Predicting Diabetes from CDC Survey Data

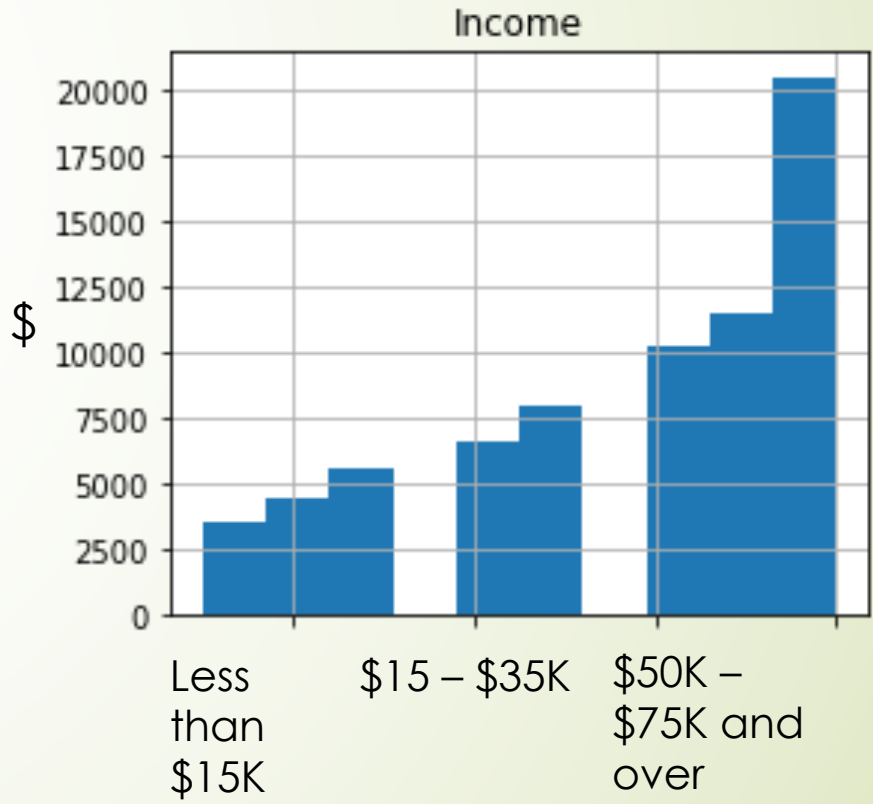
Dhruv Ragunathan – Director of Data Solutions

Business Objectives

- We have been tasked by the CDC to use the data collected from the Behavioral Risk Factor Surveillance System (BRFSS) to create models that predict diabetes.
- Create a model to tell respondents if they are at risk after the survey.
- Plan to create an app where people can screen online for their diabetic risk.
- The model will be tuned to reduce ‘false positives’ since these will waste surveyors time and resources.
- The model also needs to be able to run and make predictions quickly.

