

Fighting Diabetes

Low-cost Solutions to Health Care Inequity in
Indigenous Communities

Urban-based Native Alaskan
& Indigenous Communities
experience higher rates of
Diabetes-related death
than all other ethnic
groups in the US.

ACCESS TO HEALTH CARE IS LIMITED.

- In major urban centers, anywhere from 19-26% of NAIC individuals are uninsured.
- With over 78% of NAIC residing in urban centers as of 2010, the lack of culturally competent health care deepens already significant gaps in access.

Urban Indian Health Programs are chronically underfunded.

- Low-cost, easy-to-implement screening processes that require minimal patient time and clinic resources.
- Connect at-risk NAIC folks with preventative Diabetes treatment.



Build A Classification Algorithm

Predict instance of Type II Diabetes using baseline
health metrics

Approach



DATA

Pima Indians Diabetes Dataset (1988)
10 numeric features, 1 binary target, 768 observations



FEATURE ENGINEERING

High Blood Pressure, High BMI, Handling Noise,

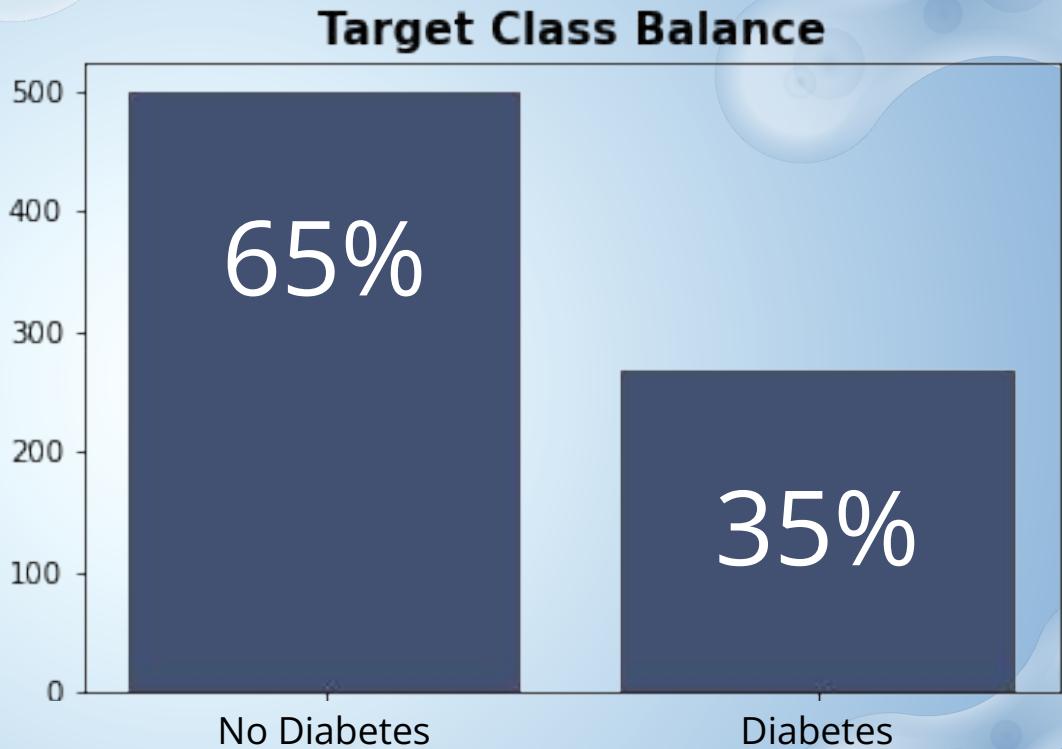


MODEL SELECTION & TUNING

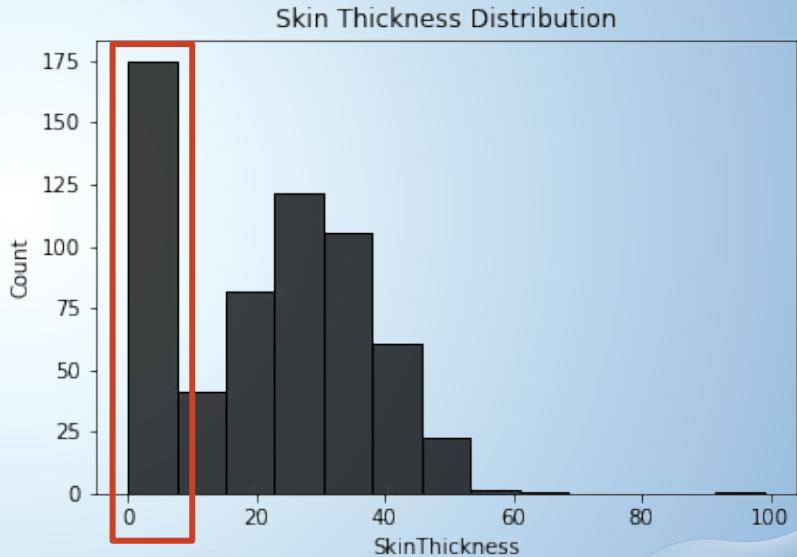
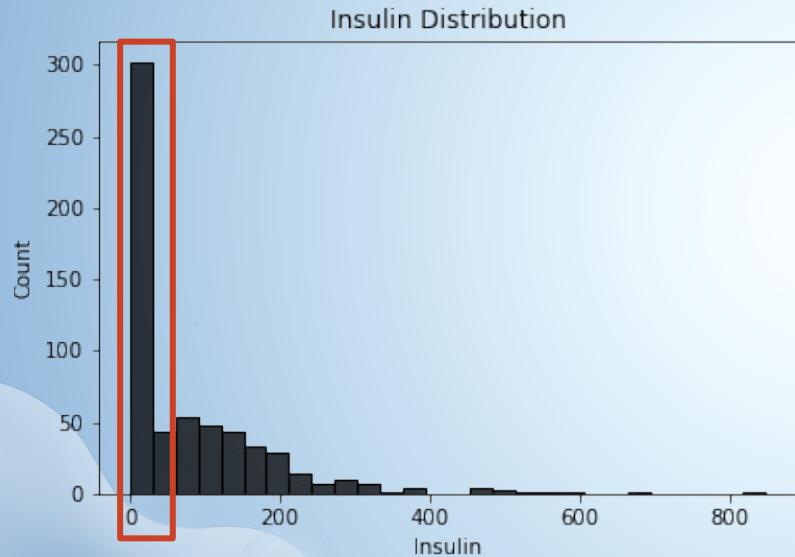
Logit Regression, Random Forest, Decision Tree, KNN, Bagging, Stratified K-Fold & Random Search Cross Validation

Moderate Class Imbalance

- Stratify Train Test Sets
- Class Weights



Feature Distributions

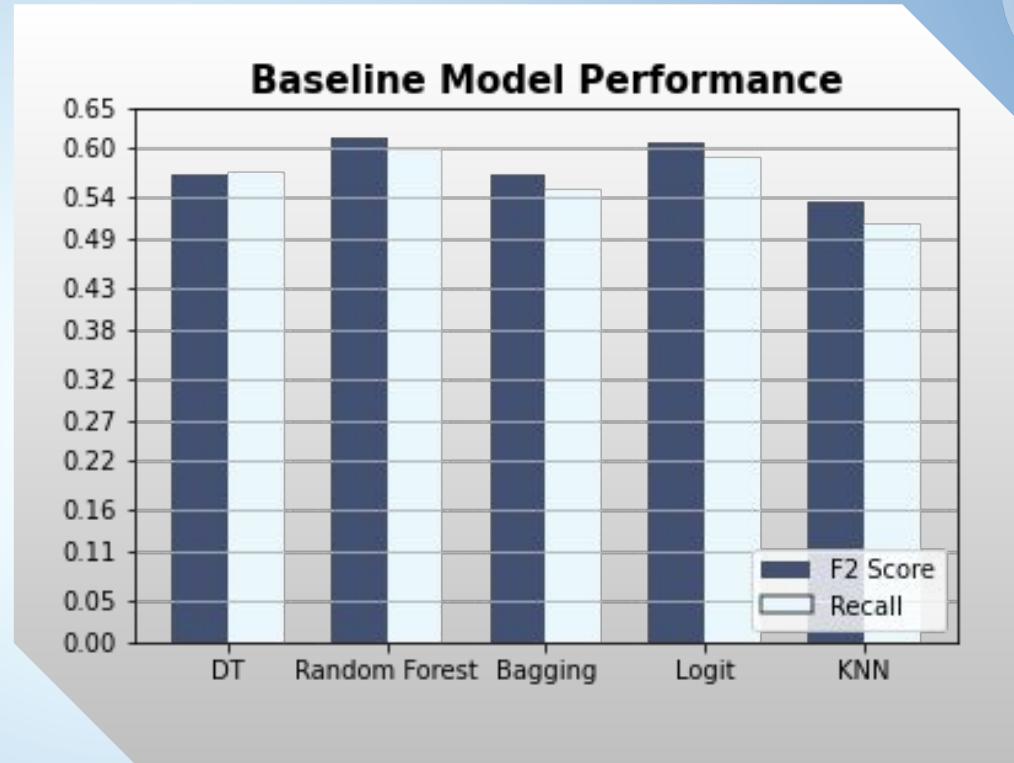


- Nearly half of the observations are missing Insulin measures, and one third are missing Skin Thickness measures.

