योगः कर्मसु कौशलम्
IN PURSUIT OF PERFECTION

VIVEKANANDA INSTITUTE OF PROFESSIONAL STUDIES - TECHNICAL CAMPUS
Grade A++ Accredited Institution by NAAC
NBA Accredited for MCA Programme; Recognized under Section 2(f) by UGC;
Affiliated to GGSIP University, Delhi; Recognized by Bar Council of India and AICTE
An ISO 9001:2015 Certified Institution

SCHOOL OF ENGINEERING & TECHNOLOGY

B. Tech Programme: AI-ML (A) (4th Semester)

Course Title: Fundamentals of Machine Learning Lab

Course Code: AIML - 258

Submitted To:

Dr. Shalini Gambhir

Submitted By:

Name: Kunsh Sabharwal

Enrolment No: 01117711623

VIPS
योगः कर्मसु कौशलम्
IN PURSUIT OF PERFECTION
VIVEKANANDA INSTITUTE OF PROFESSIONAL STUDIES - TECHNICAL CAMPUS
Grade A++ Accredited Institution by NAAC
NBA Accredited for MCA Programme; Recognized under Section 2(f) by UGC;
Affiliated to GGSIP University, Delhi; Recognized by Bar Council of India and AICTE
An ISO 9001:2015 Certified Institution
SCHOOL OF ENGINEERING & TECHNOLOGY

VISION OF INSTITUTE

To be an educational institute that empowers the field of engineering to build a sustainable future by providing quality education with innovative practices that supports people, planet and profit.

MISSION OF INSTITUTE

To groom the future engineers by providing value-based education and awakening students' curiosity, nurturing creativity and building capabilities to enable them to make significant contributions to the world.

KUNSH SABHARWAL

VIPS
योगः कर्मसु कौशलम्
IN PURSUIT OF PERFECTION

VIVEKANANDA INSTITUTE OF PROFESSIONAL STUDIES - TECHNICAL CAMPUS
Grade A++ Accredited Institution by NAAC
NBA Accredited for MCA Programme; Recognized under Section 2(f) by UGC;
Affiliated to GGSIP University, Delhi; Recognized by Bar Council of India and AICTE
An ISO 9001:2015 Certified Institution
SCHOOL OF ENGINEERING & TECHNOLOGY

INDEX

S. No.	Experiment	Date	Marks			Remarks	Updated Marks	Faculty Signature
			Laboratory Assessment (15 Marks)	Class Participation (5 Marks)	Viva (5 Marks)			
1.	Study & Implement Linear Regression							
2.	Study & Implement Logistic Regression							
3.	Study & Implement K-Nearest Neighbour (KNN)							
4.	Study & Implement classification using SVM							
5.	Study & Implement Bagging using Random Forests							
6.	Study & Implement Naïve-Bayes							
7.	Study & Implement Decision Trees							
8.	Study & Implement K- Means Clustering to find natural patterns in Data							
9.	Study & Implement Classification based on association rules							

VIVEKANANDA INSTITUTE OF PROFESSIONAL STUDIES - TECHNICAL CAMPUS
Grade A++ Accredited Institution by NAAC
NBA Accredited for MCA Programme; Recognized under Section 2(f) by UGC;
Affiliated to GGSIP University, Delhi; Recognized by Bar Council of India and AICTE
An ISO 9001:2015 Certified Institution
SCHOOL OF ENGINEERING & TECHNOLOGY

Sr. No.	EXPERIMENT TITLE (Beyond Curriculum)	Date	Faculty Signature
1.	Perform the Data Preprocessing life cycle on any sample data.		
2.	Project on Machine Learning		

EXPERIMENT 0

Problem statement: Perform the Data Preprocessing life cycle on any sample data.

Theory:

Dataset:

	A	B	C	D
1	Country	Age	Salary	Purchased
2	France	44	72000	No
3	Spain	27	48000	Yes
4	Germany	30	54000	No
5	Spain	38	61000	No
6	Germany	40		Yes
7	France	35	58000	Yes
8	Spain		52000	No
9	France	48	79000	Yes
10	Germany	50	83000	No
11	France	37	67000	Yes

Source Code with Outputs:

Program 1_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help All changes saved

Share

Files

sample_data

Data.csv

Disk 76.63 GB available

+ Code + Text

RAM Disk

Gemini

DATA.CSV Dataset

```
[2] import numpy as np
    import pandas as pd
    import matplotlib.pyplot as plt
```

```
[3] df1=pd.read_csv("Data.csv")
```

```
[4] print(df1)
```

```
   Country   Age   Salary Purchased
0   France  44.0  72000.0        No
1    Spain  27.0  48000.0       Yes
2  Germany  30.0  54000.0        No
3    Spain  38.0  61000.0        No
4  Germany  40.0      NaN       Yes
5   France  35.0  58000.0       Yes
6    Spain   NaN  52000.0        No
7   France  48.0  79000.0       Yes
8  Germany  50.0  83000.0        No
9   France  37.0  67000.0       Yes
```

```
[5] x=df1.iloc[:,:-1].values
    y=df1.iloc[:,-1].values
```

```
[6] from sklearn.impute import SimpleImputer
    imputer = SimpleImputer(missing_values=np.nan, strategy='mean')
    imputer.fit(x[:, 1:3])
    x[:, 1:3] = imputer.transform(x[:, 1:3])
```

✓ 0s completed at 3:18PM

Program 1_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help All changes saved