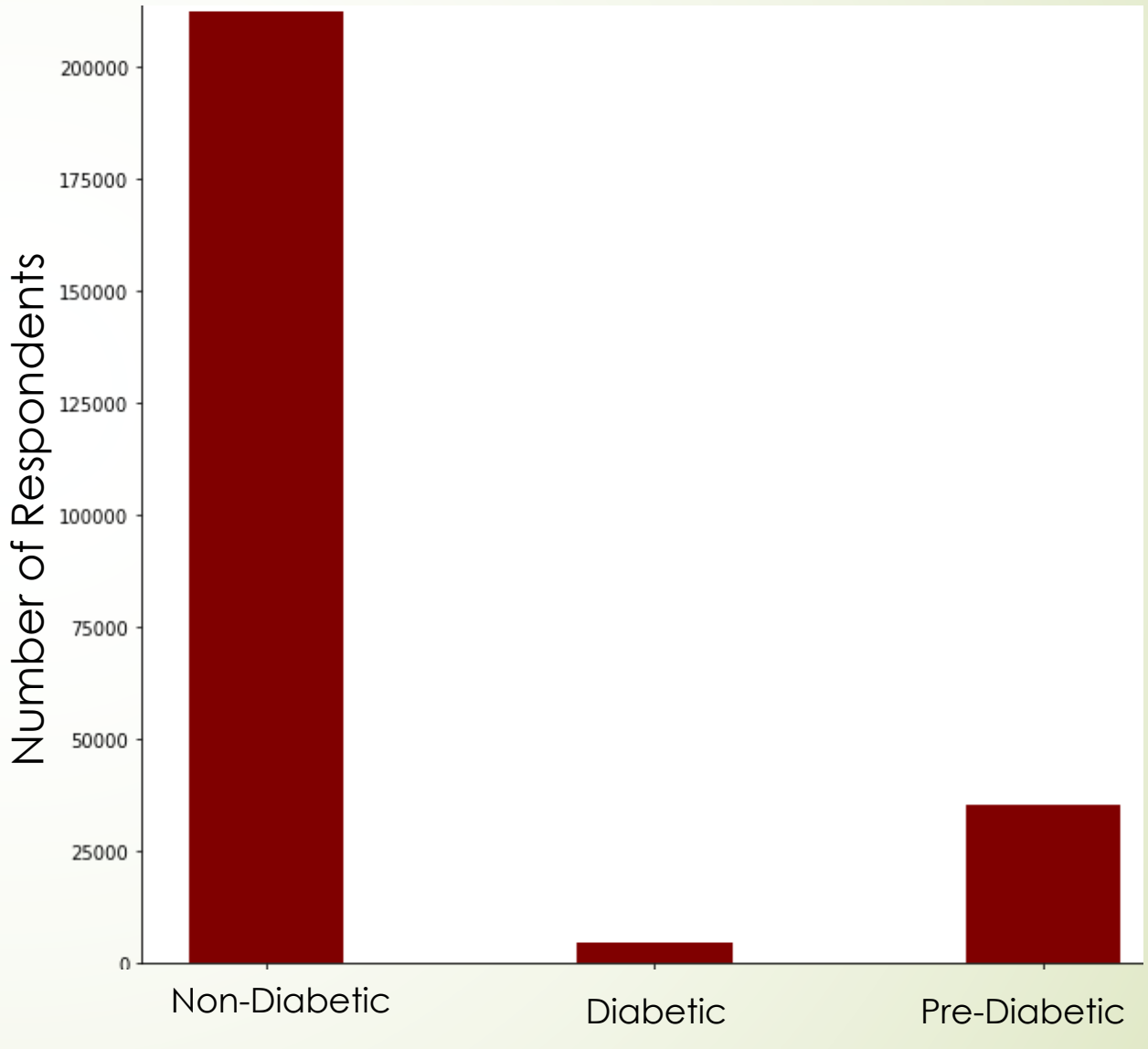
Data Overview

- The data was pulled from the 2015 BRFSS questionnaire.
- The data had around 440 thousand responses and 330 features.
- Some limitations off using this data to predict diabetes are:
  - Some survey respondents may not answer truthfully.
  - Some survey respondents may not be aware that they are pre-diabetic/diabetic.
  - Data seemed skewed towards higher – income respondents.



