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PREDICTING HEART DISEASE

Applications of Machine Learning

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AGENDA

HEART DISEASE OVERVIEW

PROBLEM STATEMENT

TRENDS

MODELS

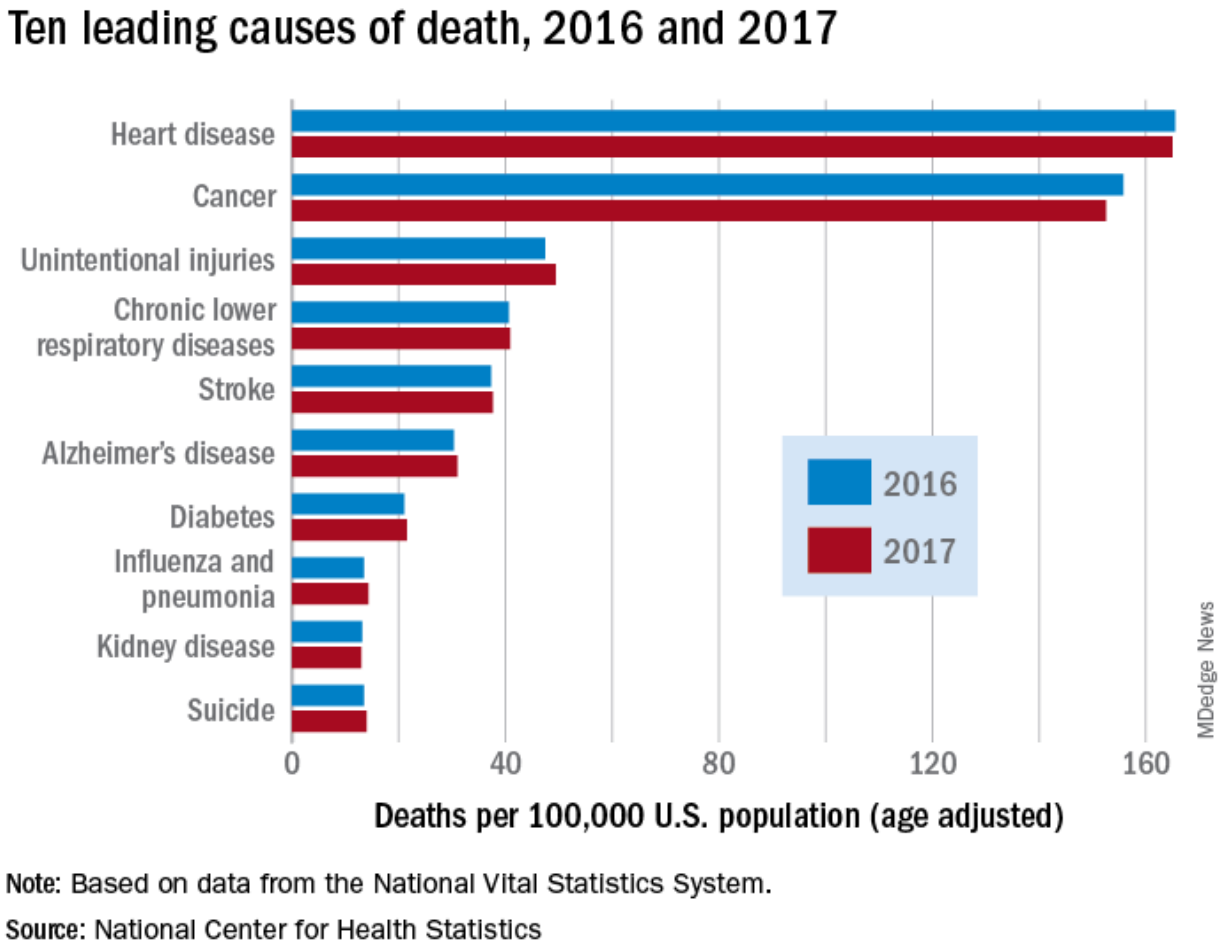
CONCLUSIONS AND NEXT STEPS

HEART DISEASE

HEART DISEASE

STATISICS

- *Leading cause of death for men and women*
- *About 630,000 people die from heart disease every year (1 in 4 deaths)*