Share

+ Code + Text

RAM Disk

Gemini

```
[7] print(x)
```

```
[['France' 44.0 72000.0]
 ['Spain' 27.0 48000.0]
 ['Germany' 30.0 54000.0]
 ['Spain' 38.0 61000.0]
 ['Germany' 40.0 63777.77777777778]
 ['France' 35.0 58000.0]
 ['Spain' 38.77777777777778 52000.0]
 ['France' 48.0 79000.0]
 ['Germany' 50.0 83000.0]
 ['France' 37.0 67000.0]]
```

```
[8] print(y)
```

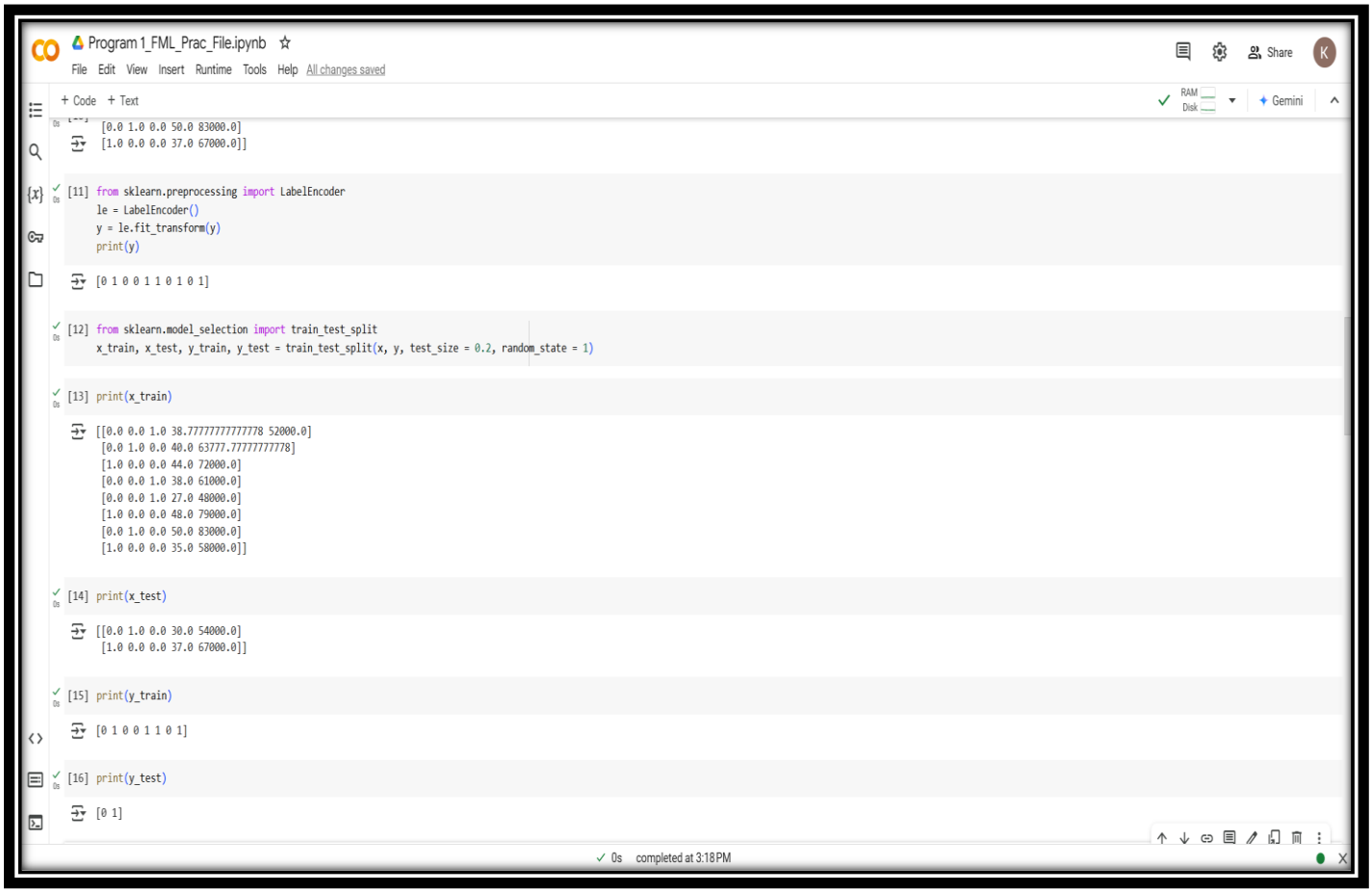
```
['No' 'Yes' 'No' 'No' 'Yes' 'Yes' 'No' 'Yes' 'No' 'Yes']
```

```
[9] from sklearn.compose import ColumnTransformer
    from sklearn.preprocessing import OneHotEncoder
    ct = ColumnTransformer(transformers=[('encoder', OneHotEncoder(), [0])], remainder='passthrough')
    x = np.array(ct.fit_transform(x))
```

```
[10] print(x)
```

```
[[1.0 0.0 0.0 44.0 72000.0]
 [0.0 0.0 1.0 27.0 48000.0]
 [0.0 1.0 0.0 30.0 54000.0]
 [0.0 0.0 1.0 38.0 61000.0]
 [0.0 1.0 0.0 40.0 63777.77777777778]
 [1.0 0.0 0.0 35.0 58000.0]
 [0.0 0.0 1.0 38.77777777777778 52000.0]
 [1.0 0.0 0.0 48.0 79000.0]
 [0.0 1.0 0.0 50.0 83000.0]
 [1.0 0.0 0.0 37.0 67000.0]]
```