MODEL PERFORMANCE

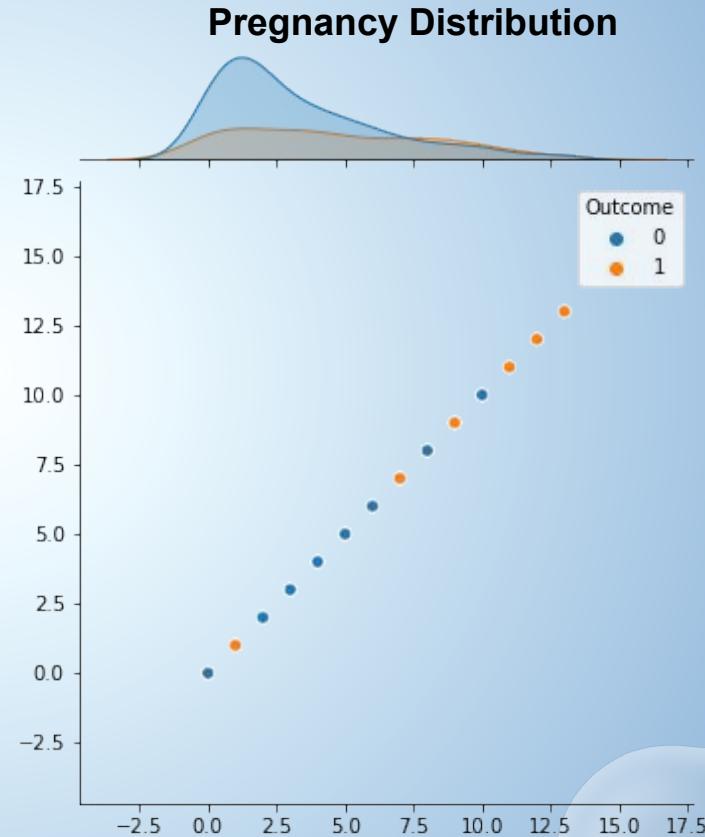
10-Fold Cross Validation Results

- **Random Forest:**
 - Recall: 59.8%
 - F2: 61.2%
- **Logistic Regression:**
 - Recall: 58.8%
 - F2: 60.7%



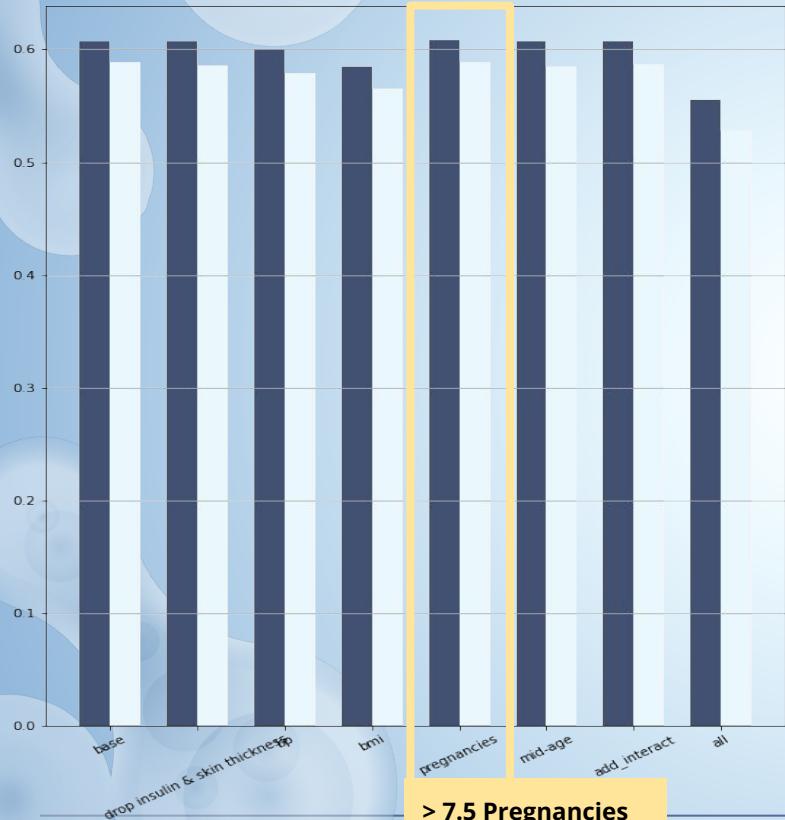
Feature Engineering

- Drop Insulin & Skin Thickness
- Interact BMI & Diabetes Predisposition
- >7.5 Pregnancies
- Middle Age
- High BP (>80)
- High BMI