HEART DISEASE

TYPES OF HEART DISEASE

- *Congenital artery disease (most common)*
- *Vascular disease*
- *Heart attack*
- *Heart failure*

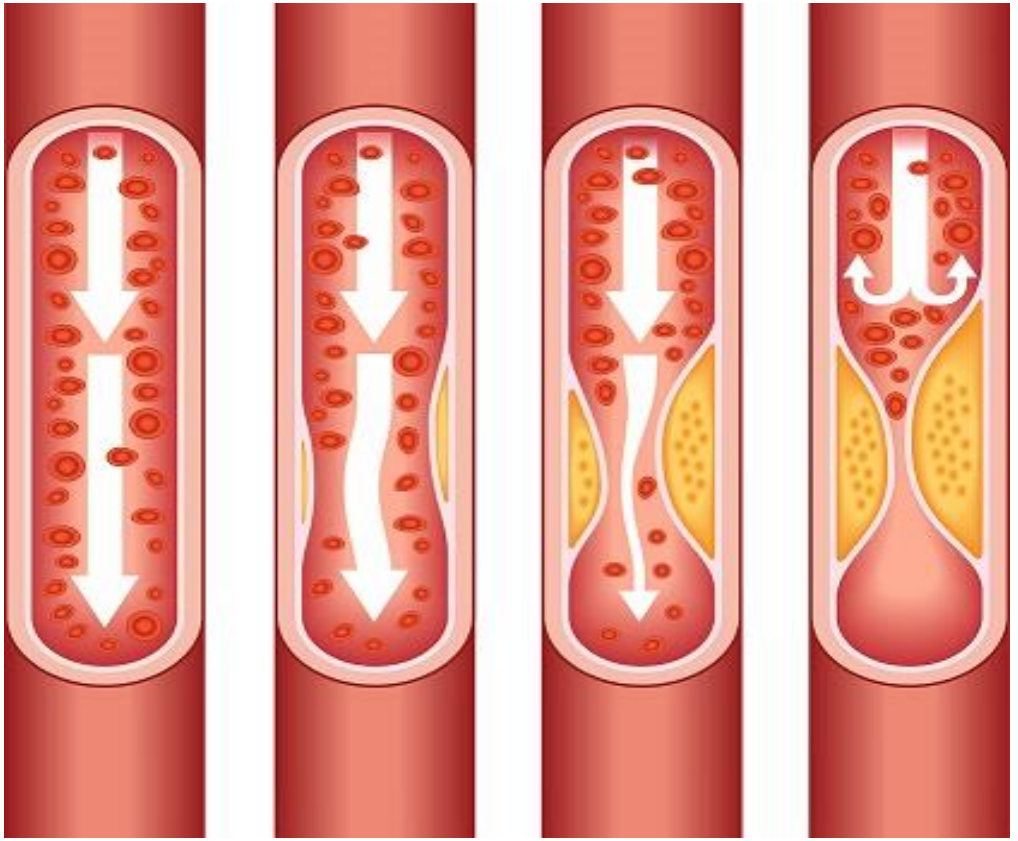


Figure 1. Plaque buildup
CDC Fast Stats: Heart Disease
Retrieved from https://www.cdc.gov/heartdisease/facts.htm

HEART DISEASE

SPENDING

2015 Spending:

$318 billion (direct)

$237 billion (indirect)

2035 Projections:

$749 billion (direct)

$368 billion (indirect)