✓ 0s completed at 3:18PM



Learning Outcome:

EXPERIMENT 1

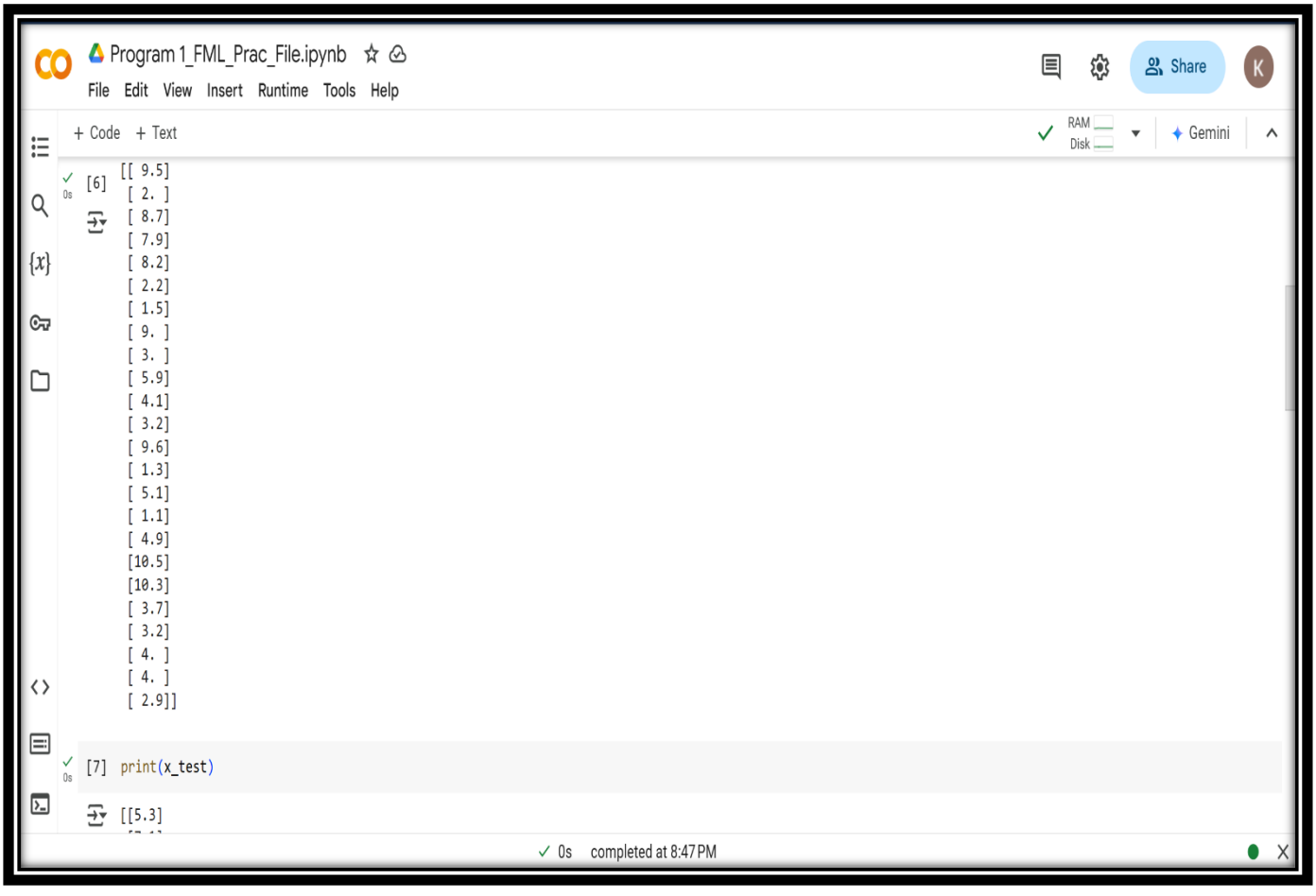
Problem statement: Study and implement Linear Regression.

Theory:

Dataset:

YearsExpe	Salary
1.1	39343
1.3	46205
1.5	37731
2	43525
2.2	39891
2.9	56642
3	60150
3.2	54445
3.2	64445
3.7	57189
3.9	63218
4	55794
4	56957
4.1	57081
4.5	61111
4.9	67938
5.1	66029
5.3	83088
5.9	81363
6	93940
6.8	91738
7.1	98273
7.9	101302
8.2	113812
8.7	109431
9	105582
9.5	116969
9.6	112635
10.3	122391
10.5	121872

Source Code with Outputs:



Program 1_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk Gemini

```
[[5.3]
 [7.1]
 [3.9]
 [6. ]
 [4.5]
 [6.8]]
```

```
[8] print(y_train)
```

```
[116969.  43525. 109431. 101302. 113812.  39891.  37731. 105582.  60150.
  81363.  57081.  54445. 112635.  46205.  66029.  39343.  67938. 121872.
 122391.  57189.  64445.  56957.  55794.  56642.]
```

```
[9] print(y_test)
```

```
[83088. 98273. 63218. 93940. 61111. 91738.]
```

```
[10] from sklearn.linear_model import LinearRegression
     regressor = LinearRegression()
     regressor.fit(x_train, y_train)
```

```
LinearRegression
LinearRegression()
```

