Comparative Study of Predictive Modeling Approaches for Medication Adherence in Diabetic Patients

Sijia Yue
AvMed, Inc. 4300 NW 89 Blvd, Gainesville, FL 32606, USA

Ognian Asparouhov
AvMed, Inc. 4300 NW 89 Blvd, Gainesville, FL 32606, USA

Ph.D., Sentara Health
AvMed, Inc. 4300 NW 89 Blvd, Gainesville, FL 32606, USA

Abstract:

Medication adherence is a critical component of effective diabetes management and plays a significant role in achieving STAR ratings for health plans. This study aims to develop and evaluate predictive models for medication adherence among diabetic members, leveraging a comprehensive dataset comprising medical claims, pharmacy claims, and zip code-based demographic data.

The analysis utilizes a cohort of 9,126 members enrolled for twelve months during the base timeframe (January 1, 2022, to December 31, 2022) and for six months during the target timeframe (January 1, 2023, to June 30, 2023). Medication adherence was assessed using the Proportion of Days Covered (PDC) metric, with a threshold of PDC ≥ 0.8 to categorize adherence.

To assess the predictive power of various models, we explored different combinations of predictors, including pharmacy claim attributes, medical claim attributes, and zip code-based attributes. The models were evaluated using three approaches: (1) continuous target modeling using PDC, (2) categorical target modeling to distinguish adherent (PDC ≥ 0.8) and non-adherent (PDC < 0.8) members, and (3) a hybrid methodology combining both continuous and categorical targets.

A variety of machine learning techniques were employed, including Generalized Linear Models (GLM), Deep Learning, Support Vector Machines (SVM), Decision Trees, Logistic Regression, Random Forest, and Gradient Boosting.

Our findings suggest that incorporating both medical and pharmacy claim attributes, along with medication adherence history, significantly enhances predictive performance through a hybrid methodology that combines continuous and categorical targets.