

AI – Assignment #1

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Question	Points	Outcomes	Question Grade	Required time minutes
Q1				
Q2				
Student Grade	10			

تعليمات مهمة:

1. ارجو اضافة الإجابات على هذه الملف مع المحافظة على نفس الترتيب، وارساله بنفس الامتداد.
2. في حالة وجود كود برمجي، يجب ان تحتوي اجابة كل سؤال على الكود البرمجي (نص) لكل برنامج.
3. احرص عزيزي الطالب على تسلیم حلولك الخاصة وعدم مشاركة اجاباتك مع اي طالب اخر لتجنب خسارة العلامات.
4. التزم بكل التعليمات السابقة، لأنها ستكون ضمن معايير التقييم.

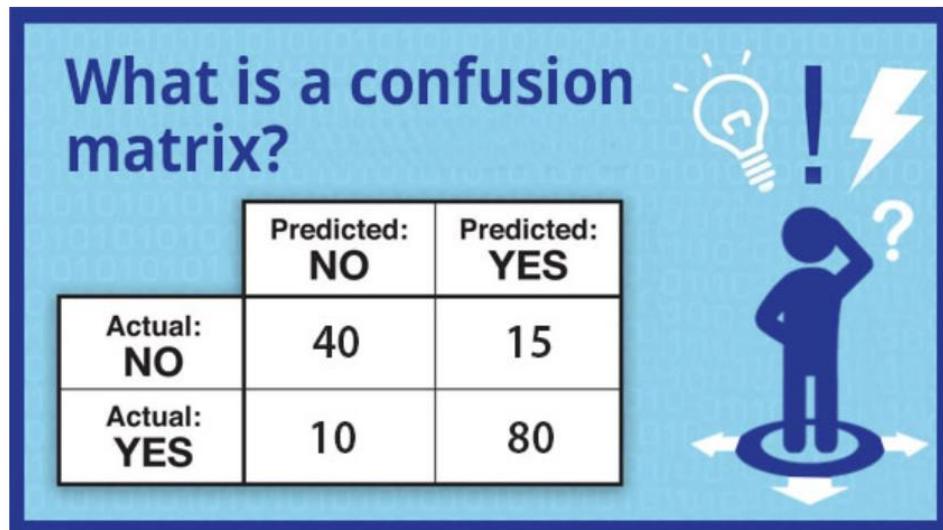
Question #1: (4 Points)

- a) Which Machine Learning approach is employed when realizing each the following applications: (---/4 Mk)

Estimating Life expectancy.	Supervised Learning >> Regression
Recommender Systems.	Unsupervised Learning >> Clustering
Market or Weather Forecasting.	Supervised Learning >> Regression
Medical Image Classification.	Supervised Learning >> Classification

Question #2: (6 Points)

The following figure represents the Confusion Matrix, calculate the following evaluationmetrics (---/6 Mk)



- **Accuracy**
- **Error Rate**
- **Precision**
- **Recall (Sensitivity)**
- **F1 score**
- **Specificity**

Good Luck 😊

Q2 Solution:

	Predicted: NO	Predicted: YES
Actual: NO	TN 40	FP 15
Actual: YES	FN 10	TP 80

1- **Accuracy**: How often is the classifier correct?

$$\begin{aligned}
 \text{accuracy} &= (\text{TN} + \text{TP}) / (\text{TN} + \text{TP} + \text{FP} + \text{FN}) \\
 &= (40 + 80) / (40 + 15 + 10 + 80) \\
 &= 120 / 145 = 0.8275
 \end{aligned}$$

$$\text{PERCENTAGE: } 0.8275 * 100\% = 82.75\%$$

2- **Error Rate**: How often is the classifier wrong?

$$\begin{aligned}
 \text{Error rate} &= (\text{FP} + \text{FN}) / (\text{TN} + \text{TP} + \text{FP} + \text{FN}) \\
 &= (10 + 15) / (145) \\
 &= 0.1725
 \end{aligned}$$

$$\text{PERCENTAGE: } 0.1725 * 100\% = 17.25\%$$

OR WE CAN SAY:

$$100 - 82.75 = 17.25\%$$

3- **Precision**: When it predicts yes, how often is correct?

$$\text{Precision} = (\text{TP}) / (\text{FP} + \text{TP})$$

$$= 80 / 95$$

$$= 0.8421$$

$$\text{PERCENTAGE: } 0.8421 * 100\% = 84.21\%$$

4-Recall (Sensitivity): When it's actually yes, how often does it predict yes? *Also known as (positive rate)*

$$\text{Recall} = (\text{TP}) / (\text{FN} + \text{TP})$$

$$= 80 / 90$$

$$= 0.889$$

$$\text{PERCENTAGE: } 0.889 * 100\% = 88.9\%$$

5-F1 Score: $2 * (\text{recall} * \text{precision}) / (\text{recall} + \text{precision})$

$$\begin{aligned}\text{F1 Score} &= 2 * (0.889 * 0.8421) / (0.889 + 0.8421) \\ &= 0.8649\end{aligned}$$

6-Specificity: when it's actually no, how often does it predict no? *Also known as (true negative rate)*

$$\text{Specificity} = \text{TN} / (\text{TN} + \text{FP})$$

$$= 40 / 55$$

$$= 0.7272$$

$$\text{PERCENTAGE: } 0.7272 * 100\% = 72.72\%$$