Data Preparation

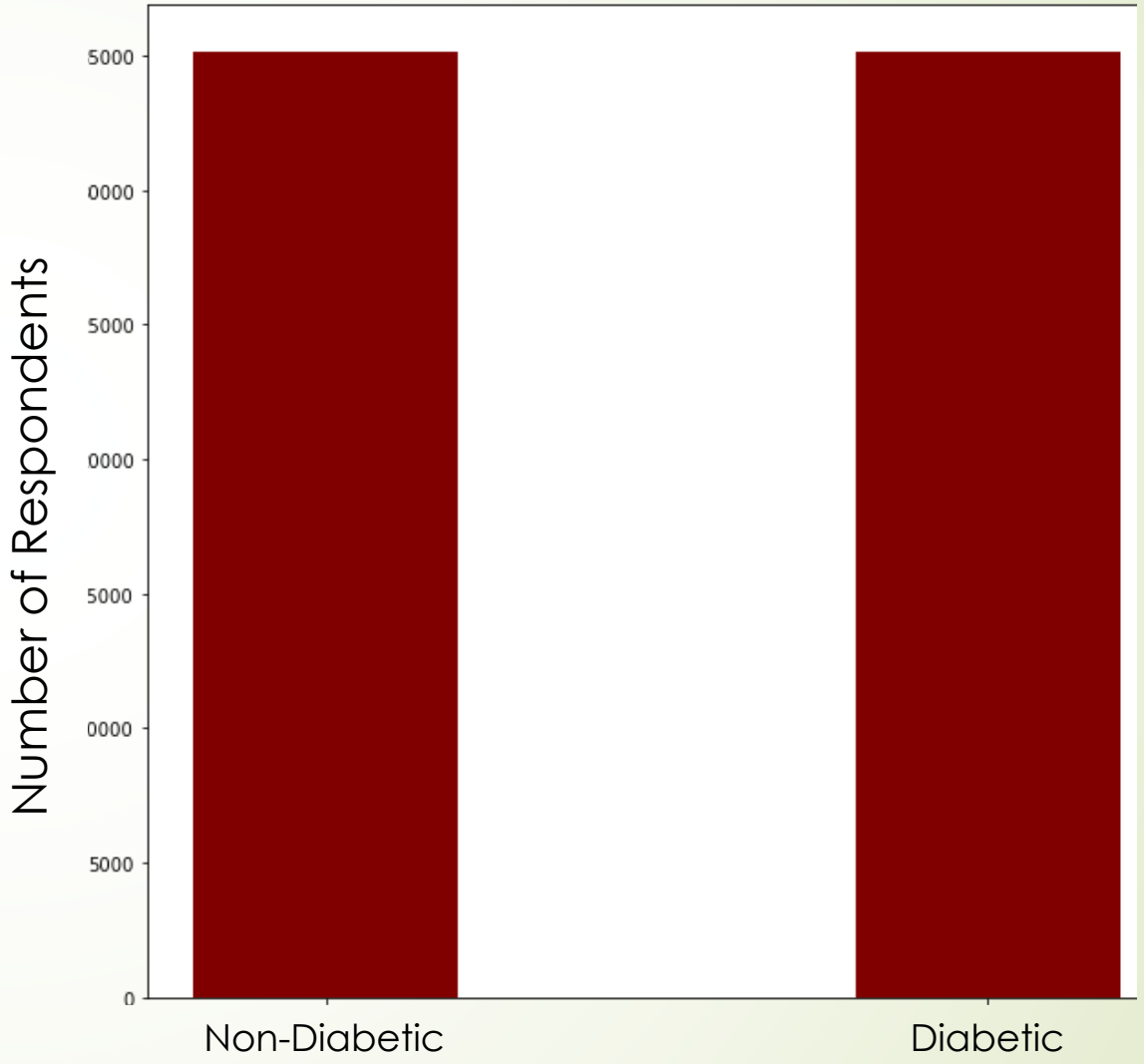
- Created a set of columns we would model.
- Removed rows with missing values and unintelligible responses. (i.e. “Refused, “Not sure”, etc.)
- Significantly more respondents are non-diabetic than diabetic.



