Using Machine Learning Models for Diabetes Evaluation

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Why use Machine Learning?

- About 11% of the world has Diabetes
  - 90% of those with it have Type 2.

- Faster/Earlier detection and Diagnosis.
  - Faster care leads to a healthier life.
  - The earlier your diagnosed, the easier it is to handle the effects.

- Less testing is needed to confirm the diagnosis.
  - If you require fewer tests, it lowers cost and patient time.

Project Goal

- The goal of the project was to find the type of model that would be the most feasible for clinical use.

- Various models were tested for this project.
  - Logistic regression, SVM, K-NN, MLP Model, etc.

- If a substantial model can be found that provides high accuracy it can be used to help physician catch earlier stage diabetes.

Current Issues with Evaluation

- Imbalanced data set, only 8.5% are diabetes positive
- The data does not specify Type 1 or 2
- The overall low recall in several models
- No explainability with our best Model MLP

Code Evaluation

	Accuracy	Precision Class 0	Precision	Recall Class 2	Recall Class 1	F1 Class 0 Avg	F1 Class 1 Avg	Time
LR	0.96	0.97	0.86	0.99	0.64	0.98	0.73	0.037 sec
Tree	0.97	0.97	0.97	1	0.69	0.98	0.80	6 Sec
MLP	0.97	0.97	0.99	1	0.81	0.99	0.81	130 Sec
SVM	0.97	0.97	0.98	1	0.65	0.98	0.78	840 Sec
Forest	0.97	0.97	0.98	1	0.69	0.98	0.81	139 Sec
KNN	0.96	0.97	0.88	0.99	0.63	0.98	0.74	7 Sec

Working Demo

- Read in the data
- Preprocess
  - Dummy variables for smoking
  - One hot encode gender
  - Scale: 'age', 'bmi', 'HbA1c_level', 'blood_glucose_level'
- Test Train split
  - 80%-20%
- Model Building
  - Gridsearch
  - K-fold Cross validation k=5

Conclusion / Results

- Our Multi-Layer Perceptron model provided the highest accuracy as well as F1 scores.
  - Coupled with it's relatively fast computation time we believe this model is the best performing.

- If this model is used in a clinical setting, physicians should be made aware of its shortcomings.
  - It's recall on diabetes classification is only 0.81, so edge cases should still be given a test if there predicted as negative.