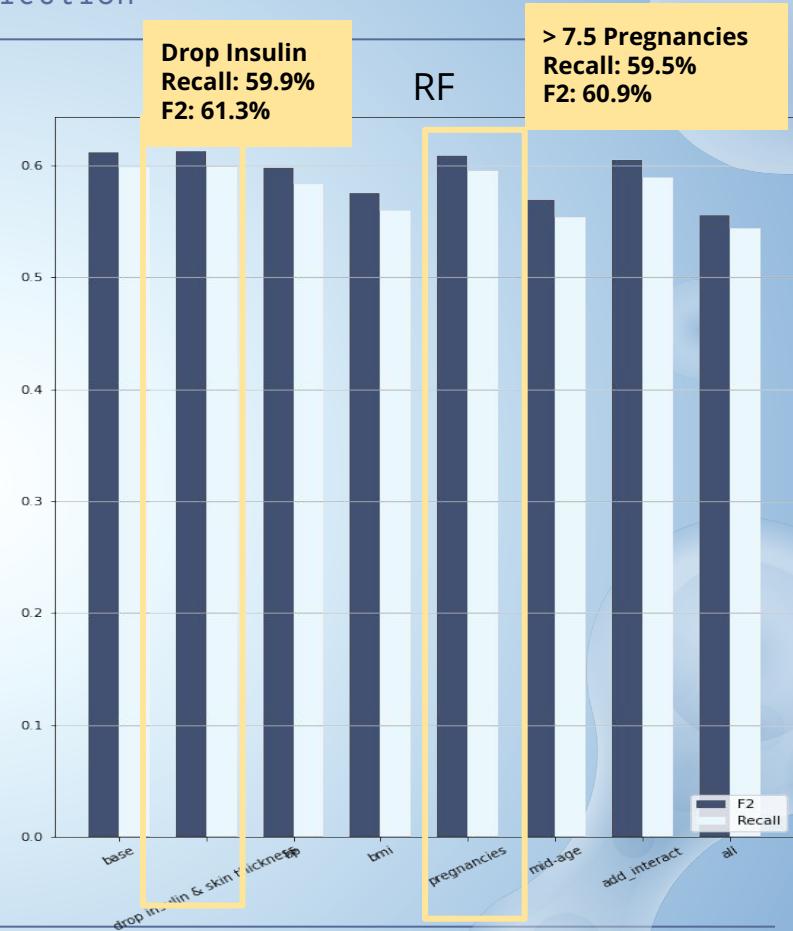


Feature Selection

Logit



RF



Hyperparameter Tuning

- Randomized Search CV
- Parameters:
 - N-estimators
 - Min. Sample split
 - Min. leaf samples
 - Max. depth

| RF | F2 Score | Recall Score | False Neg |
|------------------|----------|--------------|-----------|
| Drop Insulin | 90.3% | 89.2% | 11% |
| + >7.5 Pregnancy | 95.8% | 95.1% | 4.9% |

Hyperparameter Tuning

- Randomized Search CV
- Parameters:
 - Solver
 - Penalty
 - C value
 - Class Weight

| LM | F2 Score | Recall Score | TPR |
|--|----------|--------------|-------|
| Drop Insulin + >7.5 Pregnancy | 72.9% | 76.7% | 23.3% |
| Test | 62% | 63% | 27% |

Final Model & Future Work

- Random Forest it is!
 - App
- Fit more time-intensive ensembles:
 - Stacking Classifier
 - Ada Boost
- Model on larger dataset containing men and women of different indigenous backgrounds.
 - Mitigate overfit issues

APP INTERFACE

Created using Flask



QUESTIONS?

THANKS !

