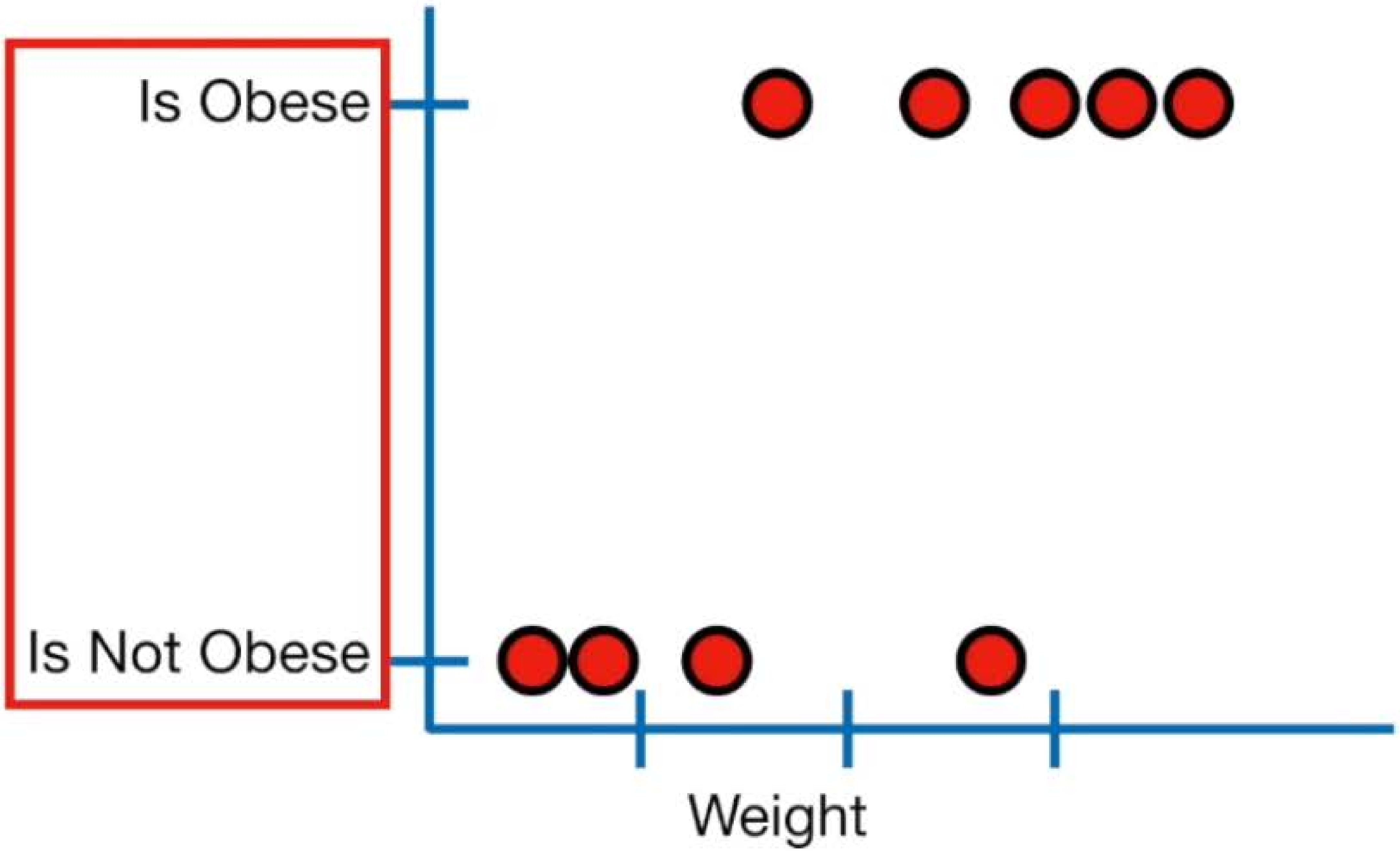
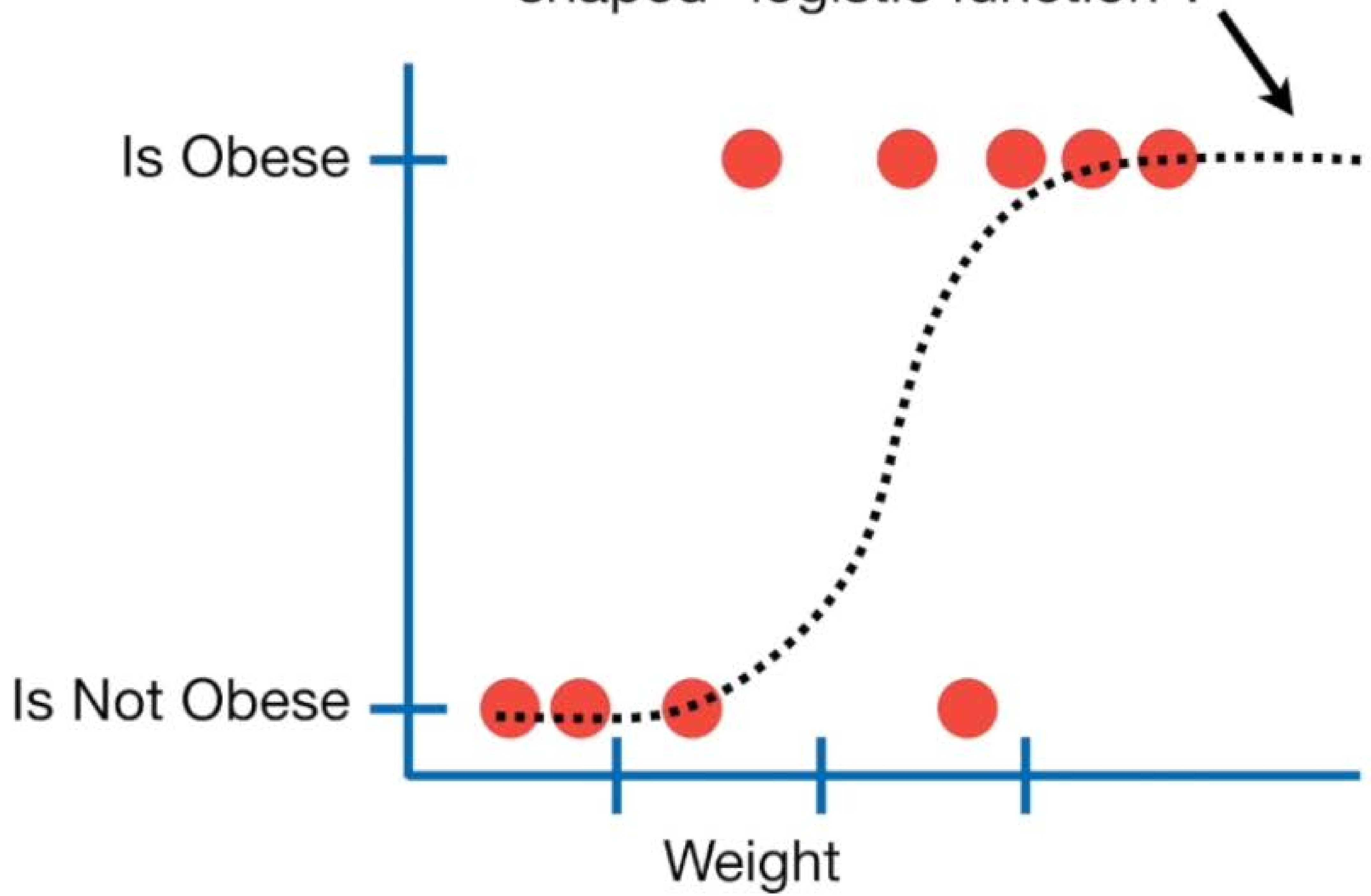
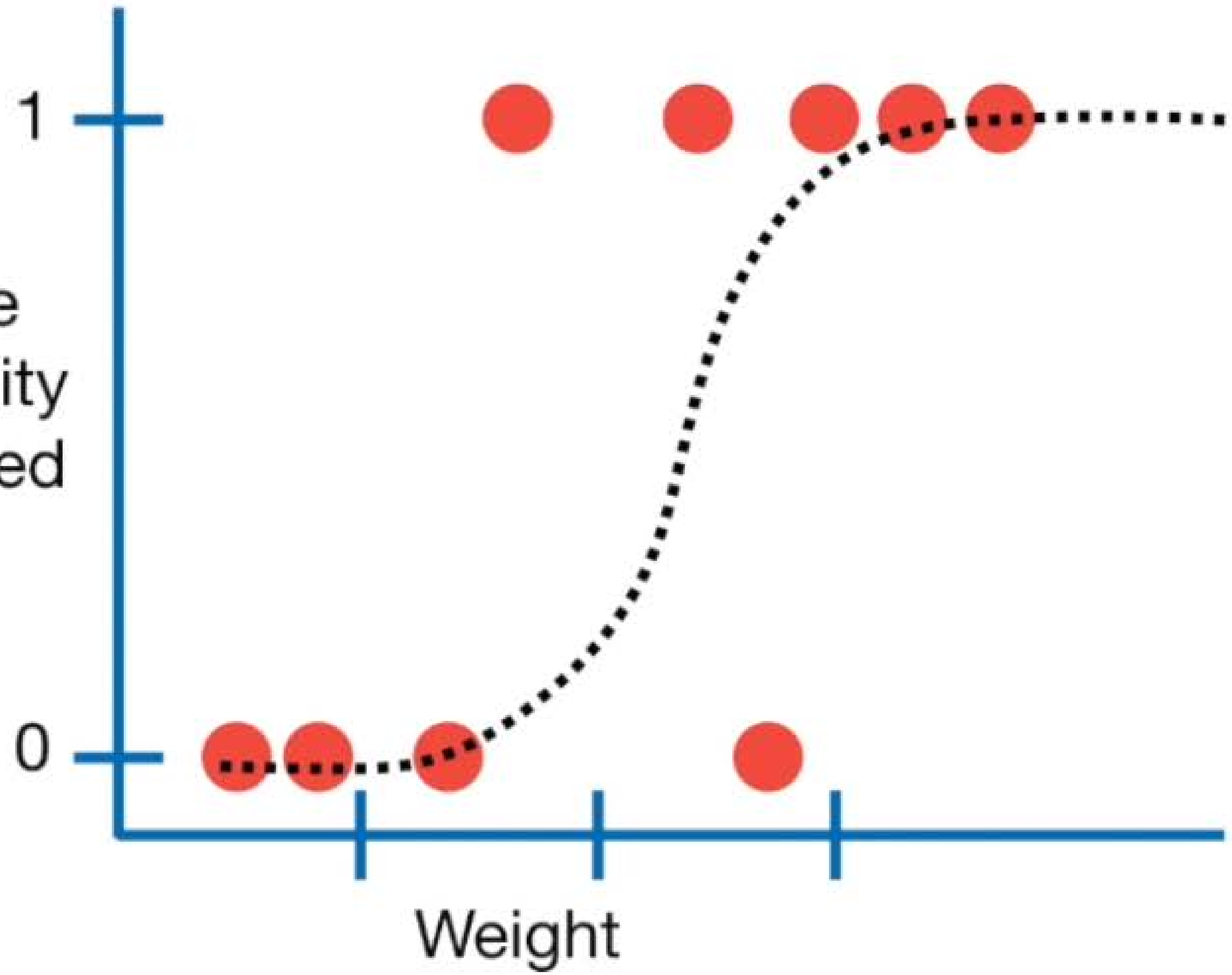
Logistic regression predicts whether something is ***True*** or ***False***, instead of predicting something continuous like ***size***.