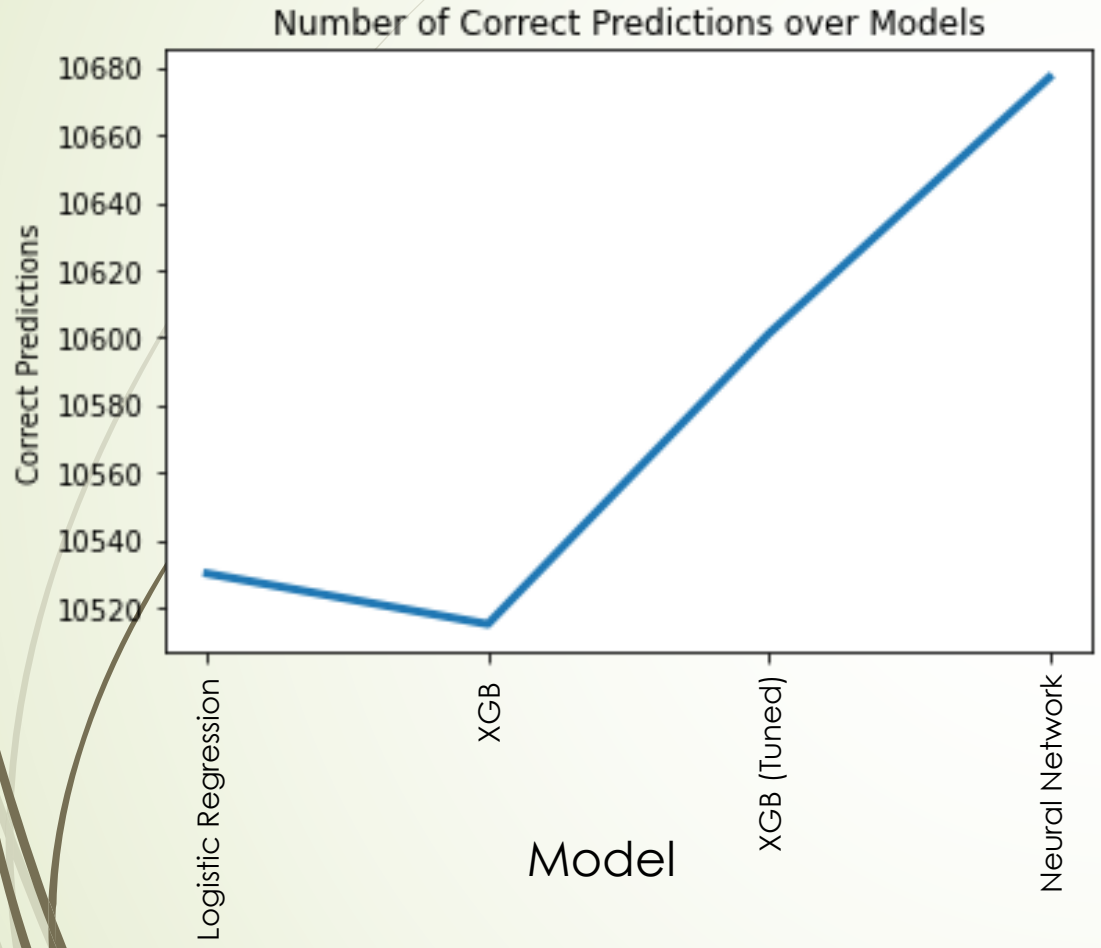
Data Preparation Cont.

- Dataset contained approximately 30,000 records in each category.
- Consolidated pre-diabetic and diabetic features.
- The consolidation meets the business objectives to screen for respondents for diabetic risk.

