# Problem Statement

**Problem(s) Identified**

Many Singaporeans are unaware of their diabetic status, creating a gap between perceived health and actual risk, therefore a dire need exists to promote early detection and prevention of diabetes in Singapore.

*To close the gap(s)...*

**Business Goals**

Develop a practical tool to estimate an individual's diabetes risk using their health and lifestyle data through analytics. This tool should addresses the critical awareness gap by enabling early detection, supporting both public and clinical prevention efforts in line with the Healthier SG initiative.

# CART Model Building

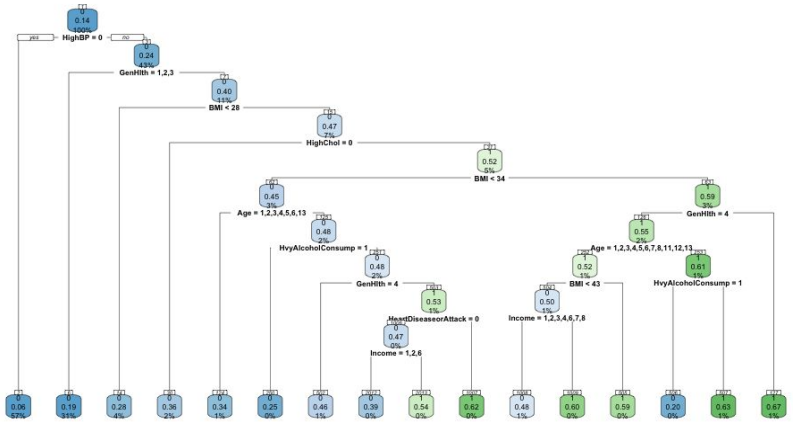
Maximum Tree → Pruning → Final Tree

**Diabetes.csv**

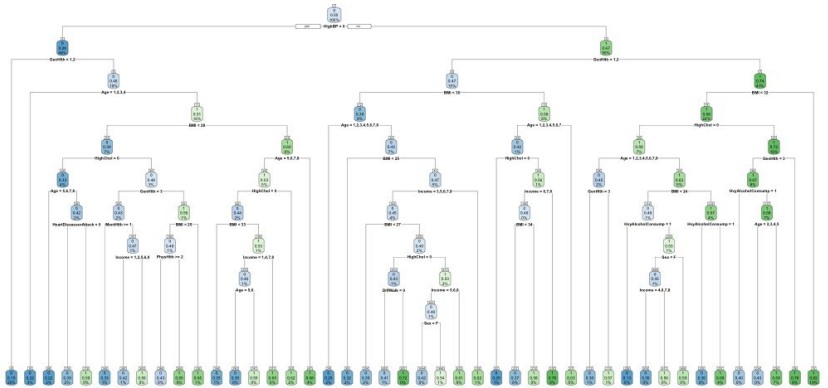
**Diabetes5050.csv**

Models are complicated/ extensive
→ **Most likely overfitted !**