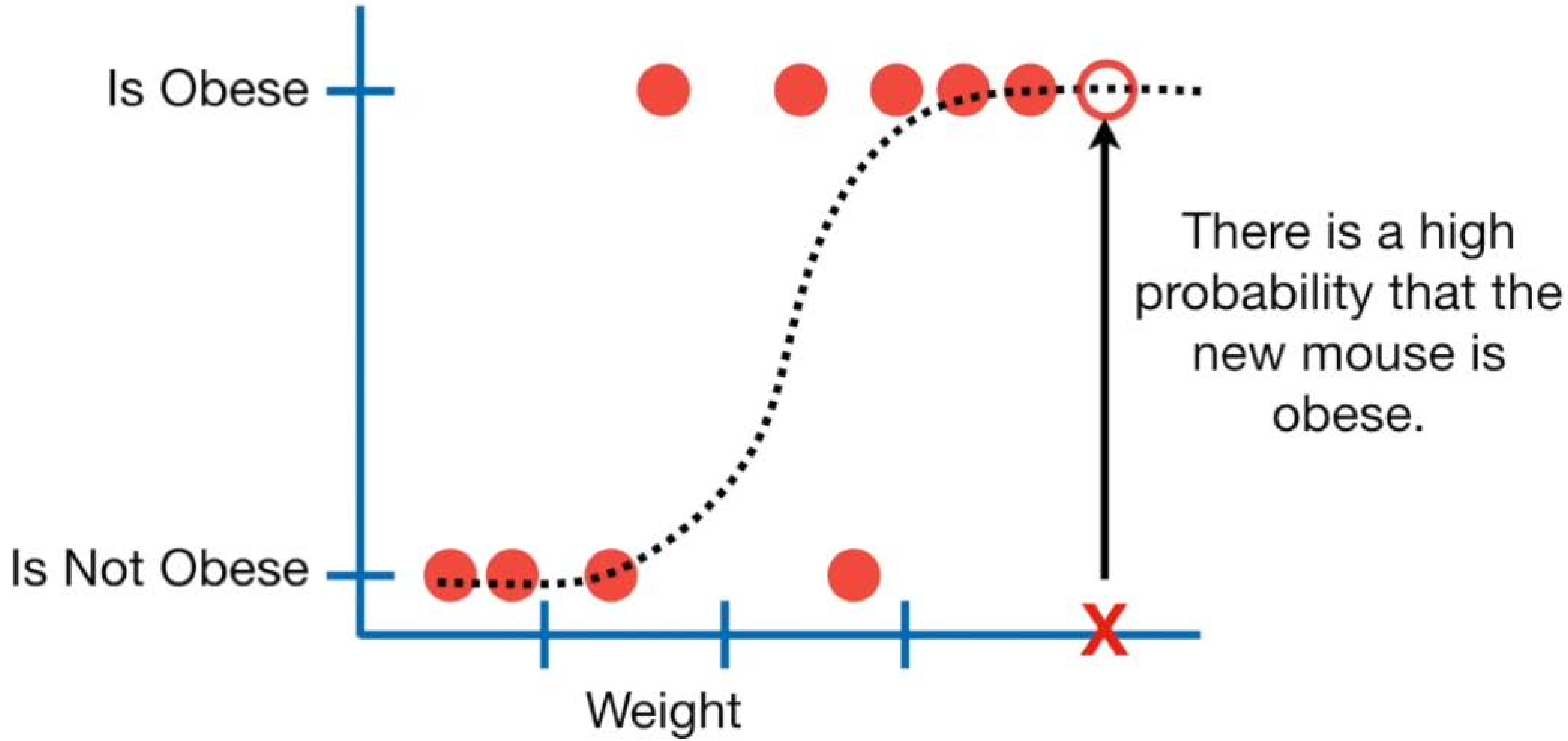


…also, instead of fitting a line to the data, logistic regression fits an "S" shaped "logistic function".