CREDITS: This presentation template was created by Slidesgo,
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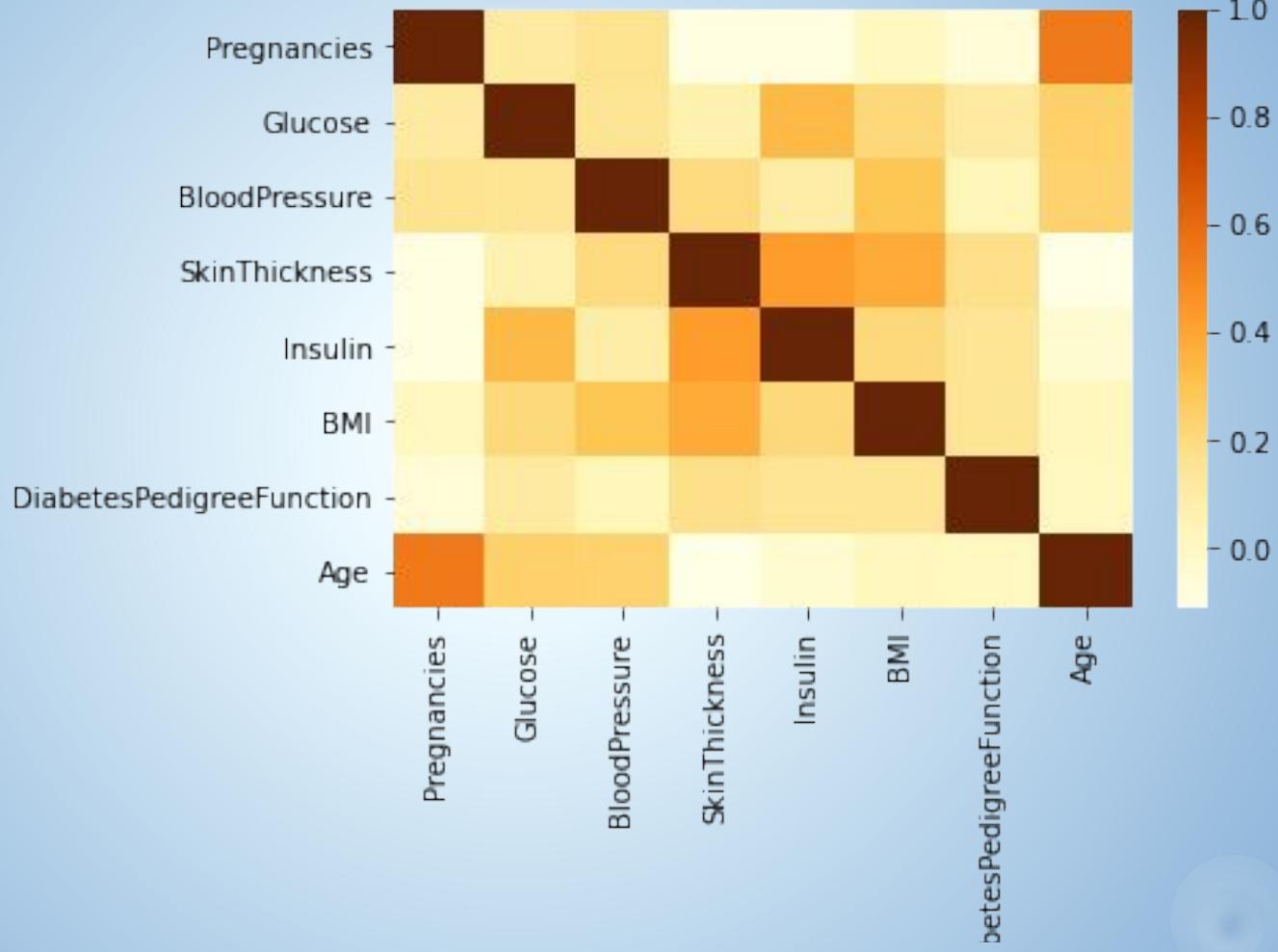
Assumptions & Caveats

- This dataset contains metrics from female patients over the age of 21, so this model is meant for adult females.
- This algorithm assumes doctors can calculate the Predospition function using family history information.
- Medical information from people of Pima Indian descent can be used to predict instance of diabetes for people of Indigenous North American descent.

Appendix

- Smith, J.W., Everhart, J.E., Dickson, W.C., Knowler, W.C., & Johannes, R.S. (1988). Using the ADAP learning algorithm to forecast the onset of diabetes mellitus. In Proceedings of the Symposium on Computer Applications and Medical Care (pp. 261--265). IEEE Computer Society Press.
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Feature Correlations





Feature Importance: Random Forest