**Maximal Tree (diabetes.csv)**



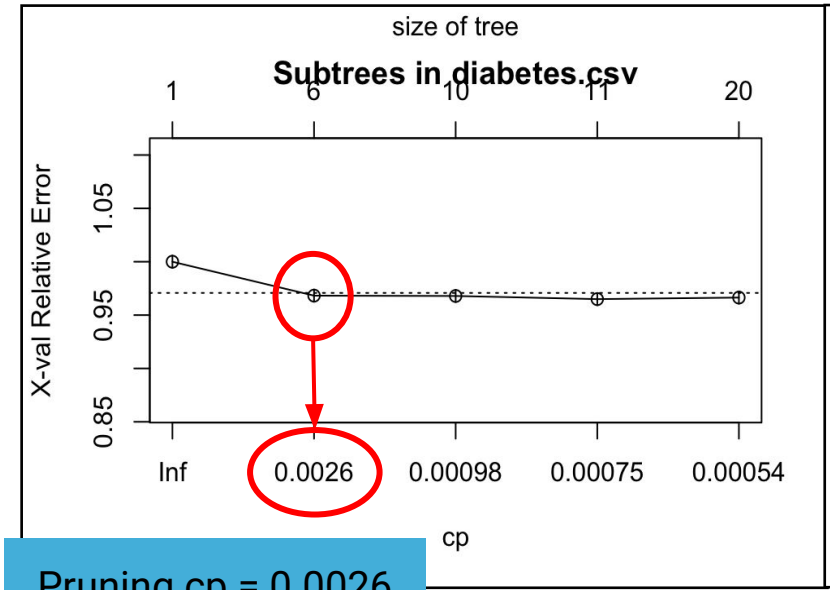

**Maximal Tree (Diabetes5050.csv)**



# CART Model Building

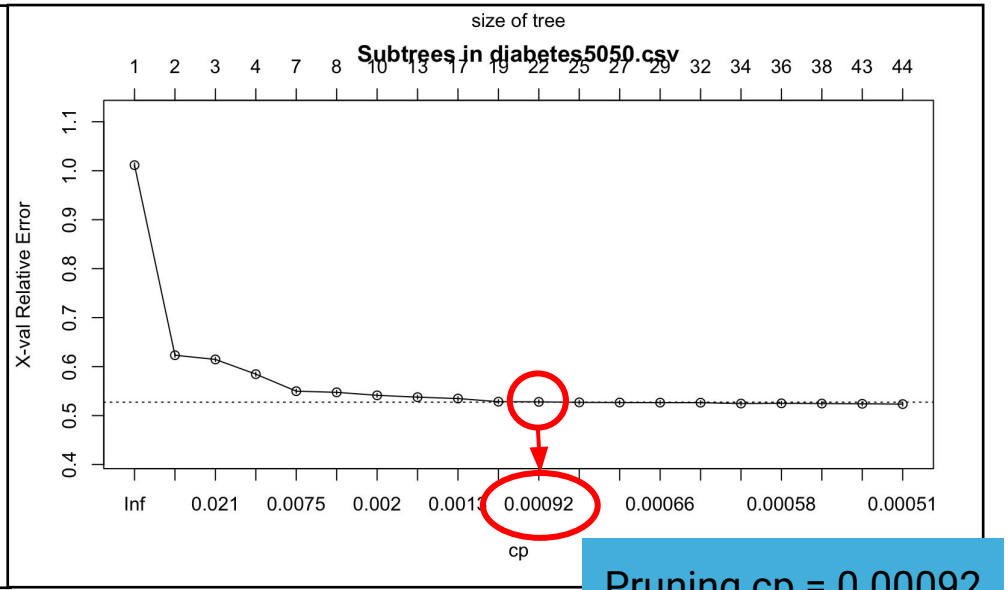
Maximum Tree → **Pruning** → Final Tree

**Diabetes.csv**




Pruning cp = 0.0026

**Diabetes5050.csv**



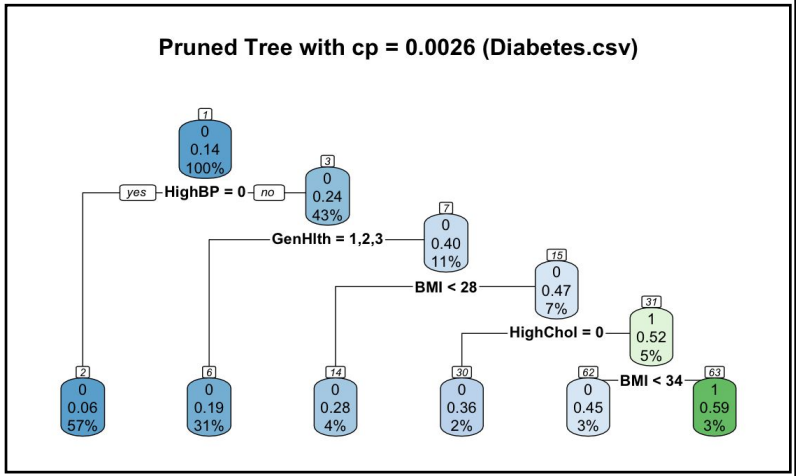

Pruning cp = 0.00092

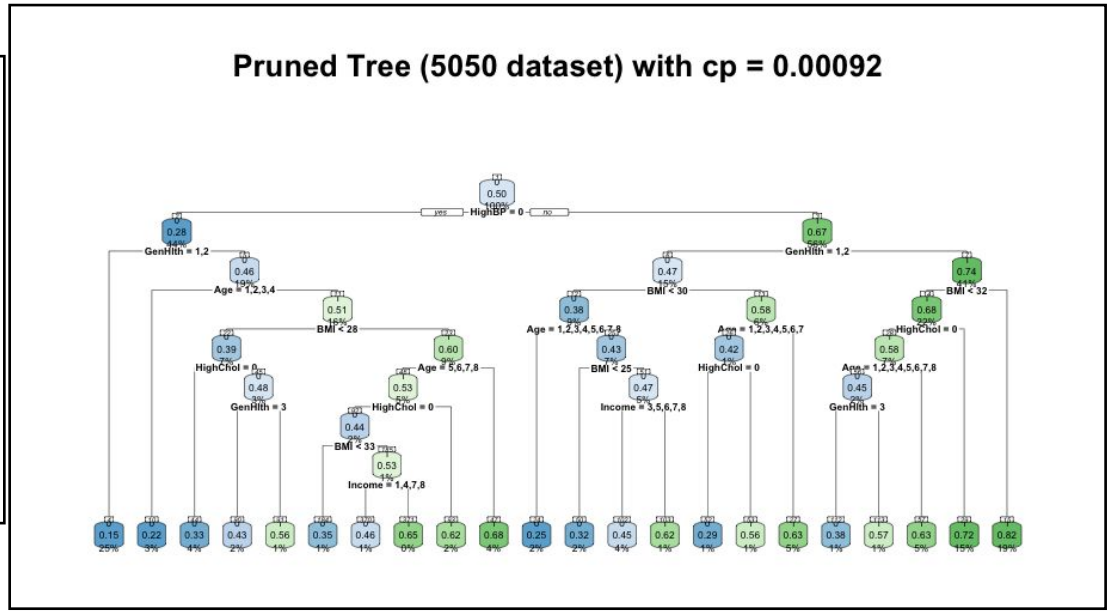
# CART Model Building

Maximum Tree → Pruning → **Final Tree**

**Diabetes.csv**

**Diabetes5050.csv**



# CART Model Performance + Selection

**Selected Model**

## Diabetes.csv

```
> confusion
Confusion Matrix and Statistics

          Reference
Prediction     0     1
         0 64676   824
         1  9514  1090

               Accuracy : 0.8642
                 95% CI : (0.8617, 0.8666)
    No Information Rate : 0.9749
    P-Value [Acc > NIR] : 1
```

High false -ve but low false +ve

Bad in Medical context (no risk when actually have risk)

Higher accuracy (86%)

Compare to NIR (97%) ⇒ model underperforms significantly

## Diabetes5050.csv

```
> confusion2
Confusion Matrix and Statistics

          Reference
Prediction    0    1
         0 7357 3247
         1 2217 8387

               Accuracy : 0.7424
                 95% CI : (0.7364, 0.7482)
    No Information Rate : 0.5486
    P-Value [Acc > NIR] : < 2.2e-16
```

Balanced false -ve and +ve

Implications are less serious (can always go for other check-ups)

Lower accuracy (74%)

Compare to NIR (54%) ⇒ Model outperforms by a good margin

# Proposed Solution – Prototype

## Model used

Final Logistic Regression & CART Model

## Shiny Package

Web page (ui) connected to ongoing R session (server)

