

# **LOGISTIC REGRESSION**

# What is Logistic Regression

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Logistic Regression is a machine learning algorithm based on is a machine learning algorithm based on **Supervised Learning**.

It is a statistical method that is used for predicting **probability** of target variable.

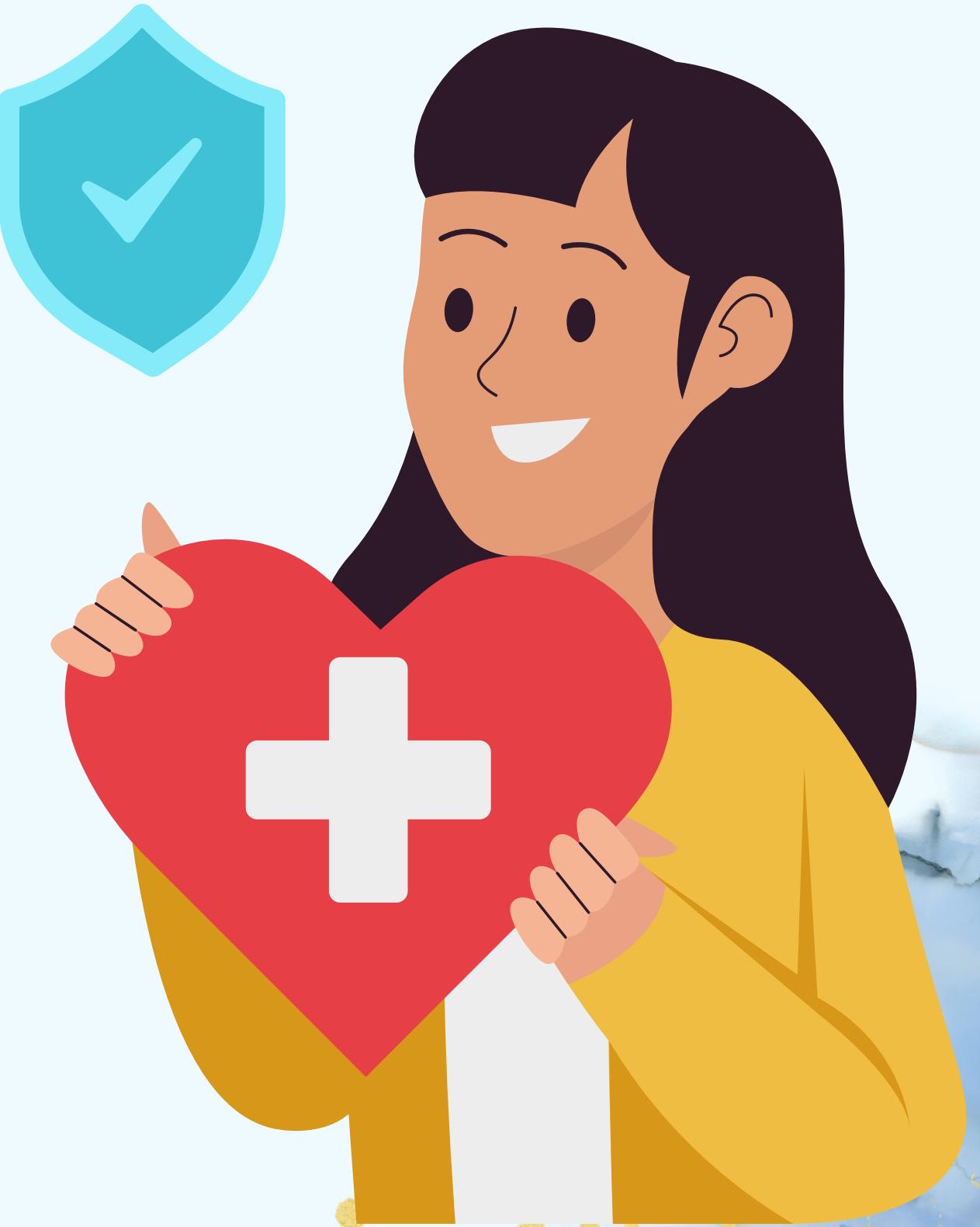
Logistic Regression makes probability for **Classification problems**.