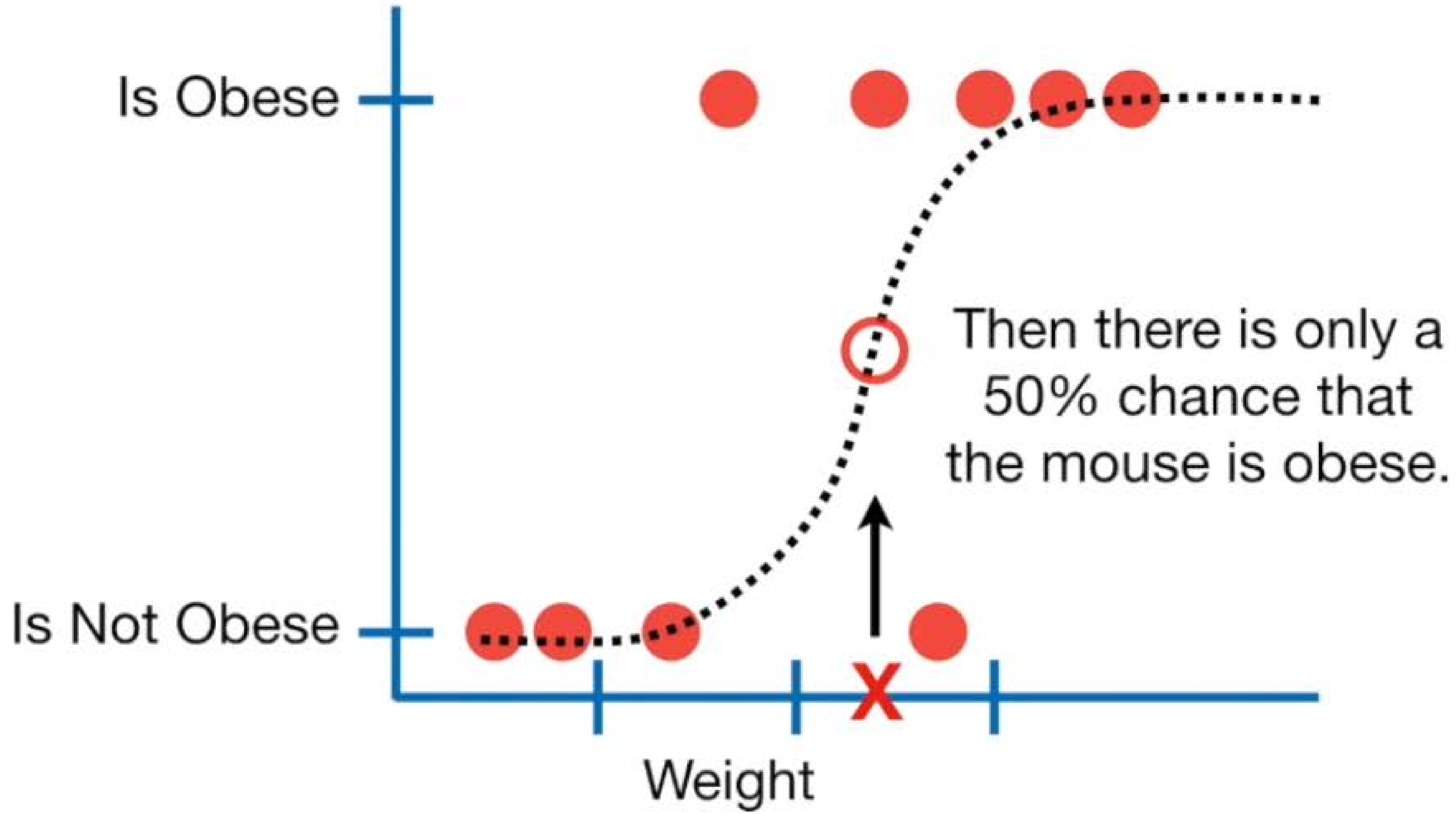


…and that means that the curve tells you the probability that a mouse is ***obese*** based on its ***weight***.

