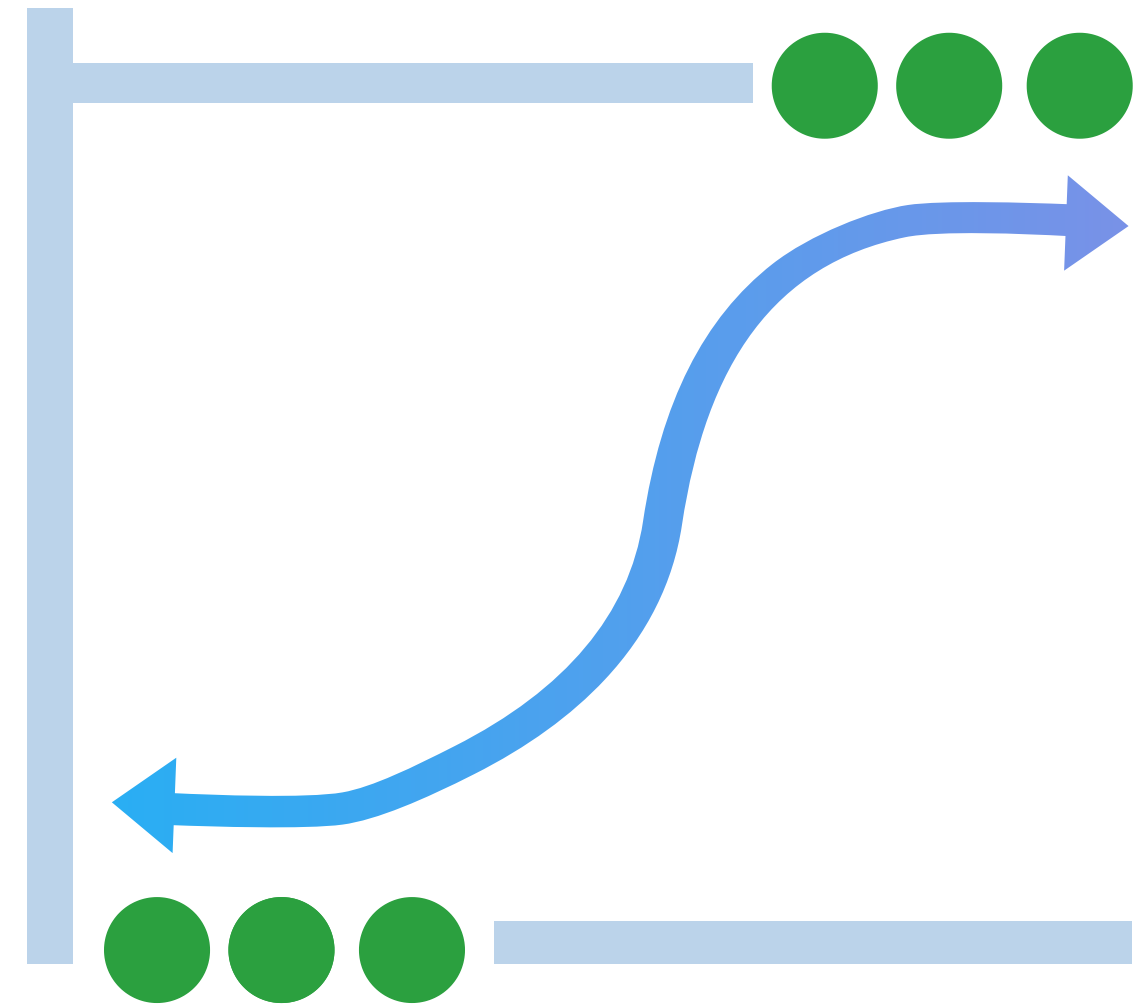
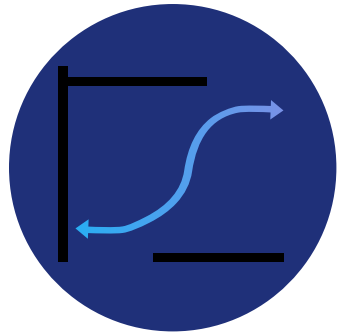


Logistics Regression



LOGISTICS REGRESSION



In this section we'll cover the a technique that predict a categorical dependent variable based on one or more independent variables

TOPICS WE'LL COVER:

**Logistics
Regression**

Goal of Logistics

Evaluation

GOALS FOR THIS SECTION:

- Use logistic regression for binary classification
- Implement logistic regression for binary classification
- Address overfitting using regularization, to improve model performance

LOGISTICS REGRESSION



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Logistics Regression

Goals of Logistics

Evaluation

Logistic Regression is a **classification technique** used to predict the probability of a binary (true/false) outcome.

- In its simplest form, logistic regression forms an **S-shaped curve between 0 -1**, which represents the probability of a TRUE outcome for any given value of X
- The **likelihood function** measures how accurately a model predicts outcomes, and is used to optimize the “shape” of the curve
- Although it has the word “*regression*” in its name, logistic regression is not used for predicting numeric variables

Example use cases:

- Will this loan application be approved or denied?