Number off Respondents in Non-Diabetic, Diabetic, Prediabetic Categories



Model Results

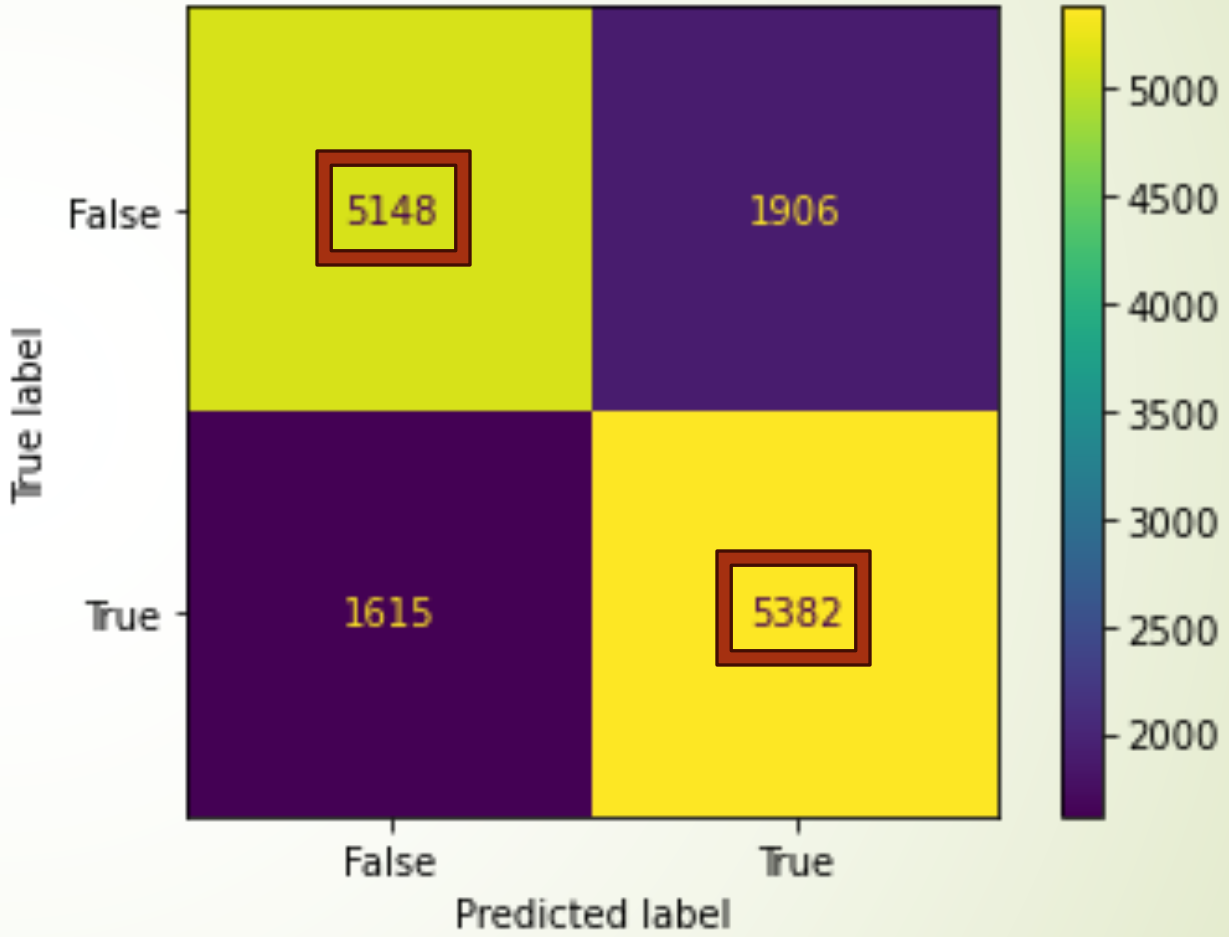


	Accuracy	Precision	Runtime (s)
Logistic Regression	0.749	0.738	<1
XGB Tuned	0.753	0.732	38
Neural Network	0.760	0.744	48
SVC	0.753	0.728	350
Random Forest	0.749	0.724	7

- The model with the highest accuracy (Neural Network) only performed 0.14% better than the baseline model.

Model Evaluation

- Logistic Regression (LR) was chosen as the model.
- Recommend using this model:
  - Accuracy and precision are close to other models
  - Easier to create
  - Significantly faster to run.



Recommendations

- The CDC should use the logistic regression model in their application.
- Consider a strategy around educating people to take their blood pressure on a regular basis since it was one of the top features.
- Providers who see people with high cholesterol should also screen for diabetes since high cholesterol was another top feature.
- Continue advocating for policy/strategies that aim to improve the general health and fitness of Americans. Low health is the highest predictor of diabetes.

Future Work

- Evaluate previous BRFSS data sets. Measure the rate of diabetes and other chronic conditions to find their trends across the country.
- Leverage the model in a diabetic risk assessment through an online application.
- Add more features too the model such as race, sodium intake, etc.

Contact Information

- **Linkedin**: https://www.linkedin.com/in/dhruv-ragunathan-908993b1/
- **Github**: https://github.com/dragunat2016