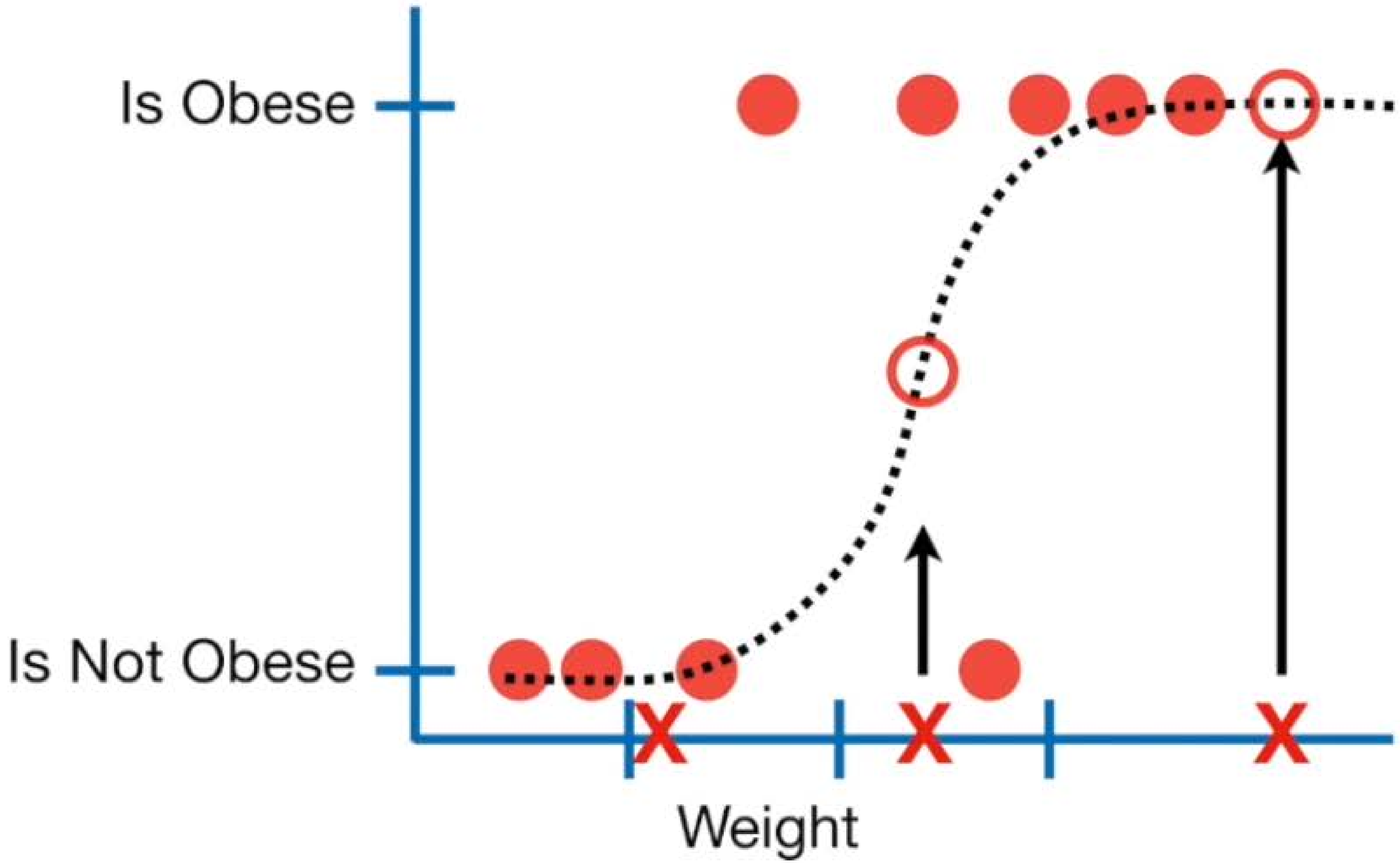




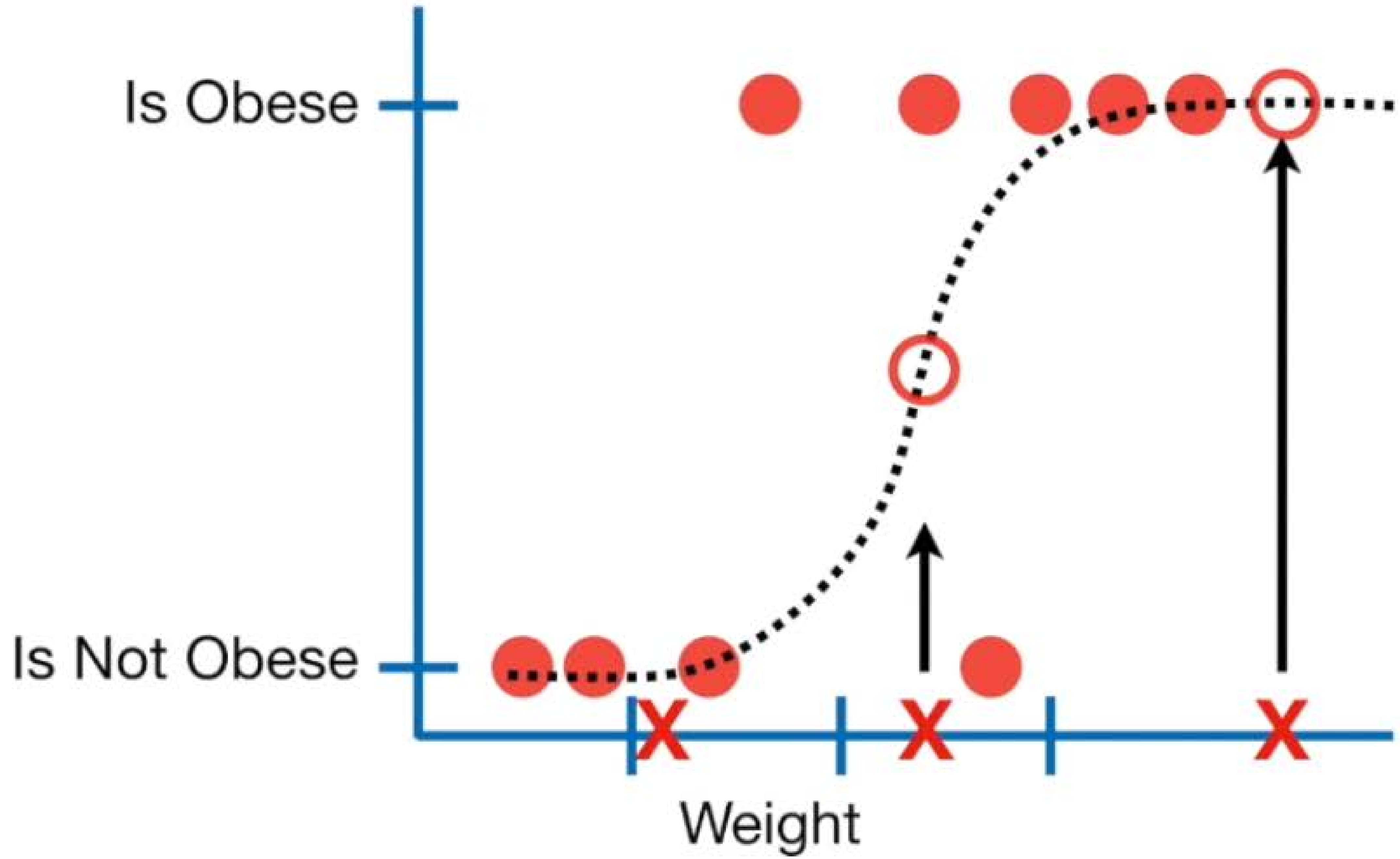
Is Obese
Is Not Obese
Weight
There is a high probability that the new mouse is obese.

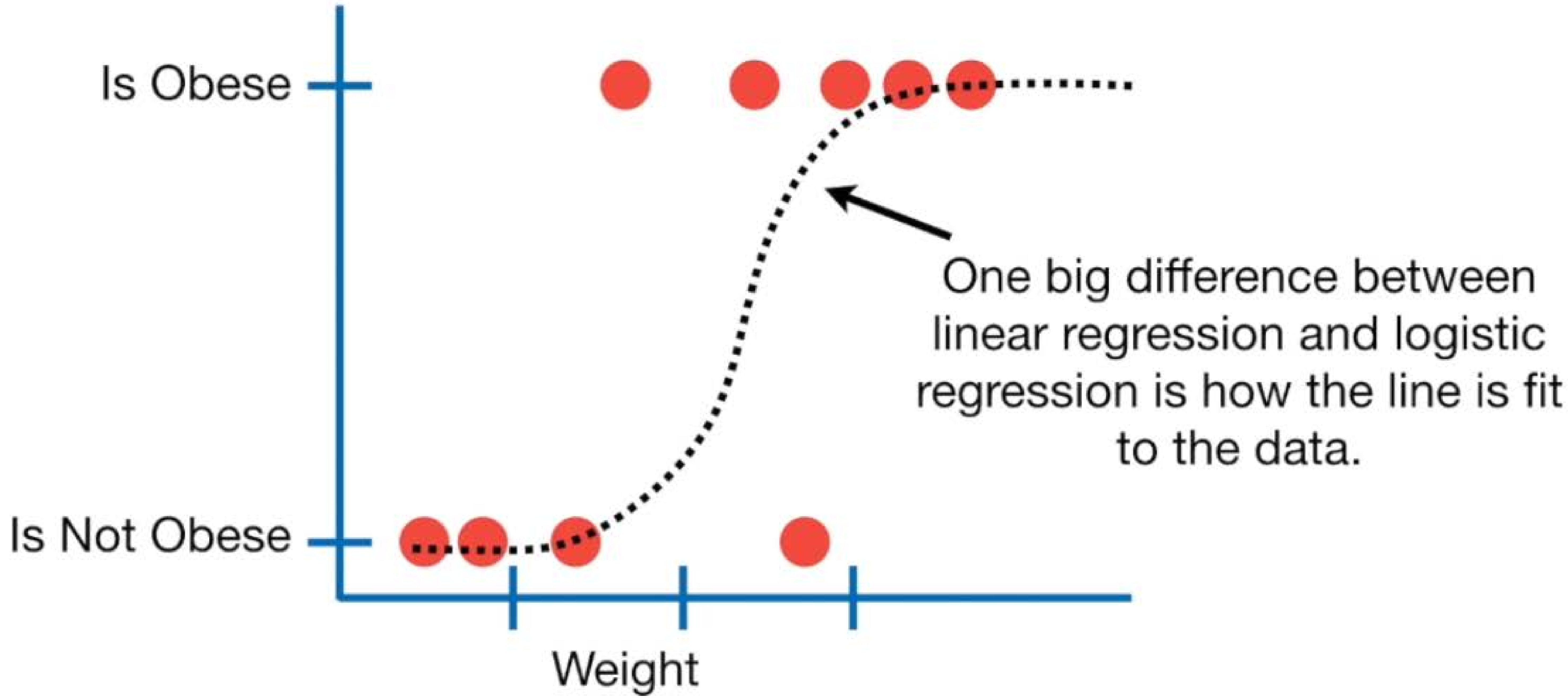

Is Obese
Is Not Obese
Weight
X
Then there is only a
50% chance that
the mouse is obese.

Although logistic regression tells the probability that a mouse is obese or not, it's usually used for classification.