***Input*** – ui → **Translation** → ***Output*** – server

6 Significant Variables from CART model:

1. HighBP
2. HighChol
3. Age
4. BMI
5. General Health
6. Income

Collect all user data into a single data frame

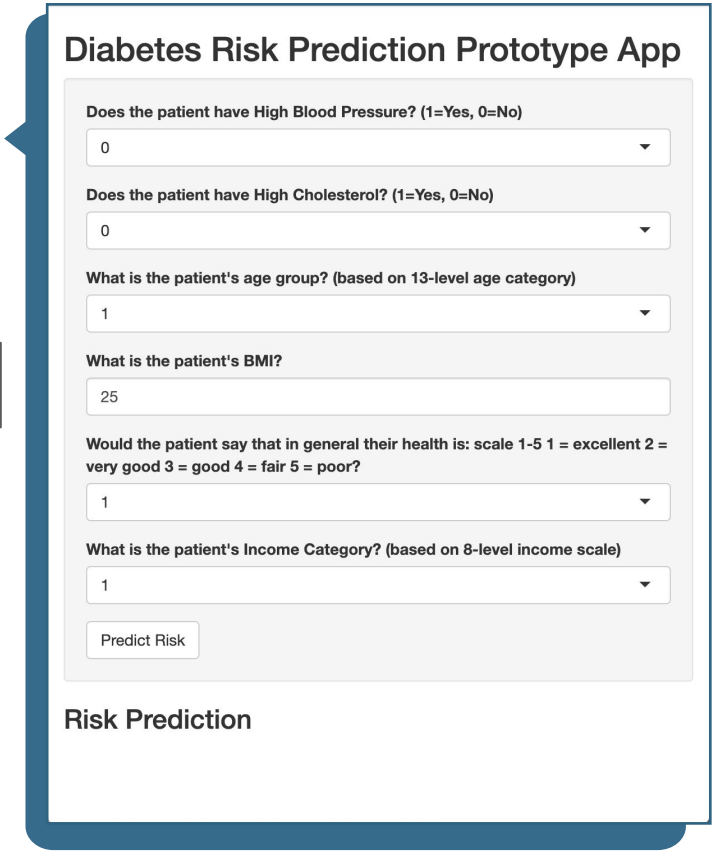
→ new user input feeds into prediction models