0s completed at 8:47 PM

Program 1_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

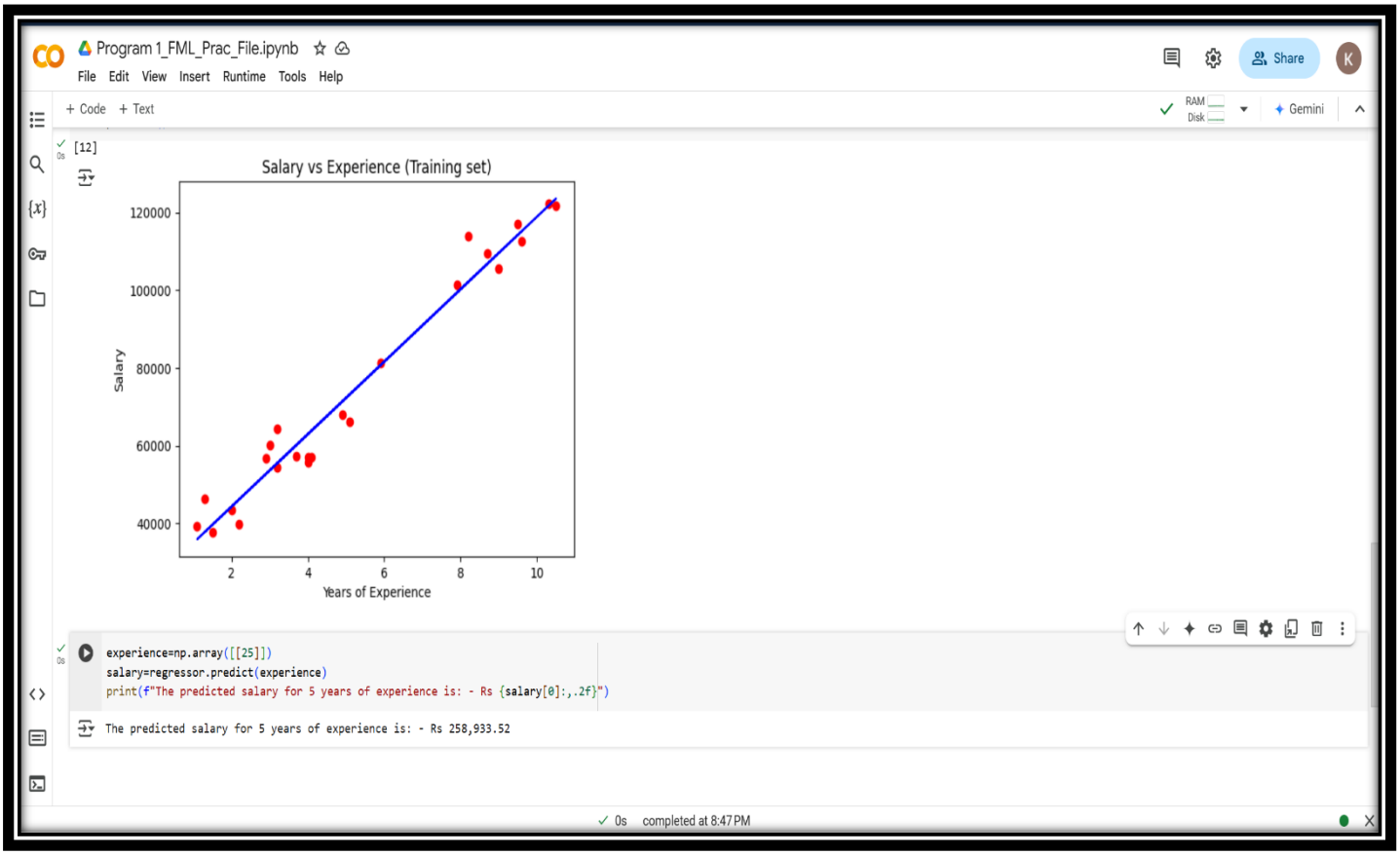
+ Code + Text

RAM Disk Gemini

```
[11] y_pred=regressor.predict(x_test)
```

```
plt.scatter(x_train,y_train,color="red")
plt.plot(x_train,regressor.predict(x_train),color="blue")
plt.title("Salary vs Experience (Training set)")
plt.xlabel("Years of Experience")
plt.ylabel("Salary")
plt.show()
```

0s completed at 8:47 PM



Learning Outcome:

EXPERIMENT 2

Problem statement: Study and implement Logistic Regression.

Theory:

Dataset:

Age	Estimated	Purchased
19	19000	0
35	20000	0
26	43000	0
27	57000	0
19	76000	0
27	58000	0
27	84000	0
32	150000	1
25	33000	0
35	65000	0
26	80000	0
26	52000	0
20	86000	0
32	18000	0
18	82000	0
29	80000	0
47	25000	1
45	26000	1
46	28000	1
48	29000	1
45	22000	1
47	49000	1
48	41000	1
45	22000	1
46	23000	1
47	20000	1
49	28000	1