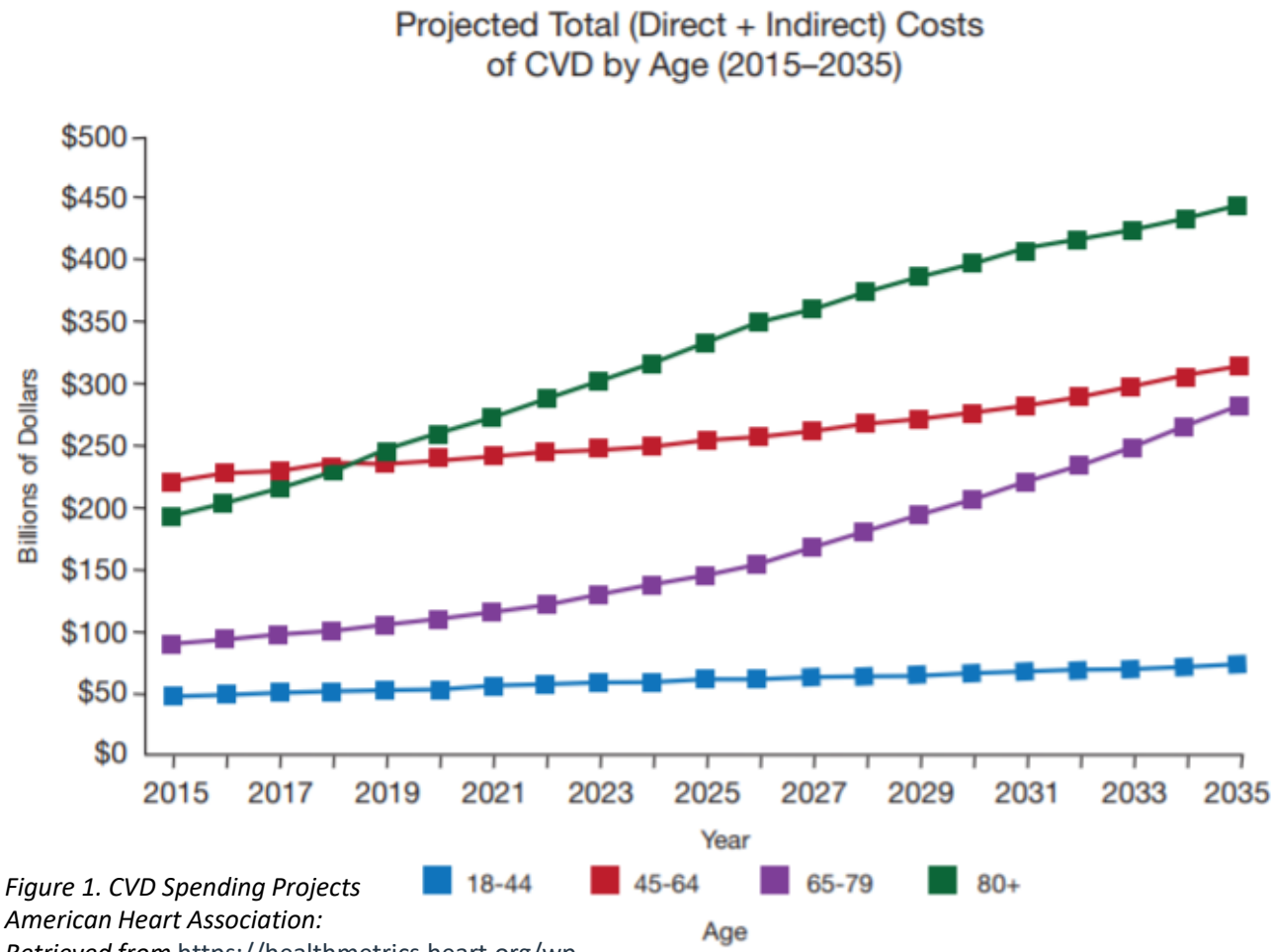


Figure 1. CVD Spending Projects American Heart Association: Retrieved from https://healthmetrics.heart.org/wp-content/uploads/2017/10/Cardiovascular-Disease-A-Costly-Burden.pdf

PROBLEM STATEMENTS

PROBLEM STATMENTS

Statements:

1. Can we predict heart disease accurately based on the variables from this data?
2. What are the trends of heart disease within our data?

