around what is the goal of the algorithm, in this case, reducing hospital readmissions and improving the quality of care. Business understanding should include a thorough understanding of the risks, as well as regulatory and ethical constraints, must be outlined. **Data Understanding** should then be conducted, with the utmost important goal of obtaining balanced, unbiased data. Arguably the biggest issue with machine learning is biased data. **Data governance structures are in place for a thorough understanding of modeling data.**

**Data Preparation** then occurs where **Data preprocessing routines are standardized and follow statistically valid techniques.** Variables indicative of race, gender, all PII, etc and their proxies should be handled carefully to avoid the introduction of bias or data privacy issues. The **Modeling data is appropriately segregated into train/test/validation sets without pollution (i.e. segregation prior to variable transformation).** During **Modeling, Standard, well-established machine learning models are deployed** with extensive work and documentation around which algorithm was used and how precautions were taken to prevent overfitting and bias. Modeling versioning is a key, as each time the model is retrained, performance could be entirely different and needs to be subject to appropriate change management and governance controls.

After development is completed, **Evaluation** of the model is extremely important to determine the accuracy and precision, as well as that appropriate testing, is conducted to ensure against bias and to test the model's sensitivity to various inputs and outputs. **A robust, cross-functional team with appropriate compensation mechanisms thoroughly**

---

<sup>1</sup> Gawronski, Quinn. "Racial Bias Found in Widely Used Health Care Algorithm." NBCNews.com. NBCUniversal News Group, November 7, 2019. <https://www.nbcnews.com/news/nbcblk/racial-bias-found-widely-used-health-care-algorithm-n1076436>.

<sup>2</sup> Andrew Clark, "The Machine Learning Audit—CRISP-DM Framework." *ISACA Journal*, vol. 1 (2018), <https://www.isaca.org/resources/isaca-journal/issues/2018/volume-1/the-machine-learning-auditcrisp-dm-framework>

<sup>3</sup> <https://serene-allen-a23a05.netlify.com/blog/top-controls/>

**evaluates machine learning models prior to deployment for inappropriate biases and “humanness” of models; and reevaluates the models on a regular basis. Models are thoroughly validated prior to deployment and regularly throughout the models’ deployment duration by creating a validation dataset across the range of inputs with the predictions evaluated by subject matter expertise for appropriate outcomes.**

When a model is ready for **Deployment**, key consideration needs to be given to if the model is doing what the business wants it to accomplish. Additionally, deployment controls such as **Monitoring processes are appropriate and sufficient to provide timely identification if the models behave unexpectedly. Model predictions are logged with sufficient detail for local interpretability of outcomes** need be included to ensure adequate visibility and auditability of the model.

Across the full lifecycle of machine learning design, implementation, and deployment, **Accountable executives are held responsible for model outcomes and erratic model performance that adversely effects customers.** As with any business process, appropriate risk management procedures should be in place to ensure that the business goals and objectives are being met without adversely affecting the greater operating environment of the corporate entity.

Monitaur is a comprehensive model management and assurance platform that enables recording, understanding, verification, and auditing of your machine learning models. For healthcare companies using machine learning in the course of patient care or as part of managing readmissions, Monitaur creates a layer of transparency and an enablement of oversight critical to effective management.