KUNSH SABHARWAL

Program 2_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk

Gemini

```
[1] import numpy as np
    import pandas as pd
    import matplotlib.pyplot as plt
```

```
[2] df=pd.read_csv("Social_Network_Ads (1).csv")
```

```
[3] print(df.head())
```

```
   Age  EstimatedSalary  Purchased
0   19            19000          0
1   35            20000          0
2   26            43000          0
3   27            57000          0
4   19            76000          0
```

```
[4] x=df.iloc[:,:-1].values
    y=df.iloc[:,-1].values
```

```
[5] from sklearn.model_selection import train_test_split
    x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.25, random_state = 1)
```

```
[6] print(x_train)
```

```
[    36 126000]
[    47  20000]
[    30  79000]
[    59  83000]
[    29  80000]
[    43 112000]
[    38  80000]
[    58 144000]
```

0s completed at 6:58 PM

Program 2_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk

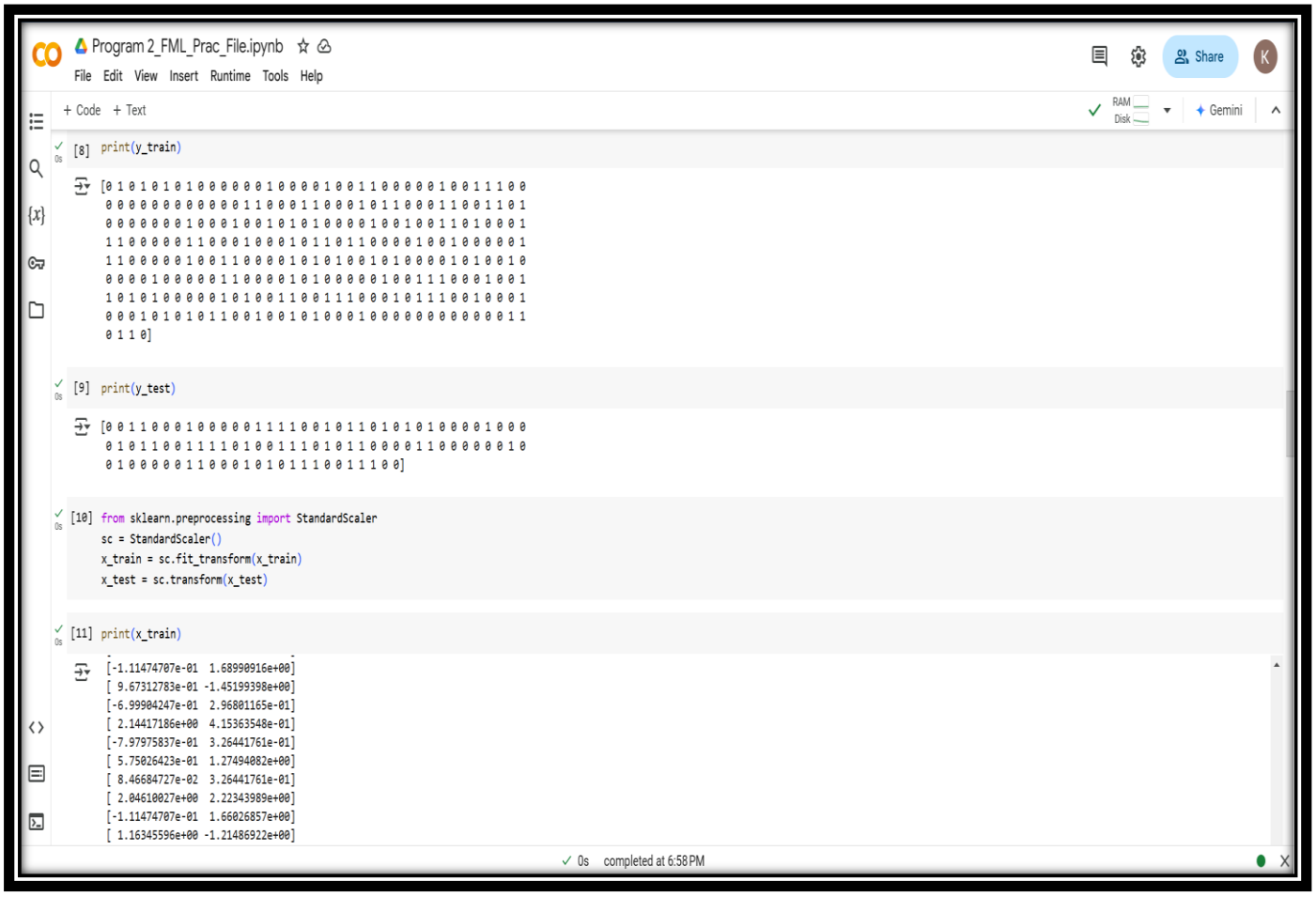
Gemini

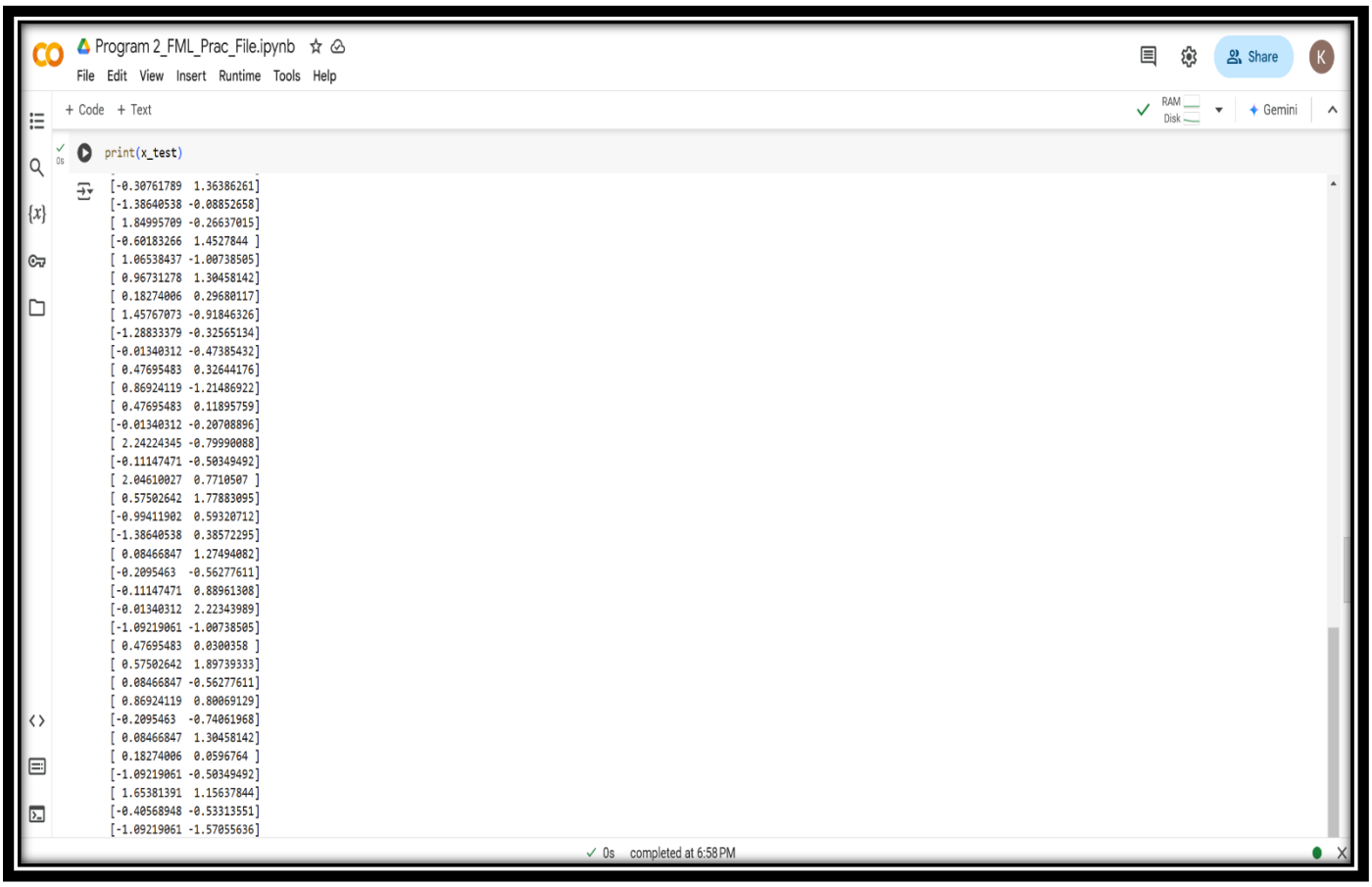
```
print(x_test)
```

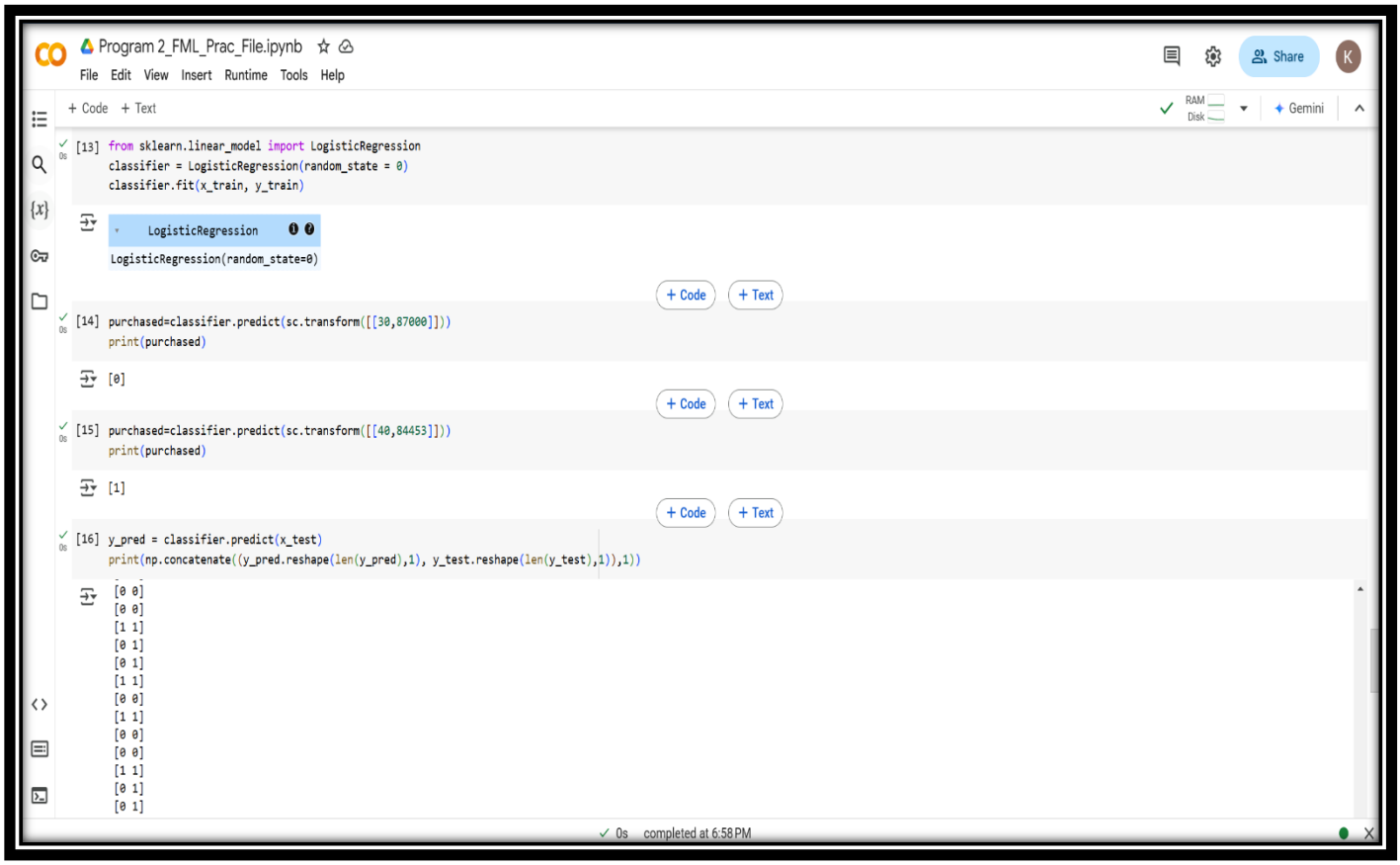
```
[    34 115000]
[    23  66000]
[    56  60000]
[    31 118000]
[    48  35000]
[    47 113000]
[    39  79000]
[    52  38000]
[    24  58000]
[    37  53000]
[    42  80000]
[    46  28000]
[    42  73000]
[    37  62000]
[    60  42000]
[    36  52000]
[    58  95000]
[    43 129000]
[    27  89000]
[    23  82000]
[    38 112000]
[    35  50000]
[    36  99000]
[    37 144000]
[    26  35000]
[    42  70000]
[    43 133000]
[    38  50000]
[    46  96000]
[    35  44000]
[    38 113000]
[    39  71000]
[    26  52000]
[    54 108000]
[    33  51000]
```