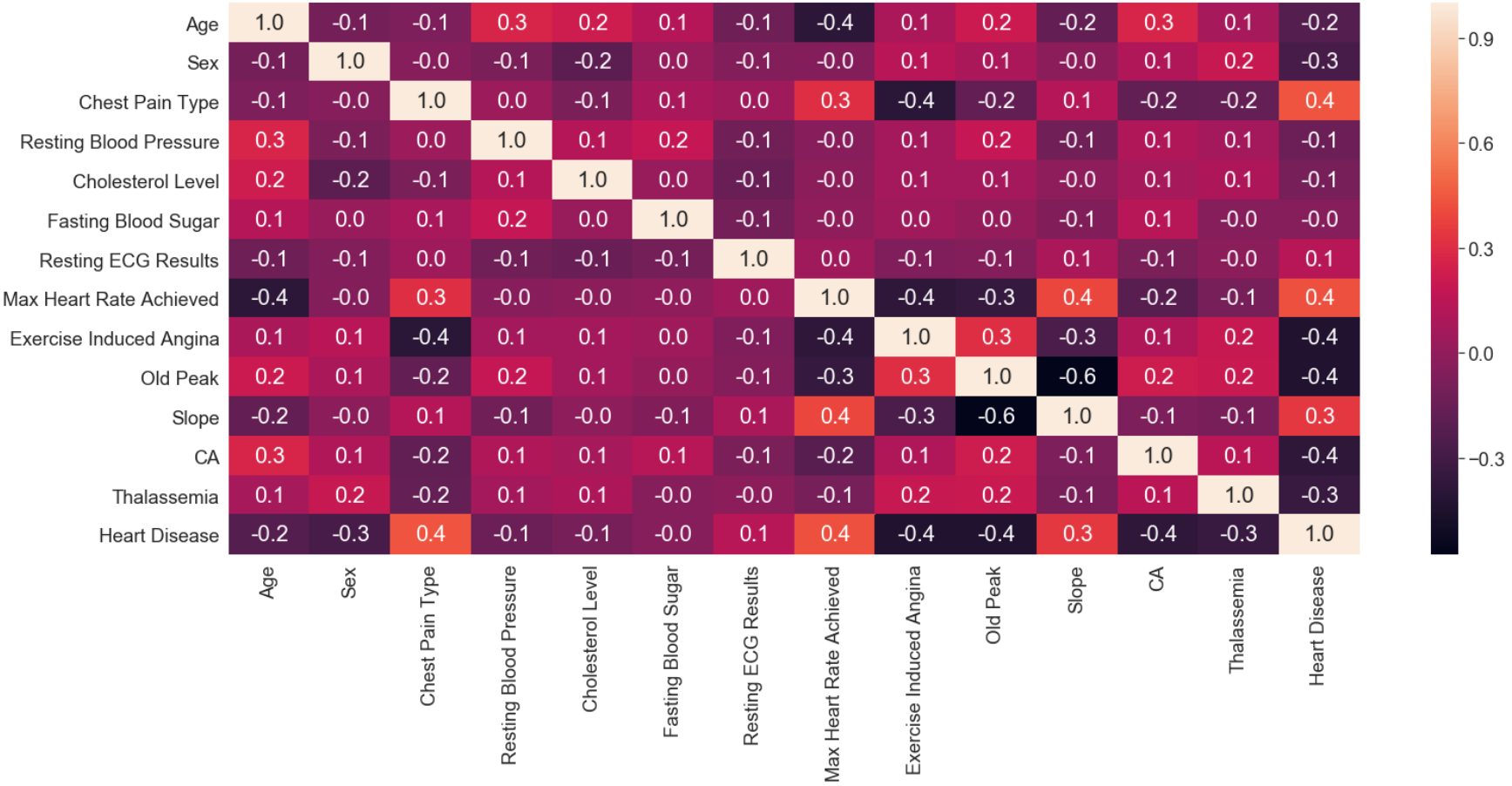
Long Term Goals:

1. Can we reduce heart disease with machine learning?
2. If we can predict heart disease with ML, could we decrease spending?