# Example of Logistic Regression

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Whether a Person will  
do the Health Insurance  
or not?

**Answer:** Yes or No



# Example of Logistic Regression

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Whether India will win  
or loss?

Answer: Win or Loss



# Types of Logistic Regression

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- Binary Classification
- Multi-class Classification

# Binary Logistic Regression

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Whether India will win  
or loss?

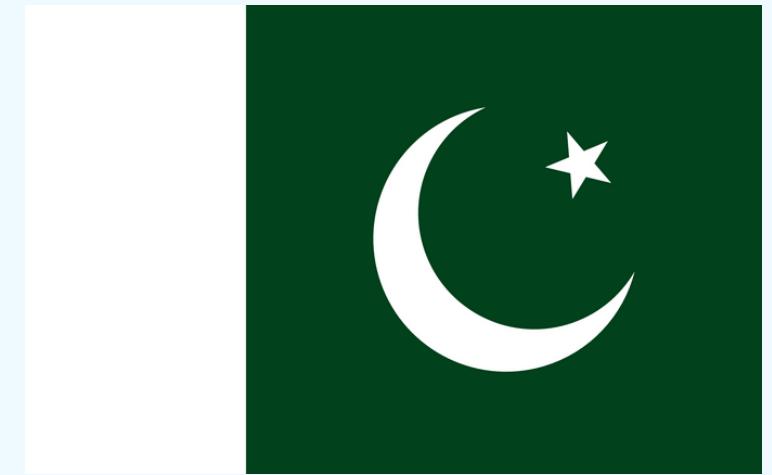
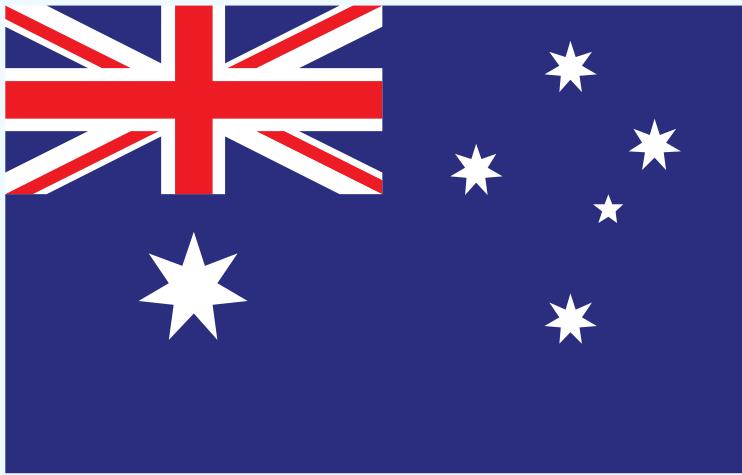
Answer: Win or Loss



# Multi-class Logistic Regression

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Who will win the world cup?