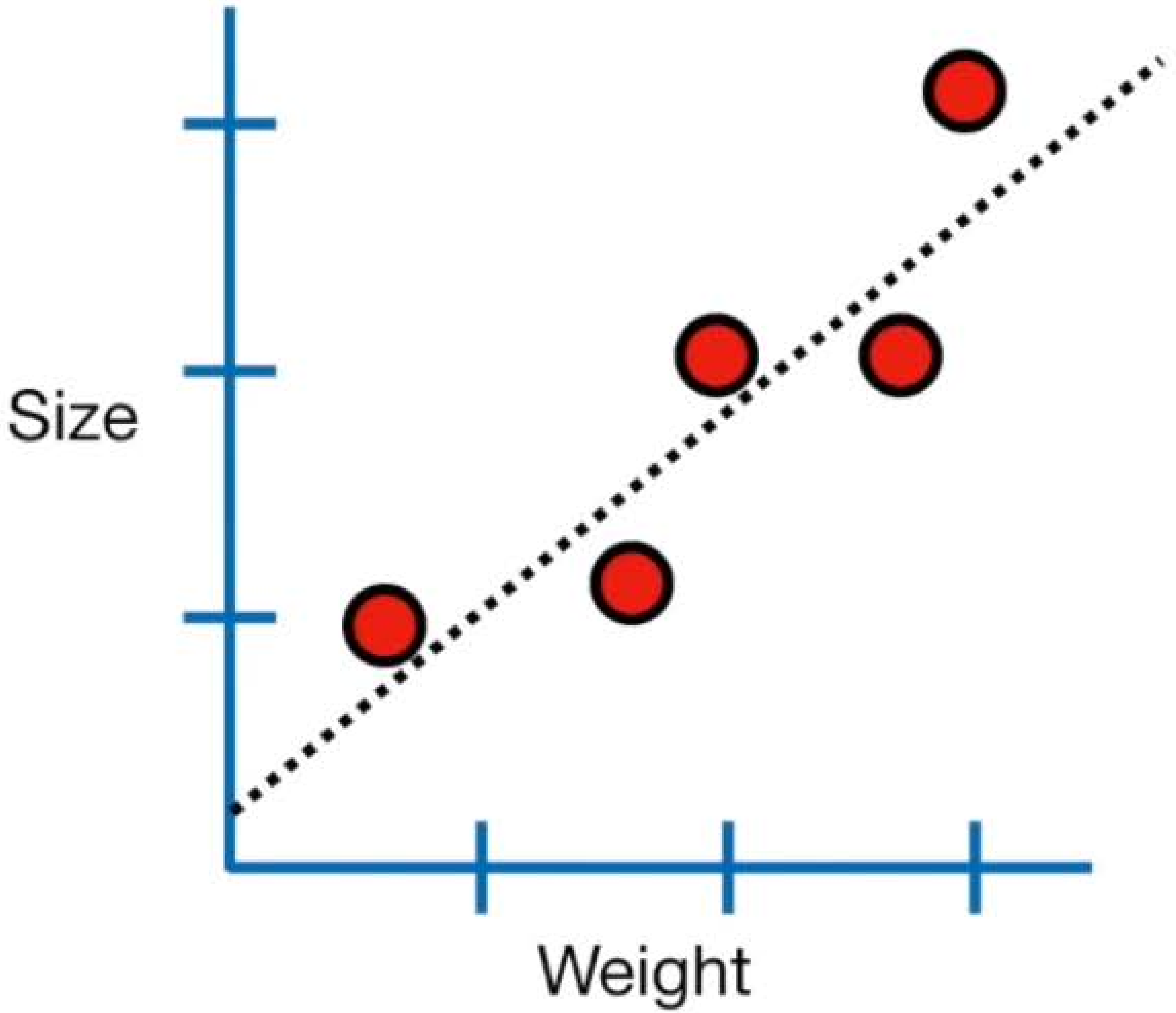


For example, if the probability a mouse is obese is > 50%, then we'll classify it as obese, otherwise we'll classify it as "not obese".

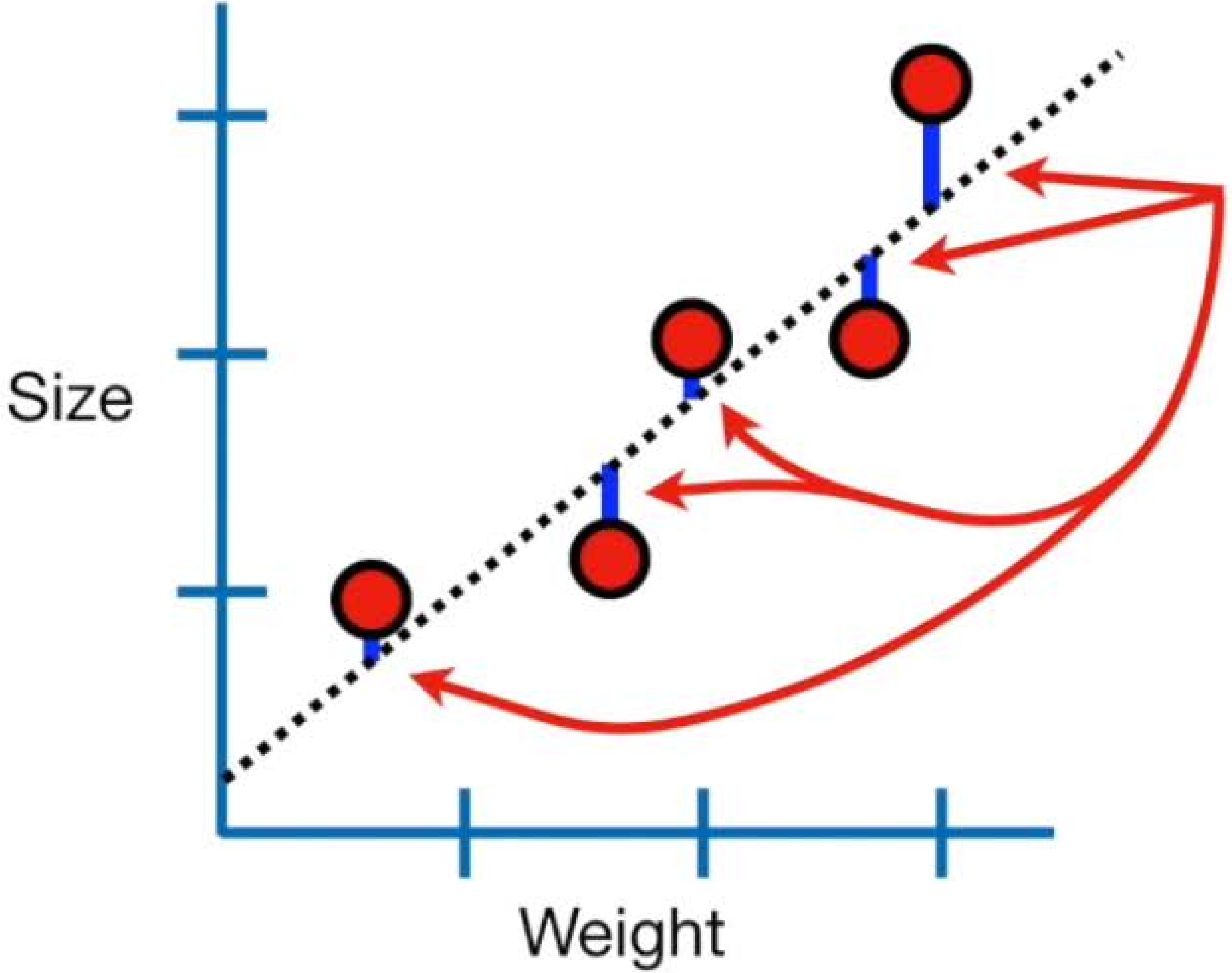




Is Obese
Is Not Obese
Weight
One big difference between linear regression and logistic regression is how the line is fit to the data.

