MACHINE LEARNING- CLASSIFICATION ALGORITHM

DECISION TREE: CLASSIFICATION

This dataset**(Social_Network_Ads.csv)** includes:

- User ID: Unique identifier for each user (can be ignored for modeling).
- Gender: Categorical feature.
- Age: Numerical feature.
- EstimatedSalary: Numerical feature.
- Purchased: Target variable (0 = No, 1 = Yes).

ACCURACY:

[[71 22]

[24 17]]

What the Confusion Matrix :

Term	Meaning in Your Case	Value
TP (True Positive)	**Model predicted 1 (purchased) and user actually purchased**	**17**
TN (True Negative)	**Model predicted 0 (not purchased) and user actually did not purchase**	**71**
FP (False Positive)	**Model predicted 1 (purchased) but user did not purchase**	**22**
FN (False Negative)	**Model predicted 0 (not purchased) but user actually purchased**	**24**

	PREDICTED(0)	**PREDICTED(1)**
ACTUAL(0)	**71(True Negative(TN)**	**22(False Positive(FP)**
ACTUAL(1)	**24(False Negative(FN)**	**17(True Positive(TP))**

What is the overall performance .(it means Accuracy): **0.66**

Accuracy= Number of Correctly Prediction/ total number of all prediction

=(71+17)/(22+24+71+17)=TN+TP/(TN+FP+FN+TP)

=88/134=**0.66 or 66%**

Recall:

[[71 22]

[24 17]]

1. What is the correct classification of not purchased? : 0-→ 0.76
   Recall(0) = True Negatives (TN)/ True Negatives(TN) + False Positives (FP)
   =71/(71+22) = **0.76**

2. what is the correct classification of purchased? : 1-→0.41

   Recall (1) = True Purchase(TP)/ True Purchase(TP) + False Purcahse (FN)

   =17/(17+24) = **0.41**

Precision:

[[71 22]

[24 17]]

1. What is the correctly and wrongly classification of not purchased(0) : its means 0'th precision value .
   Precison(0) = true negative/(true negative+false negative = TN/TN+FN
   =71/(71+24)
   = 71/95 = **0.76**
2. what is the correctcly and wrongly classification of purchased (1): it means 1'th precision value.
   Precision (1) = true purchase/(true purcahse+false purchase)=TP/TP+FP
   =17/(17+22)
   =17/39 = **0.44**

F1 SCORE:

F1=2* RECALL(1)*PRECISION(1)/RECALL(1)+PRECISION(1)

__ = 2* 0.41*0.44/(0.41+0.44)

=2*0.1804/0.85 = 0.3608/0.85

=**0.42**

F0 = 2* RECALL(0)*PRECISION(0)/RECALL(0)+PRECISION(0)

= 2*0.76*0.76/(0.76+0.76)

= **0.76**

Final Summary:

Metric	NOT PURCHASED(0)	PURCHASED(1)
Precision	**0.76**	**0.44**
recall	**0.76**	**0.42**
F1 score	**0.76**	**0.42**

	Precision	Recall	f1 score
macro avg :	**0.59**	**0.59**	**0.59**
weighted avg :	**0.65**	**0.66**	**0.65**

SVM CLASSIFICATION ALGORITHM:

[[93 0]

[41 0]]

	PREDICTED(0)	PREDICTED(1)
ACTUAL(0)	**93**	**0**
ACTUAL(1)	**41**	**0**

Final Summary:

Metric	NOT PURCHASED(0)	PURCHASED(1)
Precision	0.69	0.00
recall	1.00	0.00
F1 score	0.82	0.00

ACCURACY: 0.69

weighted avg : PRECISION(0.48), RECALL (0.69), F1 SCORE (0.57)

macro avg : PRECISION(0.35),RECALL (0.50), F1 SCORE (0.41)

RANDOM FOREST CLASSIFICATION ALGORITHM:

[[80 13]

[34 7]]

Final summary:

Metric	NOT PURCHASED(0)	PURCHASED(1)
Precision	0.70	0.35
recall	0.86	0.17
F1 score	0.77	0.23

ACCURACY : 0.65

macro avg :PRECISION(0.53) , RECALL (0.52),F1 SCORE (0.50)

weighted avg : PRECISION (0.59), RECALL (0.65), F1 SCORE (0.61)