Answer: India or Australia or  
Pakistan

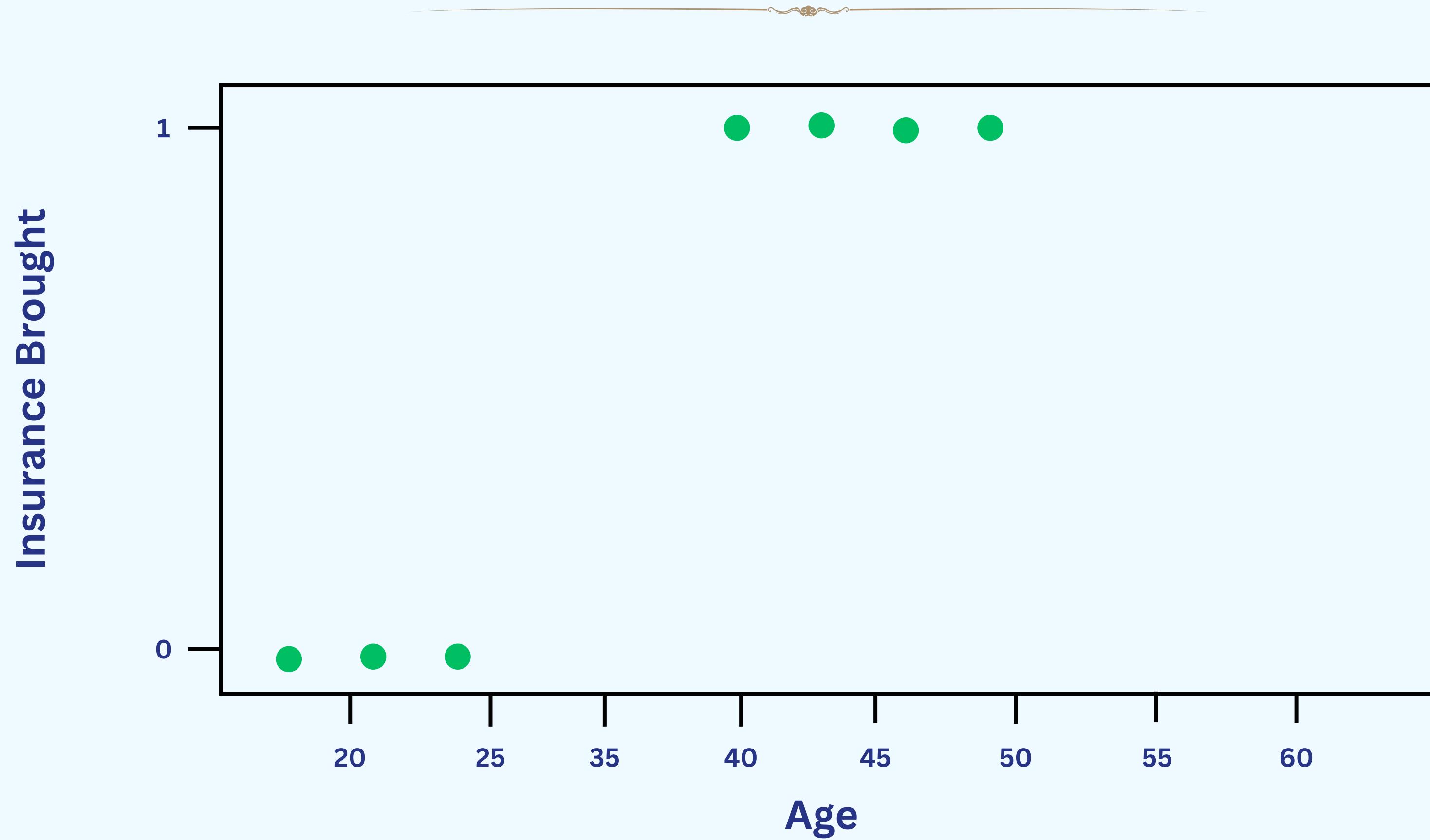
# Logistic Regression Dataset

Age	Bought Insurance
21	No
48	Yes
32	Yes
41	Yes
20	No