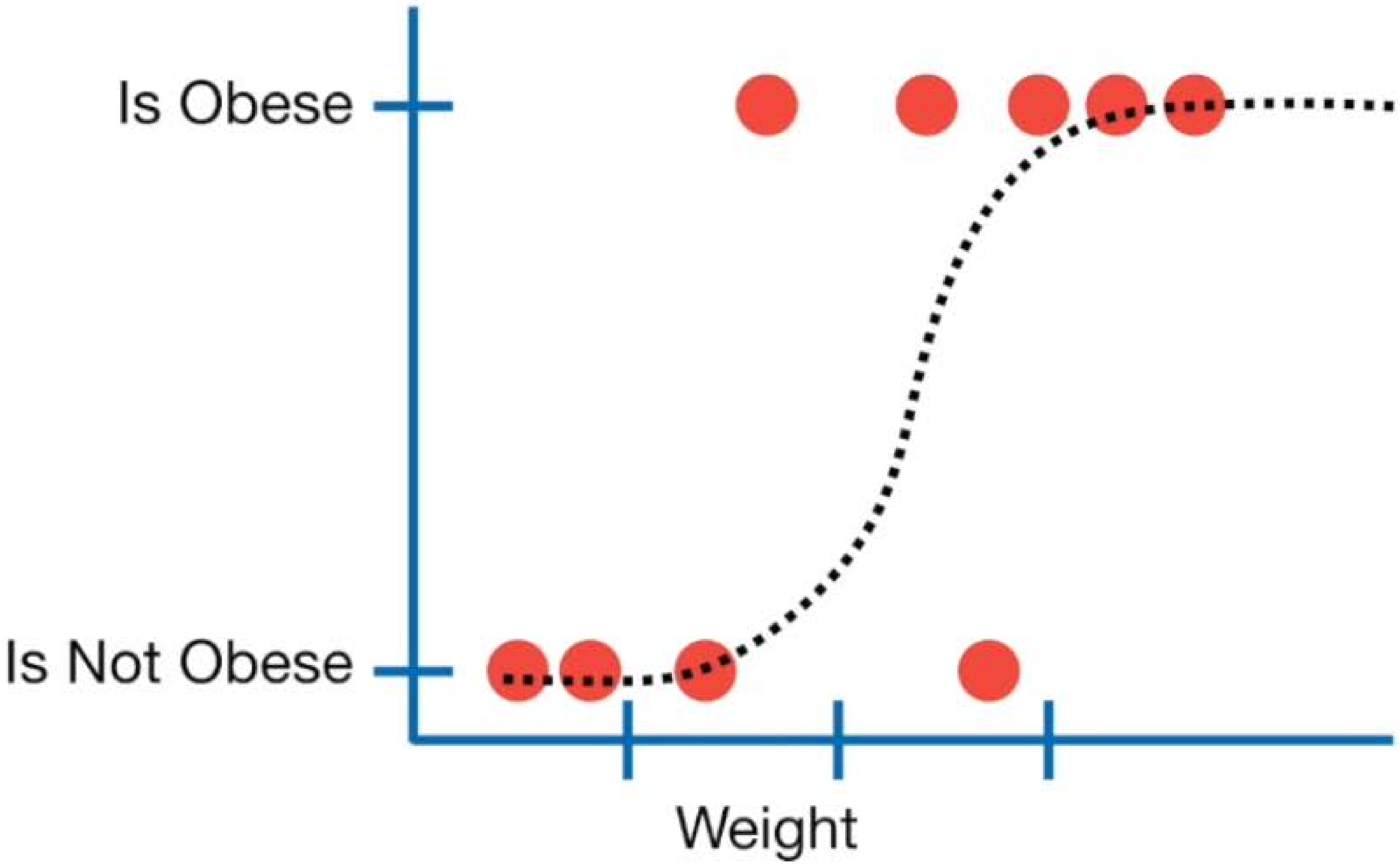


With linear regression, we fit the line using “least squares”.

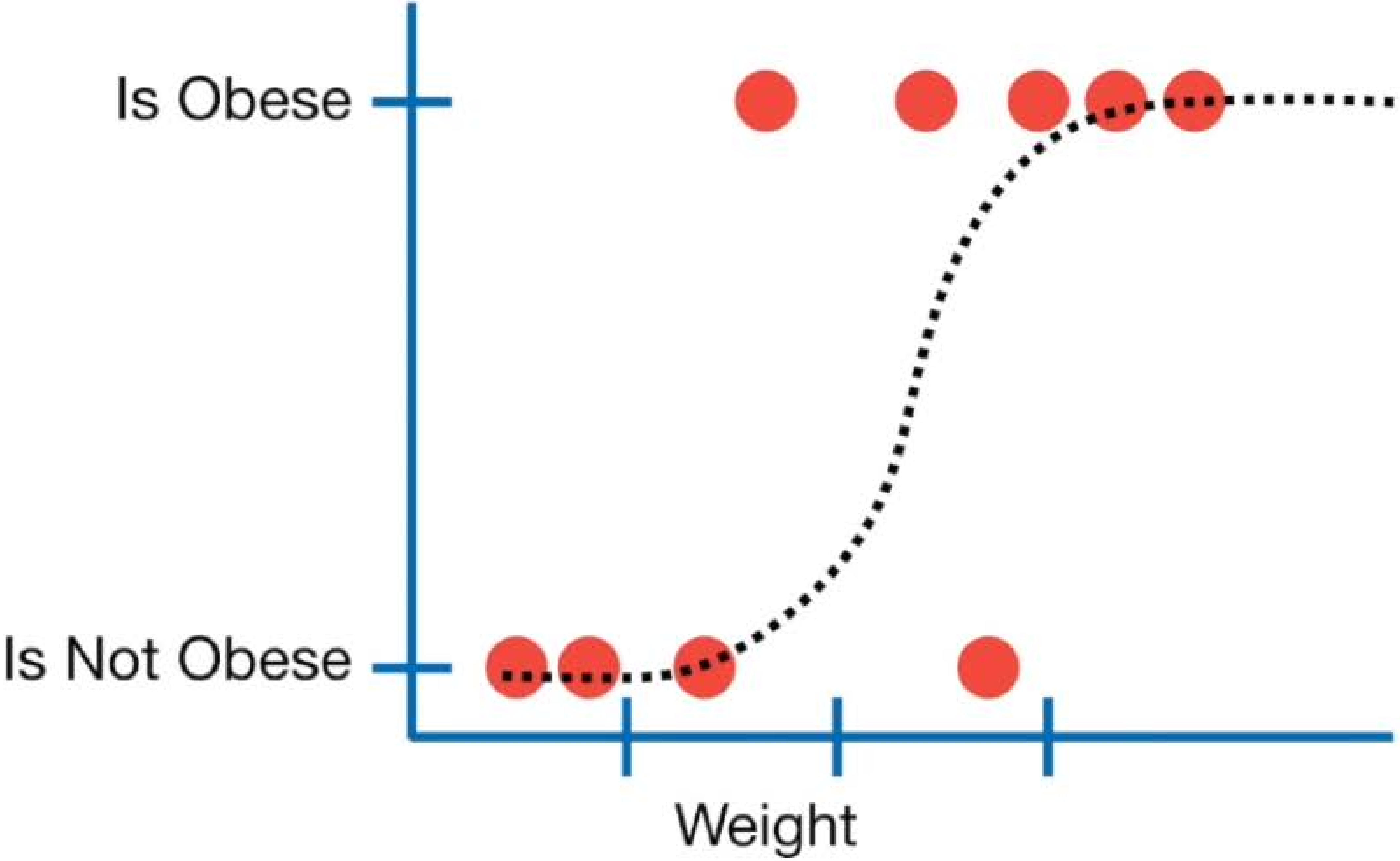


We also use the residuals to calculate $\boldsymbol{R^2}$ and to compare simple models to complicated models.

