

IMPROVING PATIENT ENGAGEMENT USING INTELLIGENT APP NOTIFICATION

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Client: LifeScan, Inc

SUMMARY

Intelligent notifications sent to the diabetes patients on the One Touch Reveal App are statistically more accurate in predicting their future behavior than the notifications sent at defined time frames

PROJECT GOAL



Improve user engagement on the One Touch Reveal App to help patients manage their diabetes better through an easy call to action self-monitoring blood glucose (BG) feature on the app, while simultaneously liaising with the business goals of increasing profits through increased use of BG testing strips

METHODOLOGY

Research Phase

- Understand Company's Vision
- Preliminary Research on Industry

Discovery Phase

- Run Exploratory Analysis on Data
- Generate User Patterns/Insights

Ideation Phase

- Ideate Potential Solutions
- Align on Final Deliverables

Modeling & Evaluation Phase

- Model for Intelligent Notification
- Validate by Tests - A/B, Past Data

BUSINESS PROBLEM OVERVIEW

How to increase the engagement on the app using intelligent push notification strategy?

What is Diabetes ?

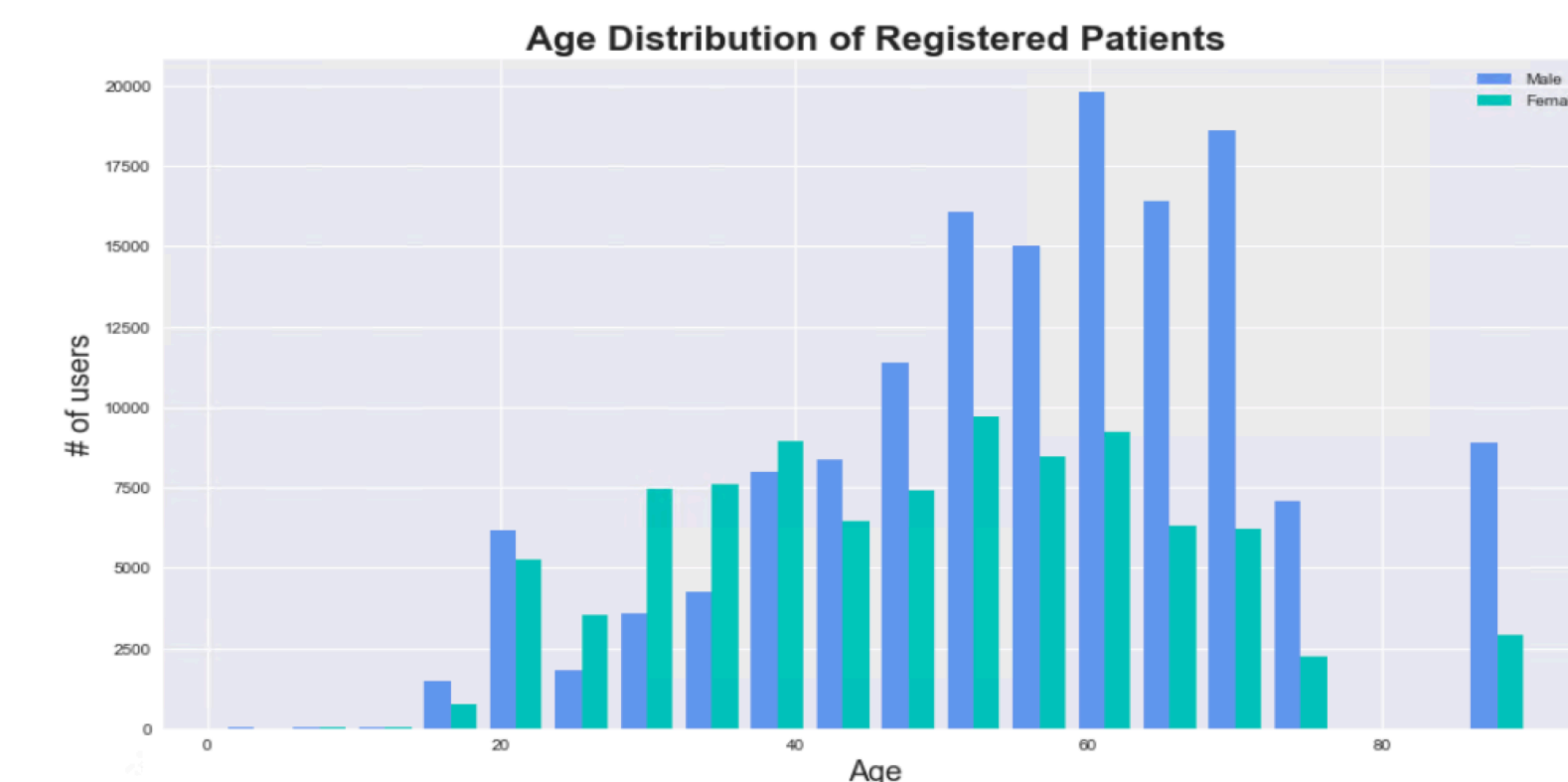
Diabetes is a metabolism disease resulting in high blood glucose levels due to lack of insulin production or resistance to insulin produced

Normal Range: 70 - 140 mg/dl for adults
Disease Types: Type 1, Type 2, Gestational

Tools and skills to live healthy with diabetes:

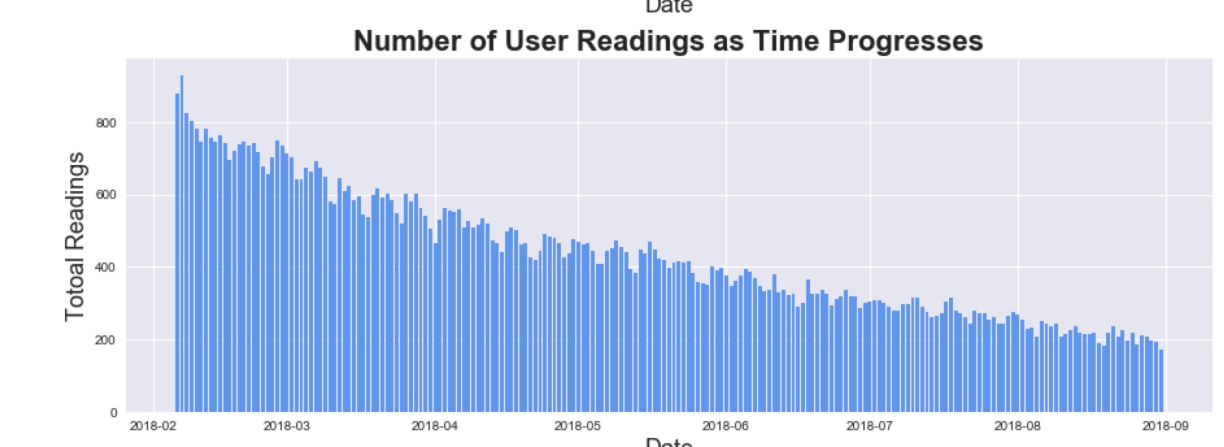
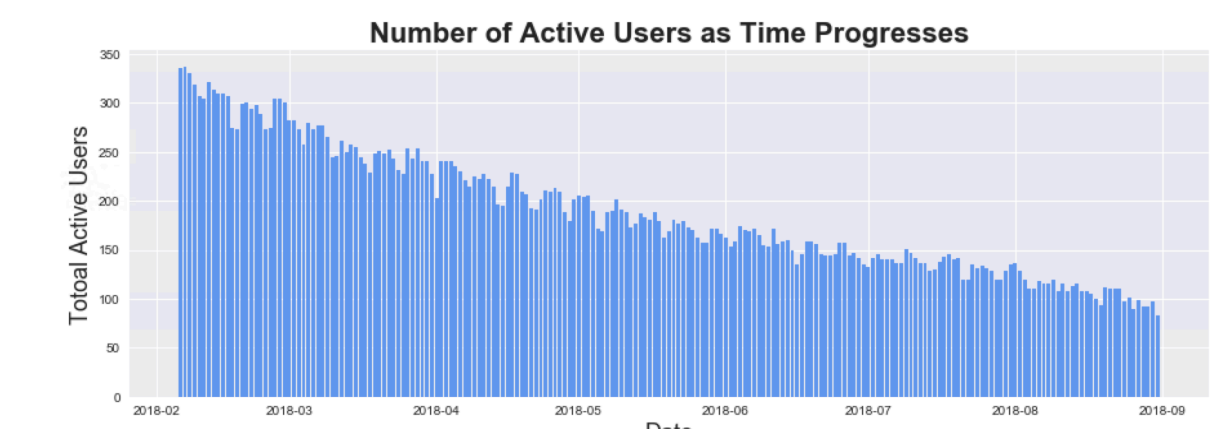
- Monitoring Blood Glucose levels daily
- Nutritional Changes or Exercise
- Medications (insulin or pills)

Who are the app users?



Age Group - Patients between 40 to 70 years old take more daily readings
Total users - 239,582; Female: 39%; Male: 61%
Diabetes Type - Type2: 76%, Type1: 14%, Gestational: 7%
Medication as Insulin - 10% on boluses

What are their habits?



The engagement on the app (# of daily active users & # of user test counts) decrease as time progresses past their first date of joining on the app

MACHINE LEARNING BASED SOLUTION

An algorithmic approach for finding patterns in the patient's daily testing time and frequency

Data Preprocessing

- Collected 18G patients' BG logs from Jan - Aug 2018
- Removed duplicate records and inactive users
- Converted users' BG reading time to minutes
- Partitioned every patient's first 4/5 of historical data as training set and retained last 1/5 as validation set

Model Exploration

- Brainstormed machine learning techniques
- Experimented with a few clustering techniques (KDE, Mean-Shift, K-Means, DBSCAN) to identify patterns in patients' BG reading time
- Concluded on using KDE for diabetes type II, not on insulin users; Mean-Shift for the rest of the users

Modeling

- Labelled each user with prescribed times based on deterministic features such as diabetes type, insulin intake or past behavior
- Based on individual's historical BG reading time records, identified patterns in the patient's test reading times and daily frequencies using KDE and Mean-Shift for the prescribed times identified above

Evaluation

- Set up an acceptance interval for tagging true positives
- True Positive Rate for users with more than 200 data points showed KDE performs 260% better and Mean-Shift performs 15% better than the defined time frame notifications theoretically
- The real effect of the intelligent notification system can be further tested using A/B testing in the future