35	Yes
23	No

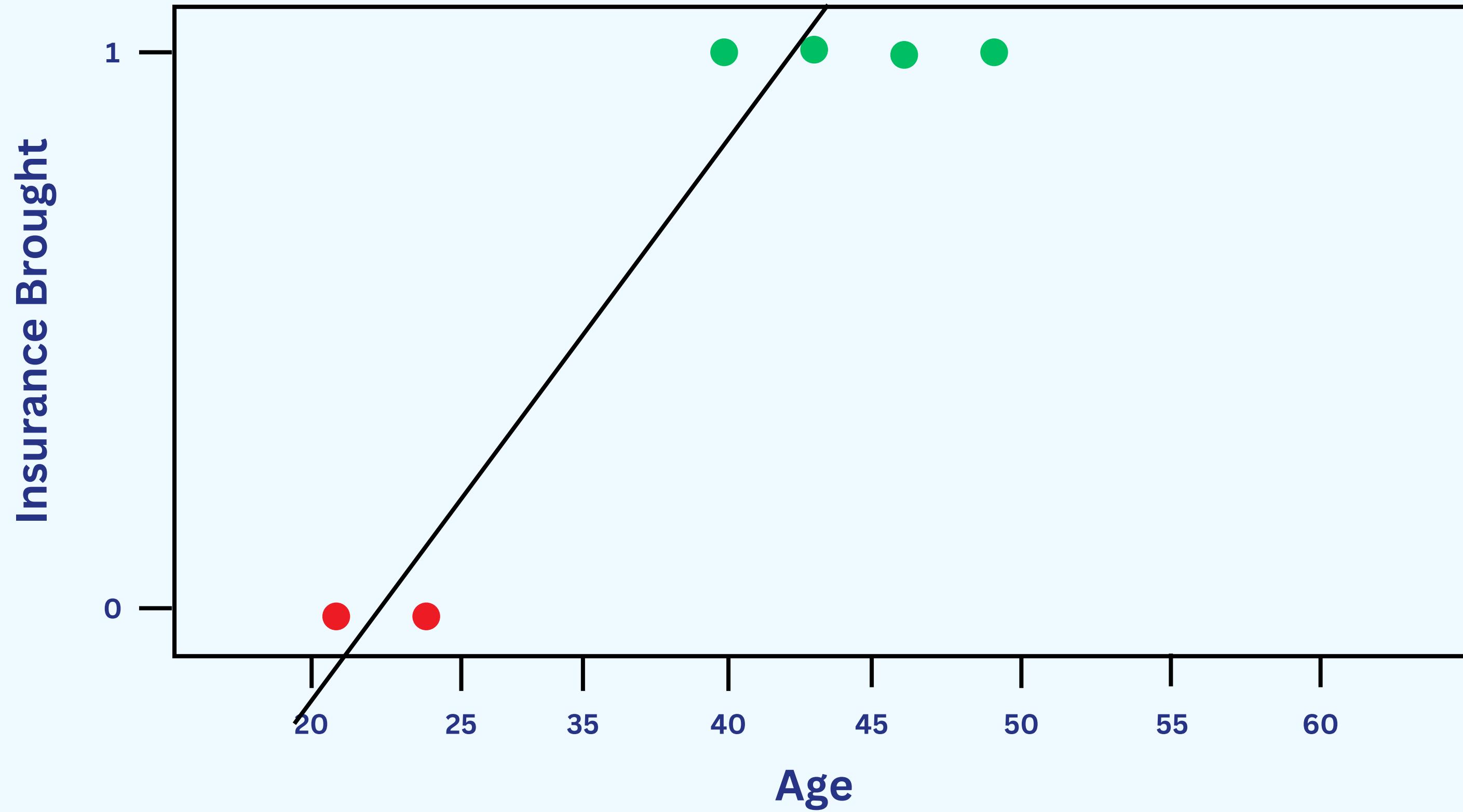
# Logistic Regression Dataset

Age	Bought Insurance	
21	No	0
48	Yes	1
32	Yes	1
41	Yes	1
20	No	0
35	Yes	1
23	No	0

