Prediction model with behavioral features

Tom Mushkat,
Yatir Ben Shlomo

Clalit Innovation, Clalit Health Services

Introduction

Clalit Health Services' (CHS) data repository holds extensive information on primary and secondary care, hospitalizations, medication, and laboratory results. Yet, it lacks data on patients' motivation, health-seeking patterns, and potential behavior. To allow a more adequate representation of patients' healthcare state, we seek to integrate behavioral insights features and evaluate their impact on computational modeling for predicting healthcare phenomena.
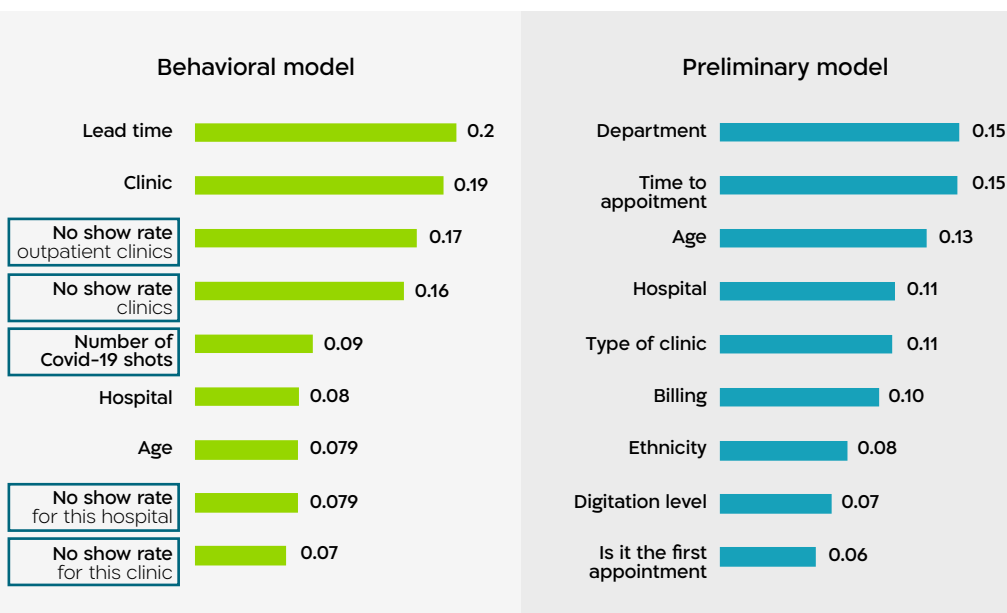
Method

Our goal is to study patient behavior data to create features that enhance machine learning applications that are embedded within the CHS system. Specifically, we'll concentrate on outpatient clinic attendance prediction and determine how behavioral patterns and trends can boost model performance.

Results

Data exploration revealed correlation between behavioral features and attendance to medical appointment. We incorporated these features into a behavioral model and compared its performance to a preliminary model. This effort increase the AUC from 0.69 to 0.74, and 5 of the top important features were behavioral, relating to health-seeking signals and past patient behavior.

Figure 1: feature importance by type of model

Behavioral model

Feature	Importance
Lead time	0.2
Clinic	0.19
No show rate outpatient clinics	0.17
No show rate clinics	0.16
Number of Covid-19 shots	0.09
Hospital	0.08
Age	0.079
No show rate for this hospital	0.079
No show rate for this clinic	0.07

Preliminary model

Feature	Importance
Department	0.15
Time to appoitment	0.15
Age	0.13
Hospital	0.11
Type of clinic	0.11
Billing	0.10
Ethnicity	0.08
Digitation level	0.07
Is it the first appointment	0.06

Discussion

These results indicate that behavior features can help improve the development of decision support tools and extend our knowledge of the potential patients' health behavior, adherence, and clinical outcomes.

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