Combined probabilities of both models

⇒

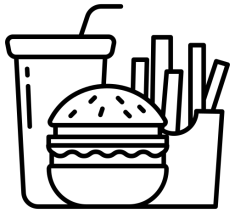
If > 0.5 = At Risk

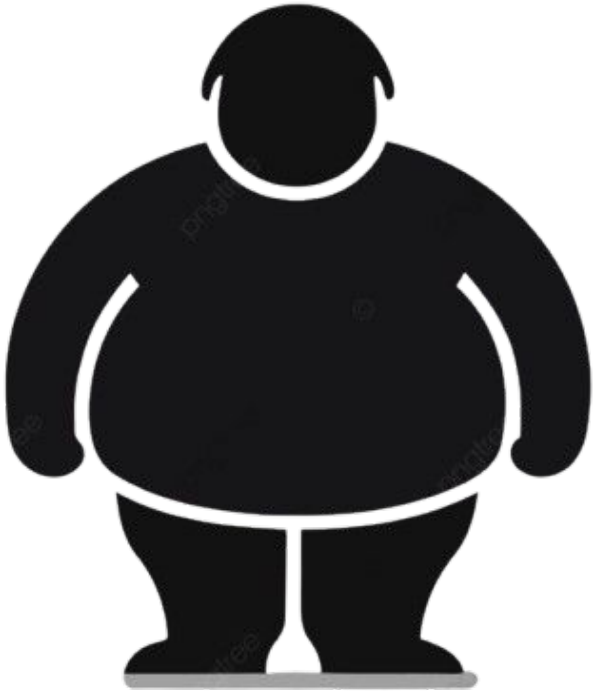
If < 0.5 = Low Risk



# Persona File - Mr Harold Tan [54 y/o Retiree]

Unhealthy diet



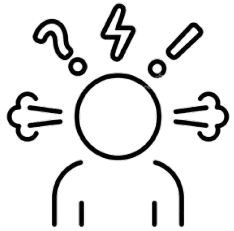


BMI = 35

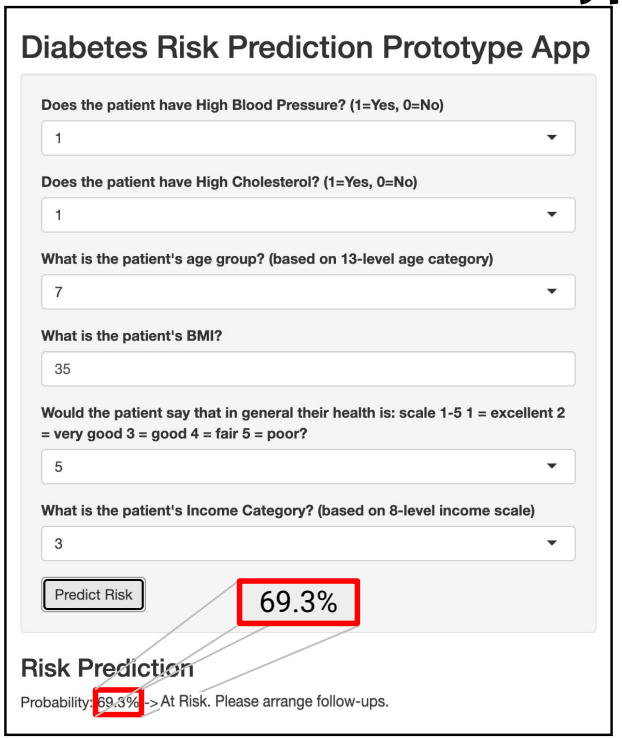
Smokes & Drinks daily

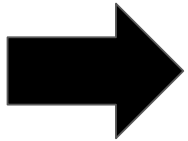
Sedentary Lifestyle

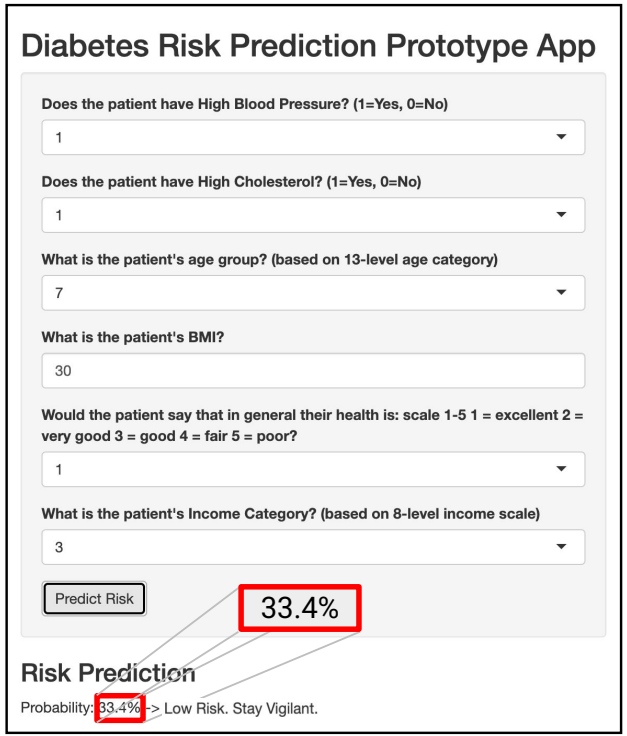
Easily Agitated & High Stress



# Prototype Test - Mr Harold Tan






The doctor would use this results and advise him about his high risk of developing diabetes. To reduce the risk levels, he should change his lifestyle habits such as weight management or improving lifestyle by taking care of his well-being.

If he does take his doctor's advice and improve his lifestyle habits, his risk of developing diabetes is greatly reduced. Stopping drinking and smoking could improve his High Blood Pressure and High Cholesterol, further reducing risk.