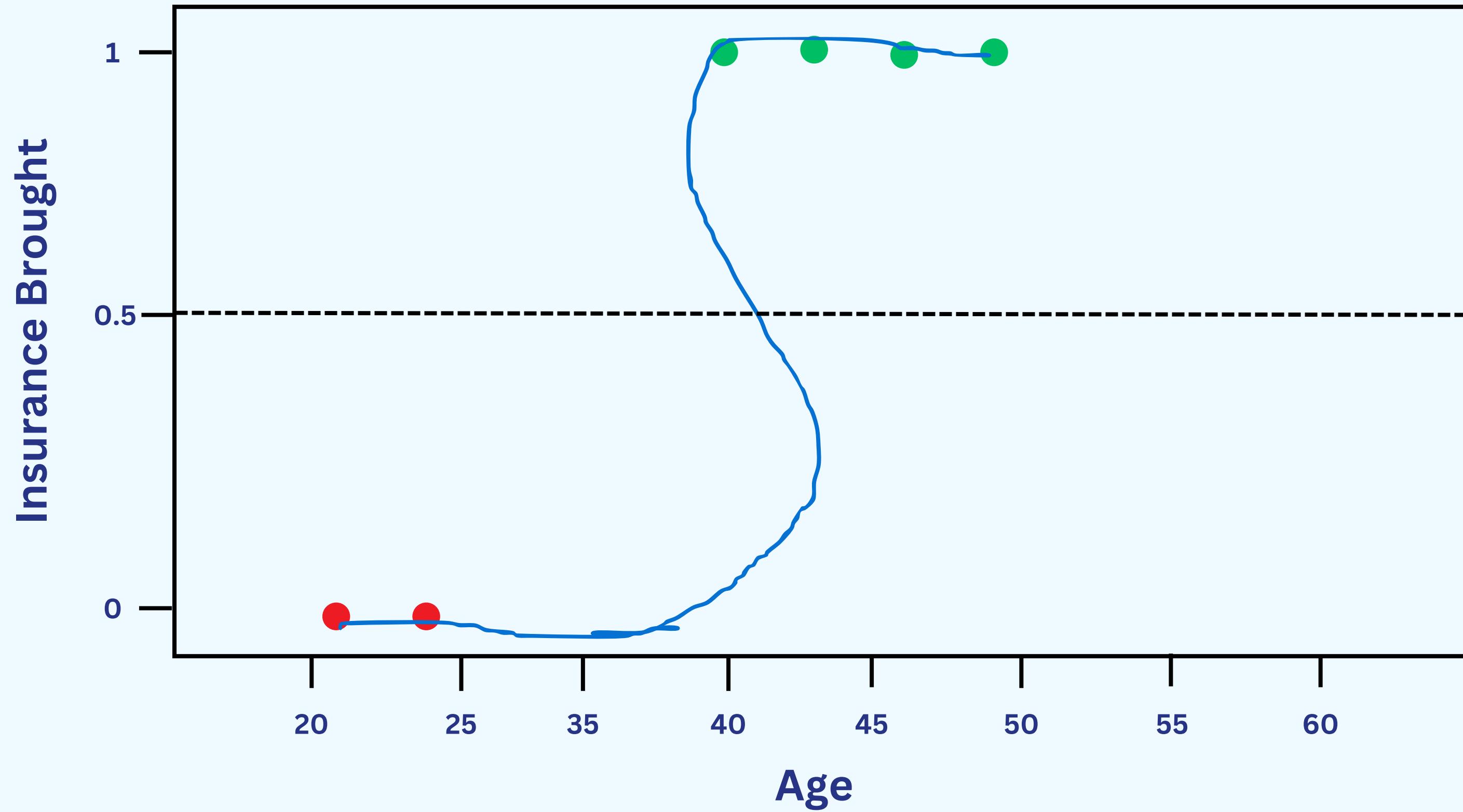
# Logistic Regression Graph



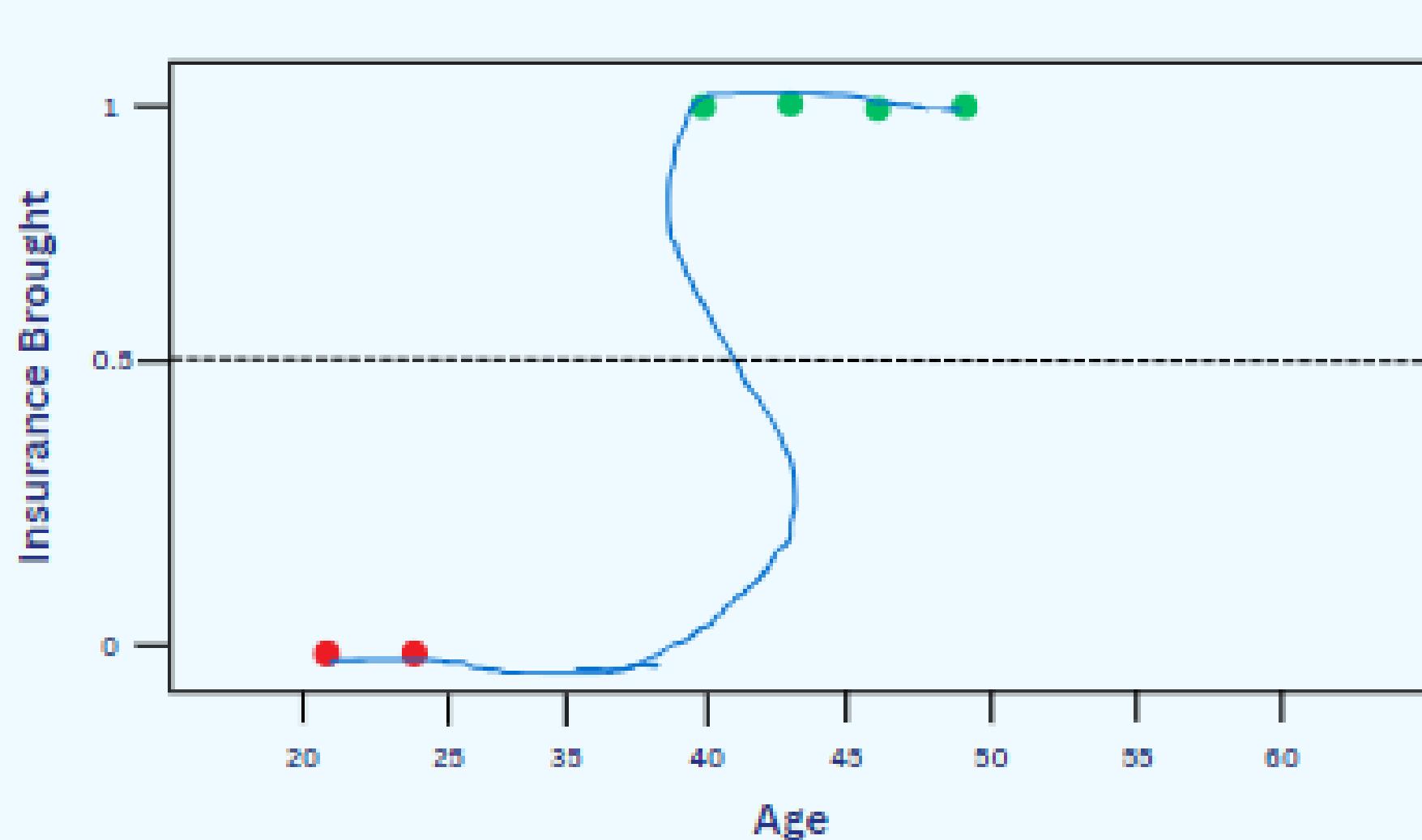
# Linear Regression Graph



# Logistic Regression Graph



# Logistic Regression Graph



$$Y = \frac{1}{1+e^{-(a_0+a_1 x)}}$$

**Sigmoid Function**  
The value of Y will be in between 0 and 1.

# Logistic Regression Problem

Hour	Exam Result
2	0
3	0
4	0
5	1
6	1
7	1
8	1

If a Student studies for 5 hours whether he will pass or fail



# Logistic Regression Problem

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Given

$$a_0 = -1.5$$

$$a_1 = -0.6$$

$$Y = \frac{1}{1 + e^{-(a_0 + a_1 x)}}$$

# Linear vs Logistic Regression

Linear Regression	Logistic Regression
Supervised Regression model.	Supervised Classification model.
The dependent variable (variable that we want to predict) is continuous.	Dependent variable is categorical and binary (0 or 1), making it suitable for calculating the probability of an event.
Equation of Linear Regression: $Y = a_0 + a_1 X$	Equation of Logistic Regression: $Y = \frac{1}{1+e^{-(a_0+a_1 X)}}$
We predict the value by an integer number.	We predict the value by 1 or 0.