Readmissions: <30 Days

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Agenda

- Introduction
- Focus
- Findings
- Recommendations

Introduction

- Patients DO NOT appreciate being readmitted
  - High risk of nosocomial infections; diseases and infections that are more prevalent in healthcare settings
  - Nosocomial infections are usually highly drug resistant, requiring longer lengths of stay and more medications with potentially stronger adverse reactions
- Healthcare providers DO NOT like readmitting either
  - Typically, exacerbation (worsening) of the patient's condition when they present (readmitted)
  - Difficulty explaining the complexity of care to entities that have to pay for readmission or unable to receive reimbursement for readmission encounter
- Payers are denying claims or requiring a lot more burdensome documentation

Why Focus on Diabetes and Readmissions?

- All patient-encounters included in the model had a diagnosis of diabetes which is based on the clinical analysis of the patient's HbA1c or A1C test

- The American Diabetes Association (ADA) considers this relatively simple blood test a POWERHOUSE!!
  - The higher the levels, the greater a person's risk of developing diabetes complications
  - It is used to monitor how well the diabetes treatment is working over time

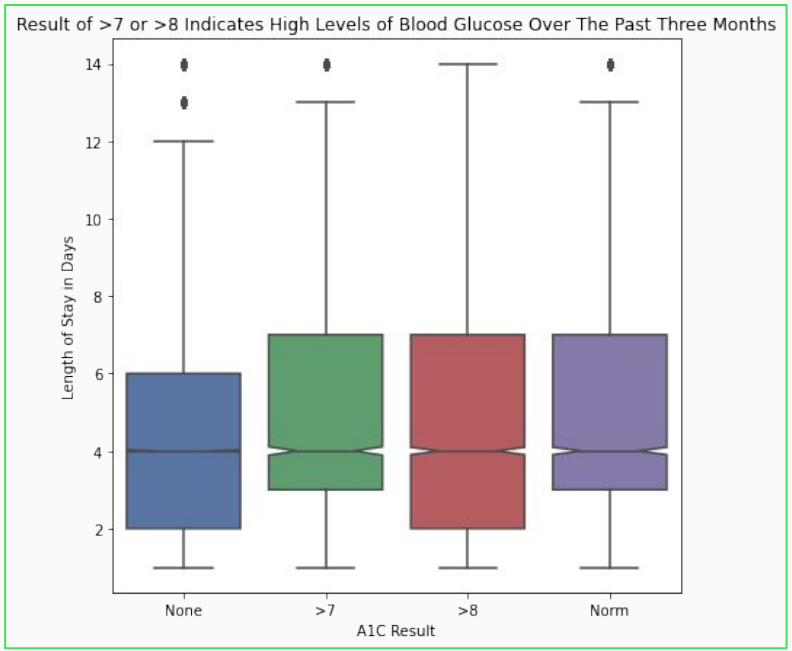
Contributing To The Treatment Plan

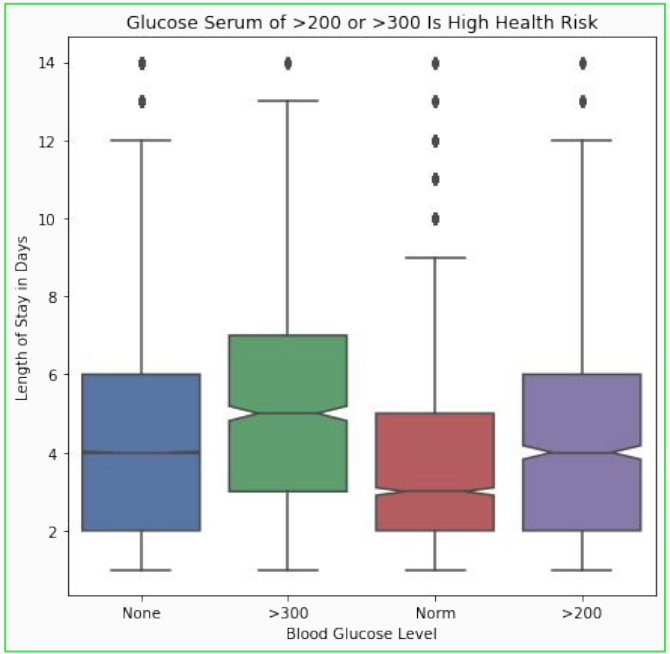
- Build A Model To Help
  - Predict which class a discharged patient belongs within:
    - <30 Days: Readmitted within 30 days of discharge (30th day inclusive)
    - >30 Days
    - NO: Not readmitted