LOGISTICS REGRESSION

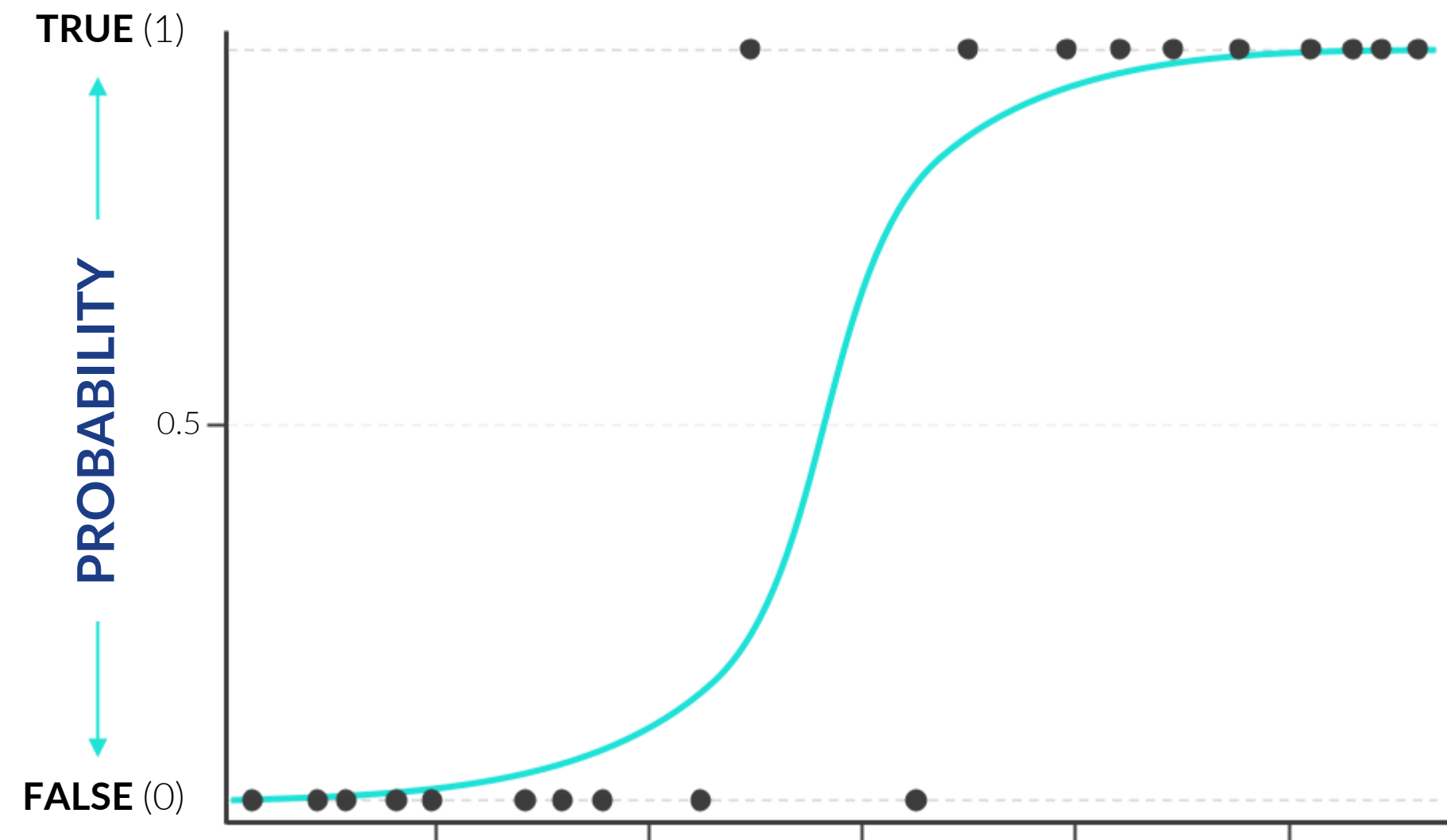


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Logistics
Regression

Goals of Logistics

Evaluation



- Logistic regression plots the **best-fitting curve between 0 and 1**, which tells us the probability of Y being TRUE for any given value of X_1