TRENDS

DATA

1025 observations and 14 variables



MODELS

LOGISTIC REGRESSION

Baseline: 51% accuracy

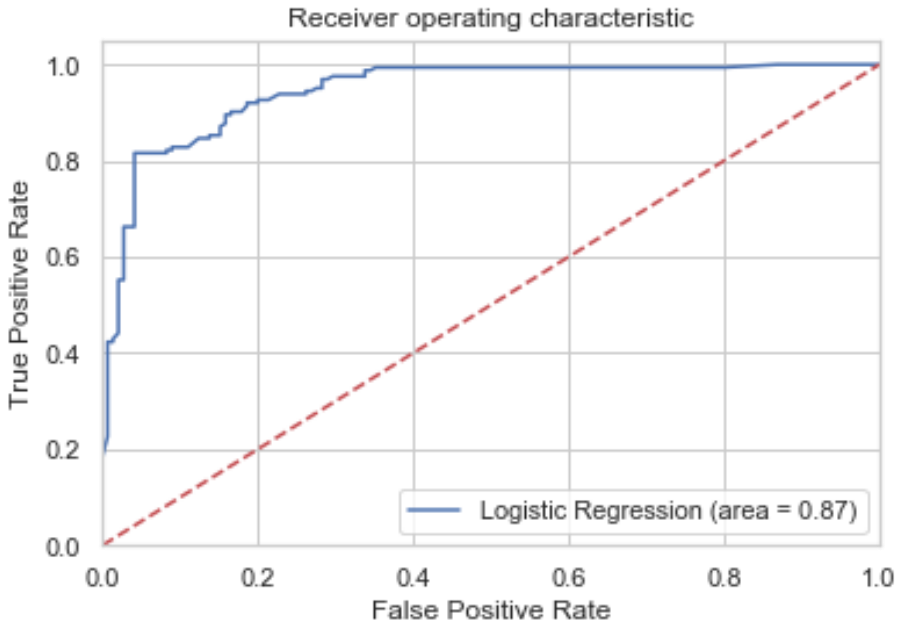
Features:

Sex, Chest pain type, Resting blood pressure, Resting ECG results, exercised induced angina, number of major vessels colors, thalassemia

Results:

Precision score of 87%

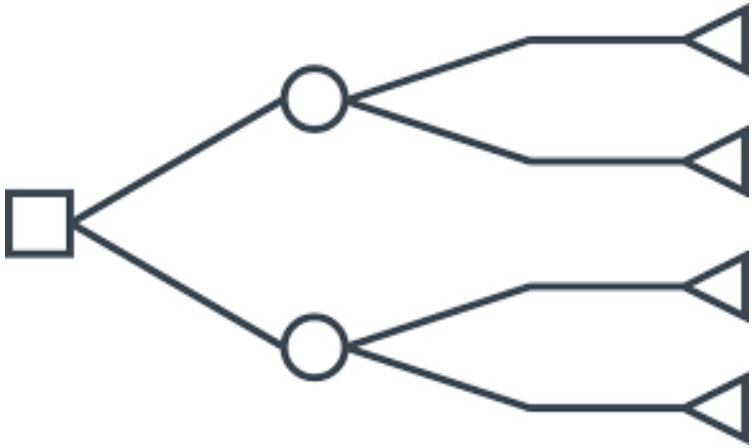
Accuracy of 87%



	precision	recall	f1-score	support
0	0.88	0.84	0.86	145
1	0.86	0.90	0.88	163
accuracy			0.87	308
macro avg	0.87	0.87	0.87	308
weighted avg	0.87	0.87	0.87	308