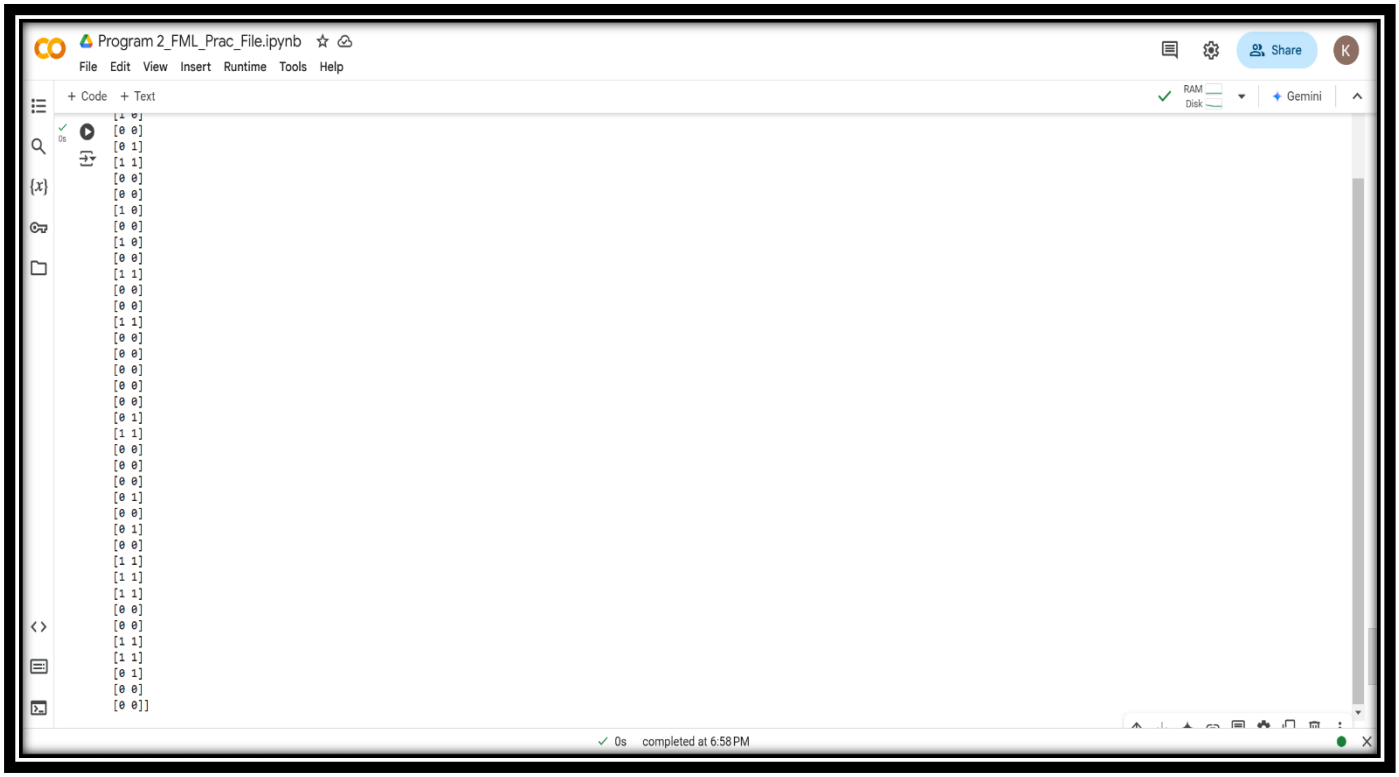
0s completed at 6:58 PM

KUNSH SABHARWAL









Learning Outcome:

