**Executive Summary**

**The Goal:**

In our project, we tackle the intricacies of small business loan guarantee processes by leveraging predictive analytics on the “SBAnational.csv” dataset. Our primary goal is to develop a model that accurately forecasts the likelihood of a “CHGOFF” (charged off) status in loan applications. As the guarantor company facilitating these loans, our focus is on making well-informed decisions to minimize default risks for small businesses. Recognizing our responsibility to honor guarantees in cases of small businesses unable to meet loan obligations, our predictive analytics initiative becomes indispensable for proactively managing and mitigating associated financial risks with small business loans.

**Best Model:**

In our analysis, we found the Bootstrap Forest model is the optimal choice in predicting the likelihood of “CHGOFF” (charged off) status in loan applications. With a total accuracy of approximately ~97.08%, prediction of the 1 being ~92.80%, and consistently strong lift values across (30% portion) training (~3.2), validation (~3.0), and Test (~3.0) it will better predict the “CHGOFF” status in small business loan applications by prioritizing positive instances and therefore will have enhanced precision. Further, this model has good AUC metrics in training (~0.9853), validation (~0.9651), and test (~0.9647) which highlights its superior discrimination abilities between positive and negative instances. This emphasizes the model's effectiveness in addressing the intricacies associated with the MIS\_Status variable, contributing to a more comprehensive understanding of the factors influencing loan outcomes. Overall the model shows excellent fit, high sensitivity, and is the most reliable in determining “CHGOFF”.

**Data-Driven Recommendations:**

Given the superior performance of the Bootstrap Forest model in predicting "CHGOFF" statuses, we recommend integrating this model into our small business loan guarantee processes. This implementation enhances precision and leverages the model's ability to prioritize positive instances. We propose an iterative approach, including continuous monitoring and refinement, to ensure sustained effectiveness in adapting to evolving lending scenarios. This implementation empowers us as the guarantor with valuable insights for mitigating risks associated with small business loans and fulfilling our commitment to repay the banks if the small businesses are unable to meet their loan obligations. Additionally, when seeking to minimize the likelihood of loan charge-offs, we recommend advising small businesses to: (1) obtain loans with repayment terms of sixty (60) months or more, and (2) obtain loans from banks that are represented in the model as having a low rate of historical charge-offs as they are more likely to adjust the payment terms if there are any difficulties in loan repayment.