DECISION TREE

Baseline Model: 51% accuracy



Features: All Features

Results:
Precision score of 94%
Accuracy of 94 %

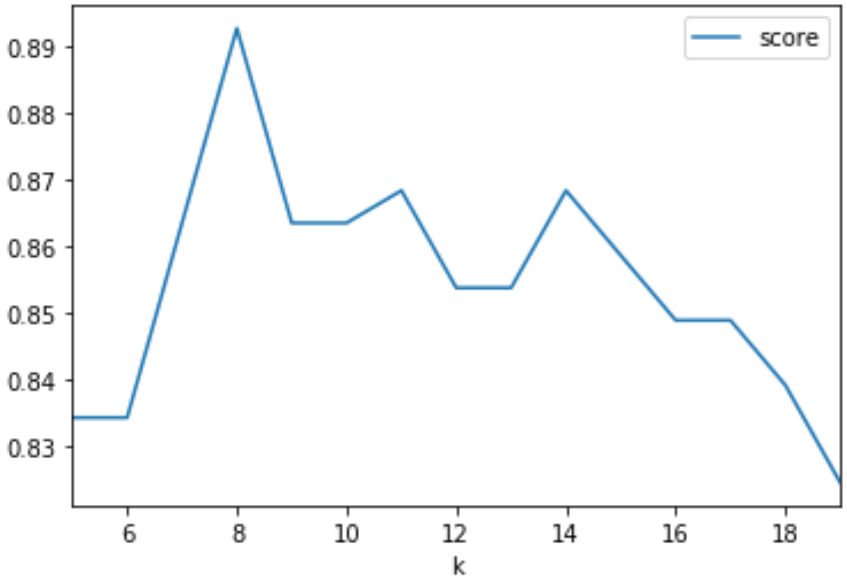
	precision	recall	f1-score	support
0	0.94	0.94	0.94	258
1	0.94	0.94	0.94	255
accuracy			0.94	513
macro avg	0.94	0.94	0.94	513
weighted avg	0.94	0.94	0.94	513

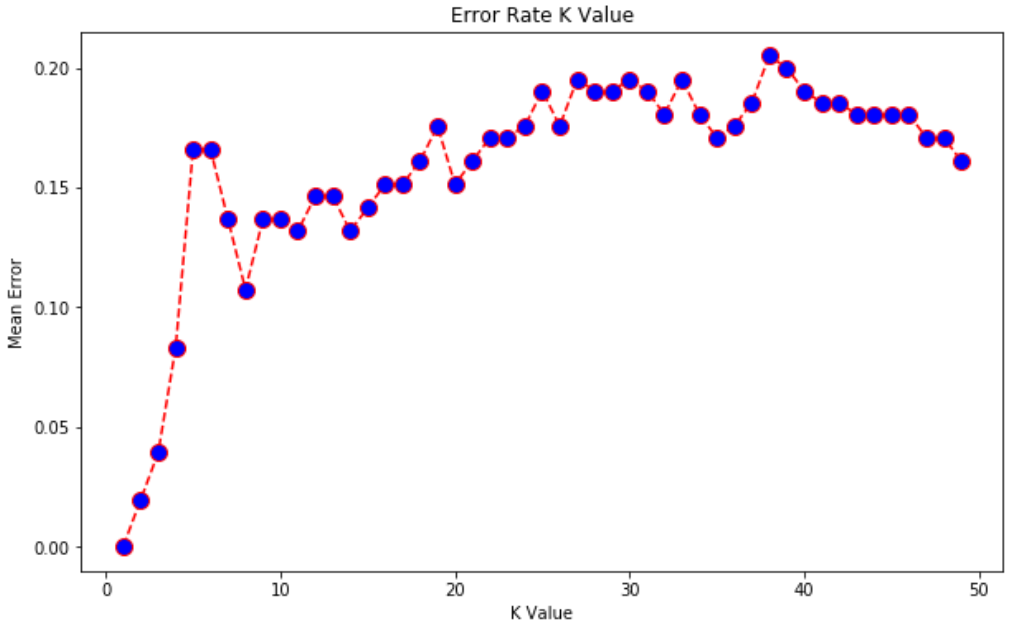
K-NEAREST-NEIGHBORS

Baseline: 51% accuracy

Results:
Precision score of 89%
Accuracy of 89 %

	precision	recall	f1-score	support
0	0.92	0.87	0.90	109
1	0.86	0.92	0.89	96
accuracy			0.89	205
macro avg	0.89	0.89	0.89	205
weighted avg	0.89	0.89	0.89	205





K-NEAREST-NEIGHBORS

PREDICTION

```
new_patient = pd.DataFrame({
 'Age'                    : 24,
 'Sex'                    : 1,
 'Chest Pain Type'        : 0,
 'Resting Blood Pressure' : 200,
 'Cholesterol'            : 150,
 'Fasting Blood Sugar'    : 1,
 'Resting ECG'            : 0,
 'Max Heart Rate'         : 185,
 'Exercise Induced Angina' : 1,
 'oldpeak'                : 0,
 'slope'                  : 0,
 'ca'                     : 0,
 'thalassemia'            : 1

}, index = [0])
```

```
new_patient
```