- Dataset Model Built Upon
  - Sourced from UCI Machine Learning Repository; over 100,000 patient-encounters but only developed model with 33,000 to ensure each had a representative close to 33%
  - Any class with a lopsided count severely impacted the model's predictive ability
  - Comprised of 50 columns (data points), identified 17 meaningful ones used by model
  - Some key features included in model: A1C, blood glucose, on diabetic meds, on insulin, age bracket
  - Patient-encounters with discharge description of deceased or discharge to hospice were excluded

Testing Patients' A1C and Blood Serum Glucose

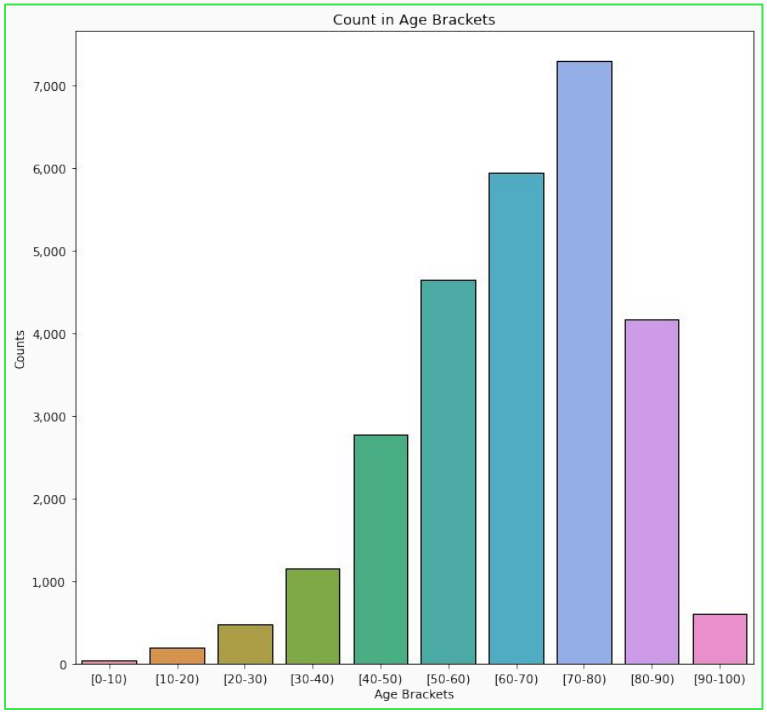
Patients with A1C greater than 7 and serum glucose greater than 200 are showing higher hospital length of stay



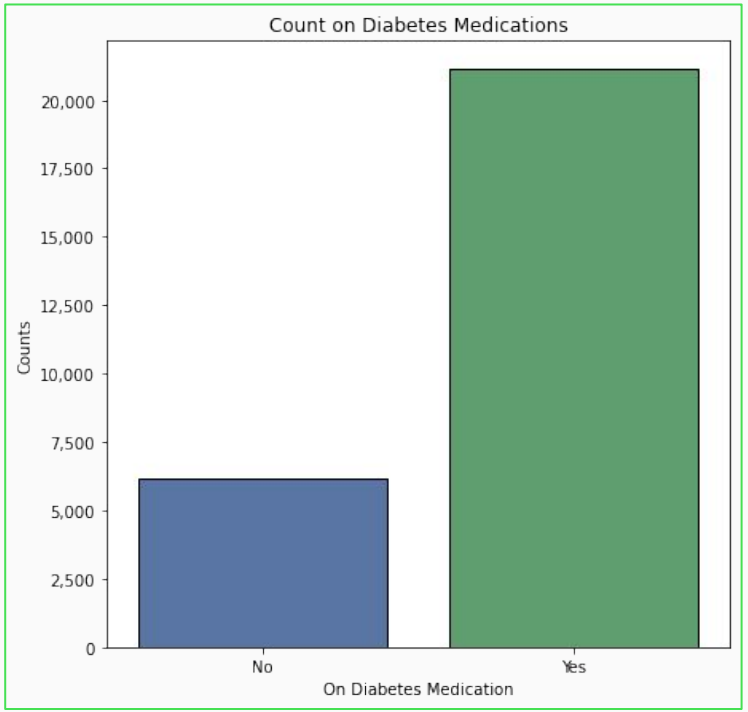


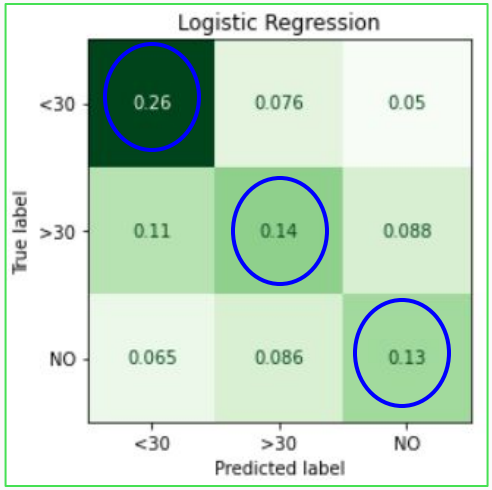
Age Demographics and Medication Usage; What is the intersection readmits and med usage?