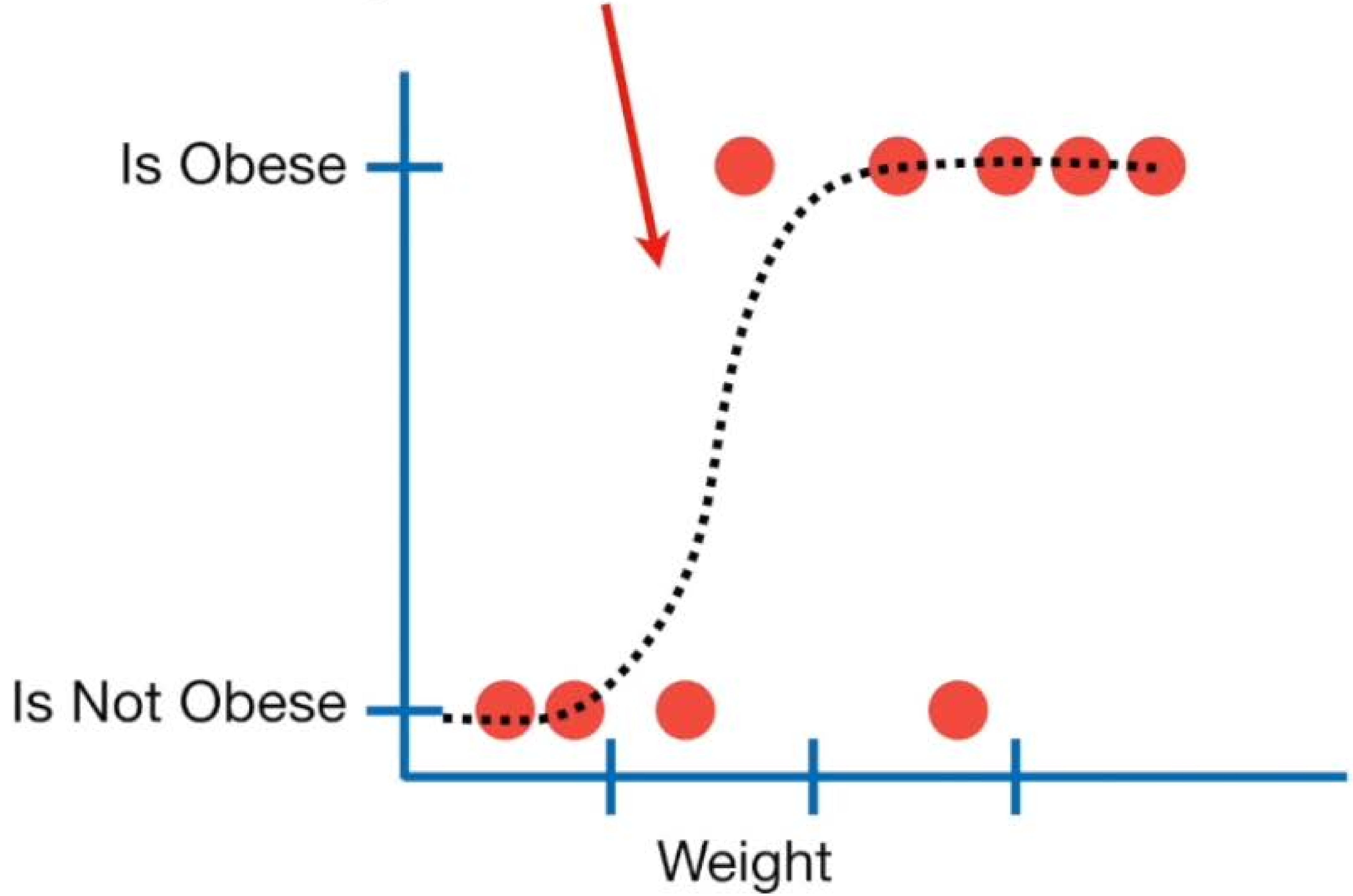
Logistic regression doesn't have the same concept of a "residual", so it can't use least squares and it can't calculate $\boldsymbol{R}^2$.



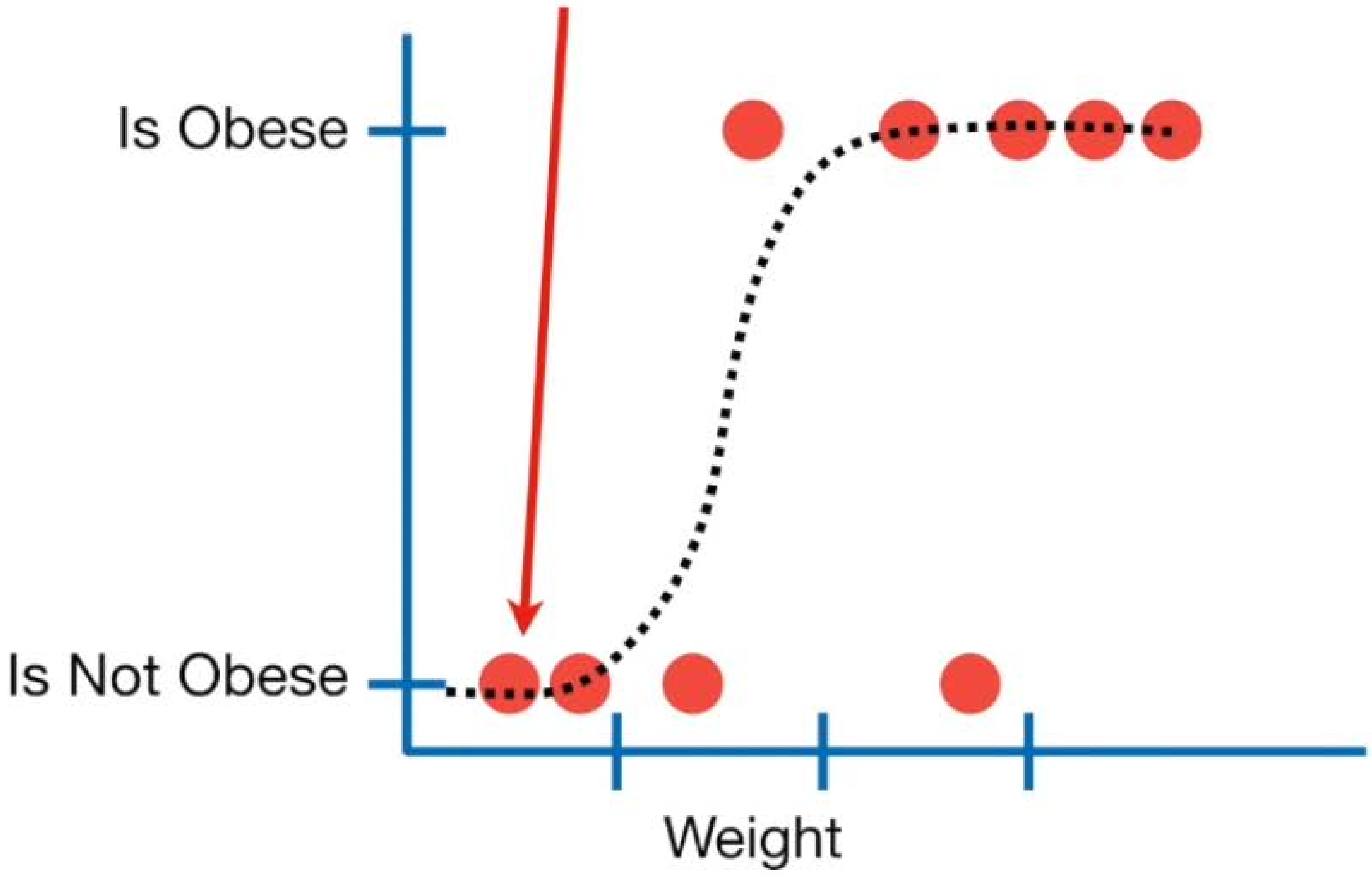
Instead it uses something called "maximum likelihood".