	Age	Sex	Chest Pain Type	Resting Blood Pressure	Cholesterol	Fasting Blood Sugar	Resting ECG	Max Heart Rate	Exercise Induced Angina	oldpeak	slope	ca	thalassemia
0	24	1	0	200	150	1	0	185	1	0	0	0	1

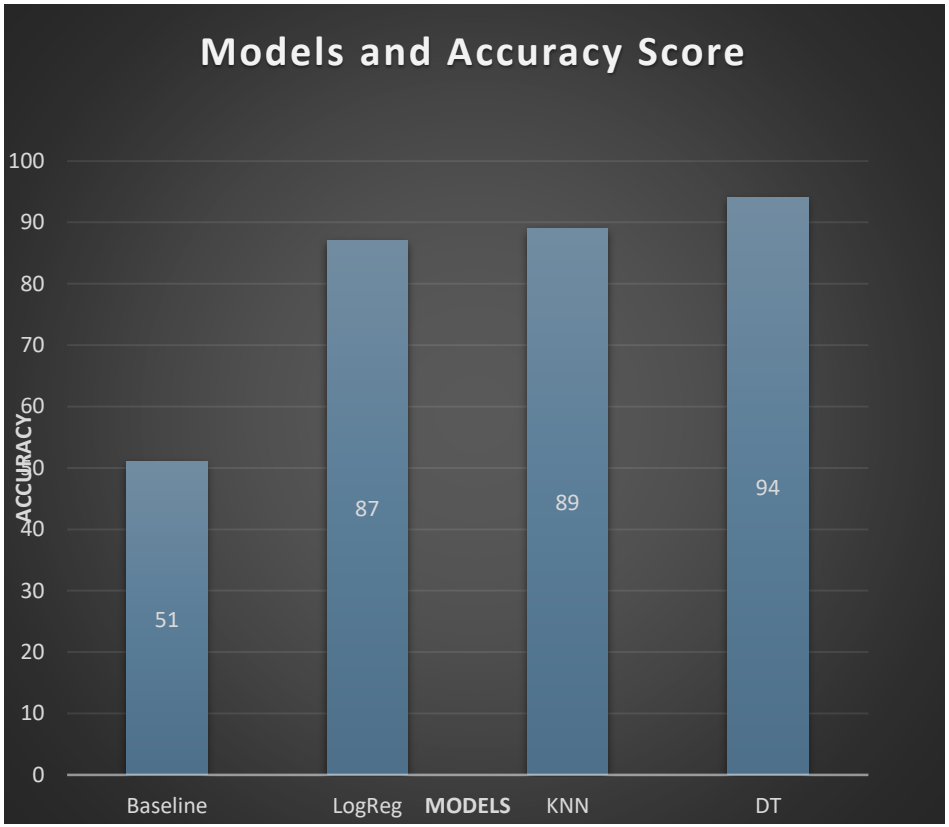
```
print(knn.predict_proba(new_patient).round(2))
print(knn.predict(new_patient))
```

```
[[0.58 0.42]]
[0]
```

No Heart Disease!

CONCLUSIONS

CONCLUSIONS



NEXT STEPS

- ***Feature Engineering***
- ***Fine tuning parameters***
- ***Looking at the complete data set of 74 variables***

SOURCES

- Devitt, Michael. “CDC Data Show U.S. Life Expectancy Continues to Decline.” *AAFP Home*, AAFP, 10 Dec. 2018, www.aafp.org/news/health-of-the-public/20181210lifeexpectdrop.html.
- “Heart Disease Fact Sheet|Data & Statistics|DHDSP|CDC.” *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 2017, www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_heart_disease.htm.
- "CARDIOVASCULAR DISEASE: A COSTLY BURDEN FOR AMERICA. PROJECTIONS THROGH 2035" American Heart Association https://healthmetrics.heart.org/wp-content/uploads/2017/10/Cardiovascular-Disease-A-Costly-Burden.pdf

THANK YOU, NEXT