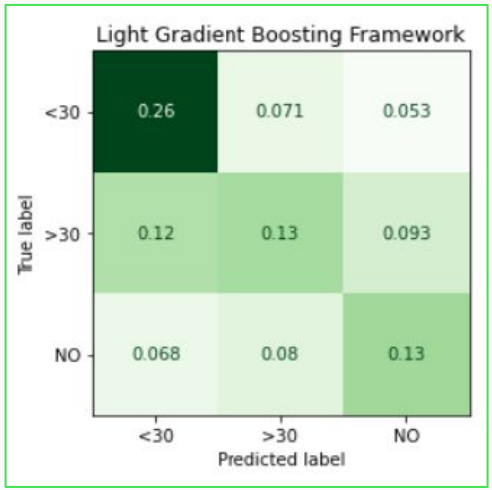
Over 50% of the sample are over the age of 59



About 20% are not taking any diabetes medications

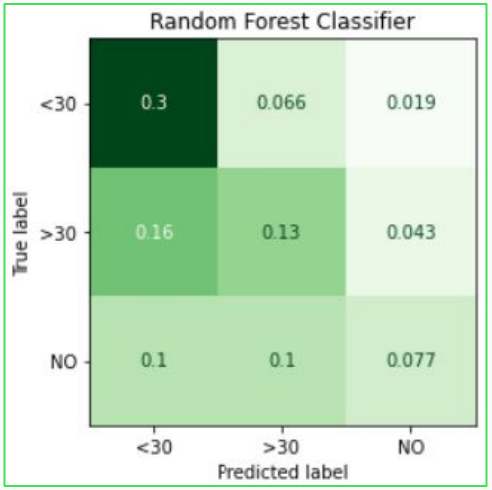


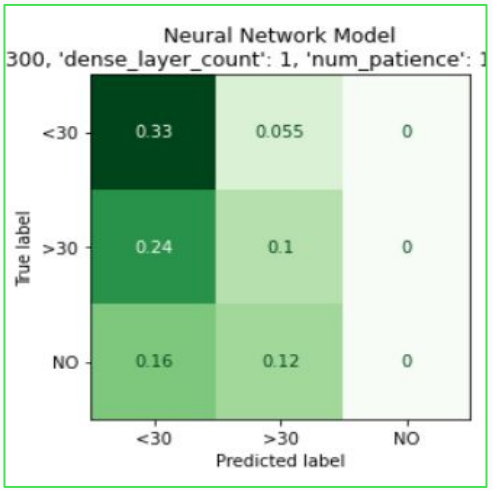




An evaluation of eight models were reduced to the following four.
And the final recommended model was further evaluated in this order:
1) True Positives
2) False Negatives
3) False Positives

Distribution of Classes		
<30	>30	NO
0.384	0.338	0.278





Recommendation

- Based on the key objectives of predicting:
  - True positives within the three classes
  - Minimizing false negatives
  - Minimizing false positives
- I am recommending the use of the random forest classifier model based on its better performance and balanced metrics result over the other three models

References and Citations

1. Source of data is UCI Machine Learning Repository, URL is: https://archive.ics.uci.edu/ml/datasets/Diabetes+130-US+hospitals+for+years+1999-2008
2. List of features and descriptions: https://www.hindawi.com/journals/bmri/2014/781670/tab1/
3. Open Access article: https://www.hindawi.com/journals/bmri/2014/781670/
4. Beata et al article: Beata Strack, Jonathan P. DeShazo, Chris Gennings, Juan L. Olmo, Sebastian Ventura, Krzysztof J. Cios, John N. Clore, "Impact of HbA1c Measurement on Hospital Readmission Rates: Analysis of 70,000 Clinical Database Patient Records", BioMed Research International, vol. 2014, Article ID 781670, 11 pages, 2014. https://doi.org/10.1155/2014/781670
5. American Diabetes Association: ADA/A1C

Thank You

Questions and Answers