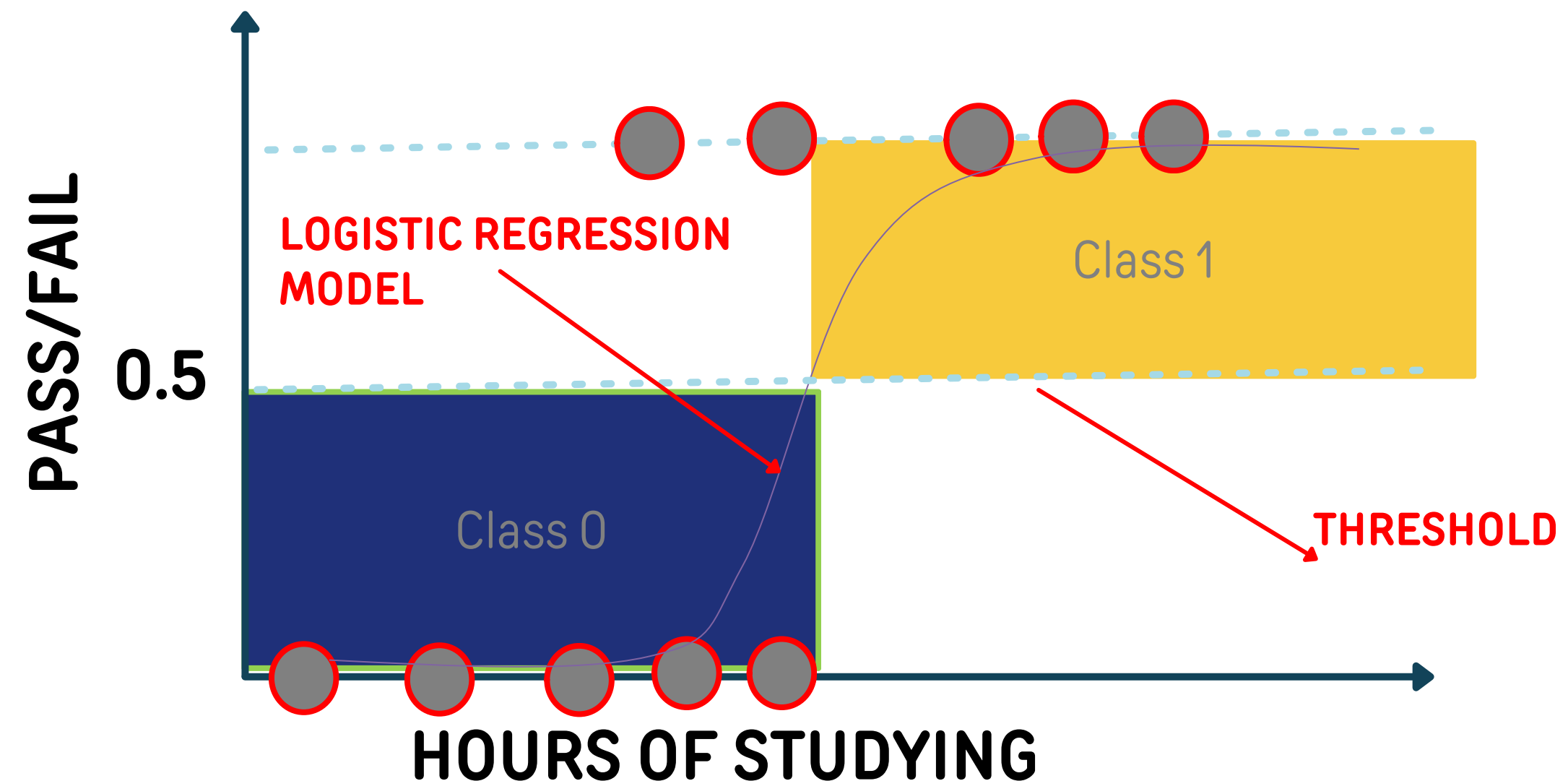
LOGISTICS REGRESSION



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LOGISTIC REGRESSION: **FROM PROBABILITY TO CLASS**

- Now we need to convert from a probability to a class value which is "0" or "1".



Logistics
Regression

Goals of Logistics

Evaluation

GOALS OF REGRESSION



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Regression models are used for two primary goals: **prediction** and **inference**

The goal shapes the modeling approach, including the regression algorithm used, the complexity of the model, and more

Logistics
Regression

Goals of Logistics

Evaluation



PREDICTION

Used to **predict** the target as accurately as possible

“What is the predict charges for a client given their age?”



INFERENCE

- Used to **understand the relationships** between the features and target
- *“How much do a age impact its charges?”*

What is Confusion Matrix?



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A **confusion matrix** is defined as the table that is often used to describe the performance of a classification model on a set of the test data for which the true values are known.

Logistics
Regression

Goals of Logistics

Evaluation

		Predicted Classes	
		Negative	Positive
Actual Classes	Negative	True Negative	False Positive
	Positive	False Negative	True Positive

PRECISION & RECALL



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Goals of Logistics

Evaluation

Precision indicates the percentage of positive predictions made by the model that are actually correct.

$$\text{Precision} = \frac{\text{True Positive}}{\text{True Positive} + \text{False Positive}}$$

Recall indicates the percentage of actual positive cases that the model correctly identifies

$$\text{Recall} = \frac{\text{True Positive}}{\text{True Positive} + \text{False Negative}}$$

SPECIFICITY AND TNV



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Logistics
Regression

Goals of Logistics

Evaluation

True Negative Values focuses on the proportion of correct negative predictions out of all predicted negatives.

$$\text{TNV} = \frac{\text{True Negatives}}{\text{True Negatives} + \text{False Negatives}}$$

Specificity measures the ability of the model to identify all actual negative cases.

$$\text{Specificity} = \frac{\text{True Negative}}{\text{True Negative} + \text{False Positive}}$$