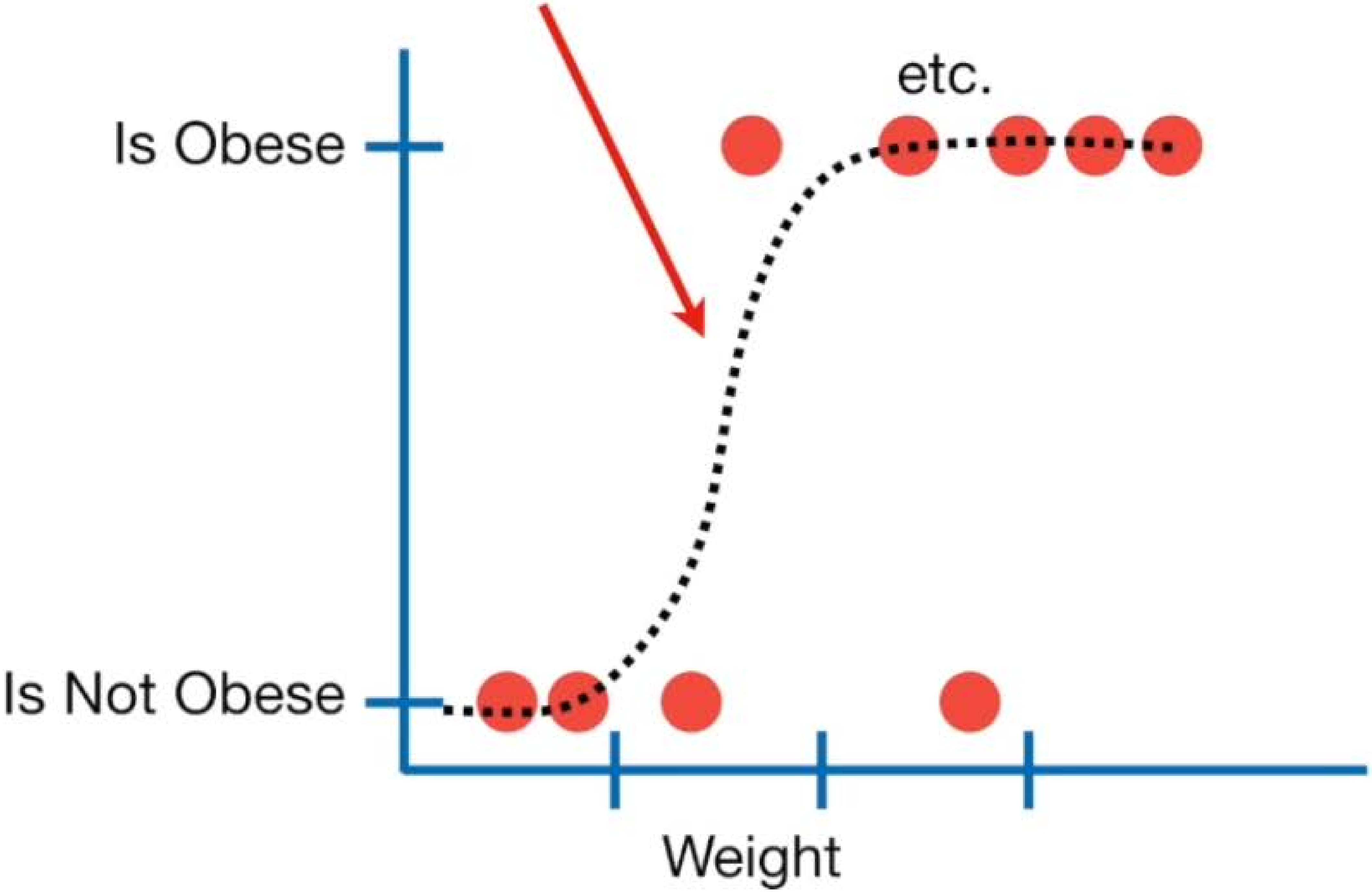
You pick a probability, scaled by weight, of observing an obese mouse - just like this curve…

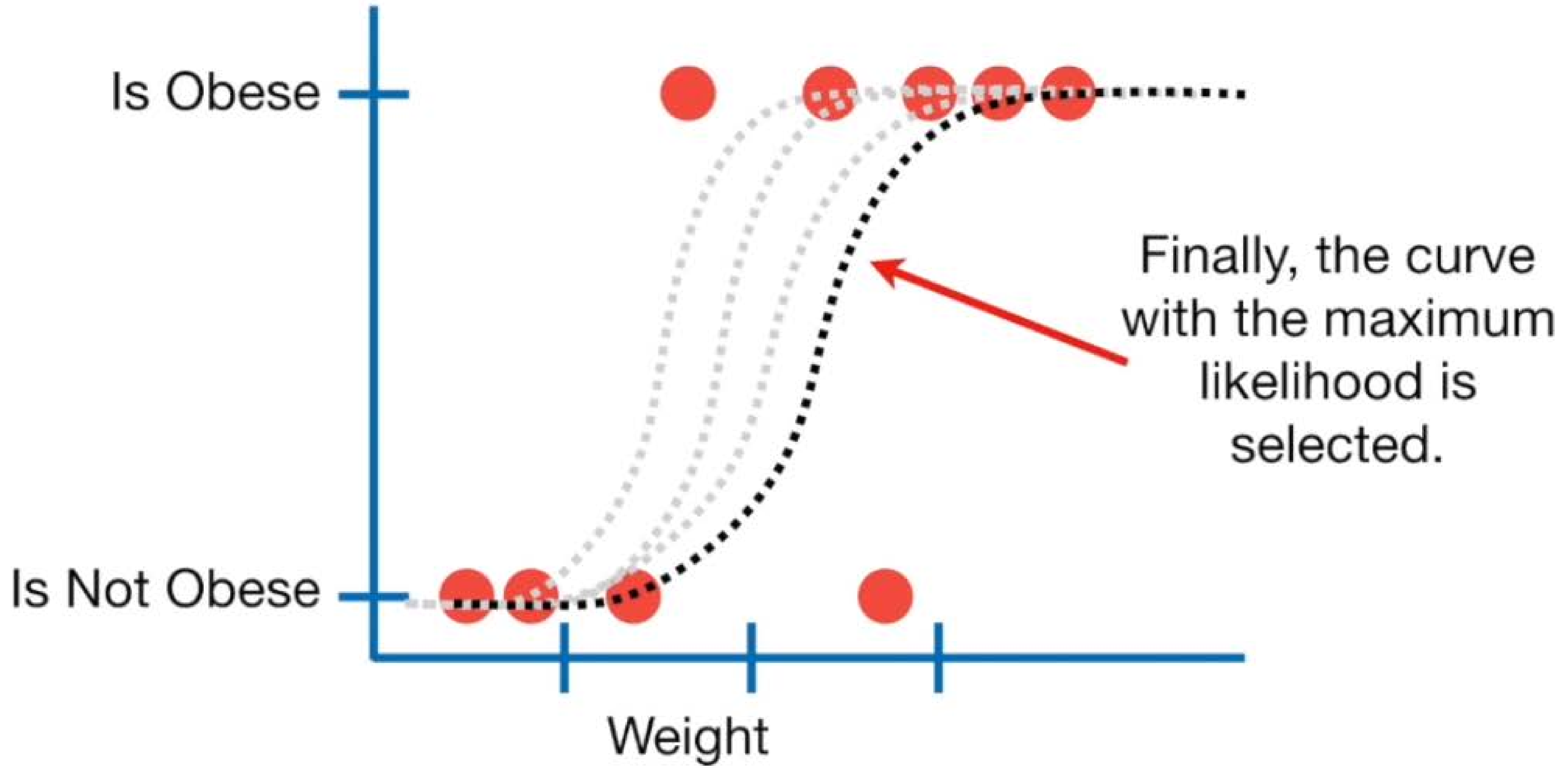


…and you use that to calculate the likelihood of observing a non-obese mouse that weighs this much…



...and lastly you multiply all of those likelihoods together. That's the likelihood of the data given this line.




Is Obese
Is Not Obese
Weight
Finally, the curve
with the maximum
likelihood is
selected.