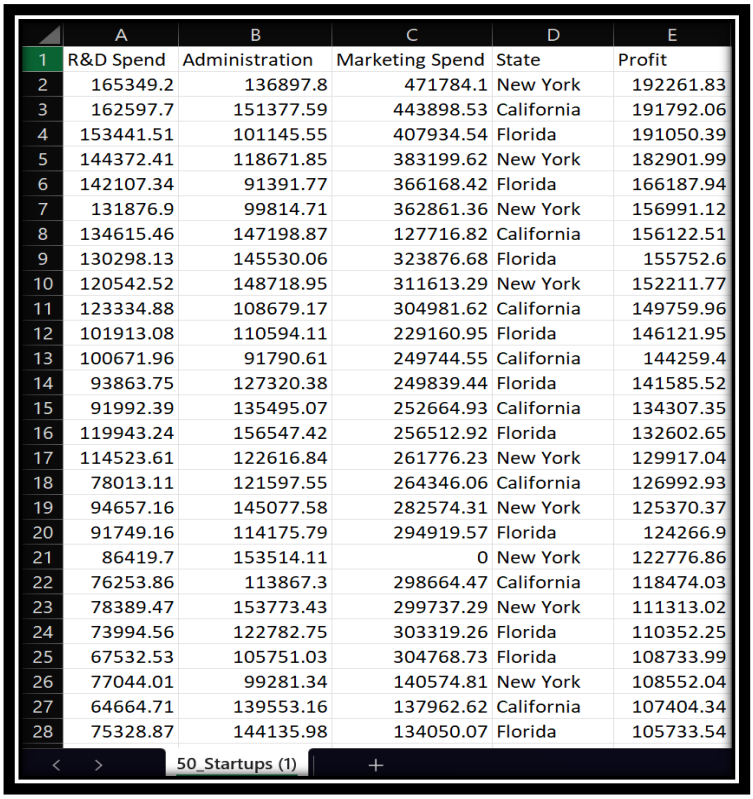
EXPERIMENT 3
(Beyond Curriculum)

Problem statement: Study and implement Multiple Regression and Polynomial Linear Regression.

Theory:

Datasets:

1) 50_Startups Dataset



	A	B	C	D	E
1	R&D Spend	Administration	Marketing Spend	State	Profit
2	165349.2	136897.8	471784.1	New York	192261.83
3	162597.7	151377.59	443898.53	California	191792.06
4	153441.51	101145.55	407934.54	Florida	191050.39
5	144372.41	118671.85	383199.62	New York	182901.99
6	142107.34	91391.77	366168.42	Florida	166187.94
7	131876.9	99814.71	362861.36	New York	156991.12
8	134615.46	147198.87	127716.82	California	156122.51
9	130298.13	145530.06	323876.68	Florida	155752.6
10	120542.52	148718.95	311613.29	New York	152211.77
11	123334.88	108679.17	304981.62	California	149759.96
12	101913.08	110594.11	229160.95	Florida	146121.95
13	100671.96	91790.61	249744.55	California	144259.4
14	93863.75	127320.38	249839.44	Florida	141585.52
15	91992.39	135495.07	252664.93	California	134307.35
16	119943.24	156547.42	256512.92	Florida	132602.65
17	114523.61	122616.84	261776.23	New York	129917.04
18	78013.11	121597.55	264346.06	California	126992.93
19	94657.16	145077.58	282574.31	New York	125370.37
20	91749.16	114175.79	294919.57	Florida	124266.9
21	86419.7	153514.11	0	New York	122776.86
22	76253.86	113867.3	298664.47	California	118474.03
23	78389.47	153773.43	299737.29	New York	111313.02
24	73994.56	122782.75	303319.26	Florida	110352.25
25	67532.53	105751.03	304768.73	Florida	108733.99
26	77044.01	99281.34	140574.81	New York	108552.04
27	64664.71	139553.16	137962.62	California	107404.34
28	75328.87	144135.98	134050.07	Florida	105733.54

50_Startups (1)

2) Position_Salaries Dataset

	A	B	C
1	Position	Level	Salary
2	Business Analyst	1	45000
3	Junior Consultant	2	50000
4	Senior Consultant	3	60000
5	Manager	4	80000
6	Country Manager	5	110000
7	Region Manager	6	150000
8	Partner	7	200000
9	Senior Partner	8	300000
10	C-level	9	500000
11	CEO	10	1000000

Source Code with Outputs:

Multiple/Polynomial Linear Regression_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk Gemini

MULTIPLE REGRESSION

```
[1] import numpy as np
    import pandas as pd
    import matplotlib.pyplot as plt
```

```
[2] df=pd.read_csv("50_Startups (1).csv")
```

```
[3] print(df.head())
```

```
   R&D Spend  Administration  Marketing Spend       State     Profit
0  165349.20       136897.80        471784.10    New York  192261.83
1  162597.70       151377.59        443898.53  California  191792.06
2  153441.51       101145.55        407934.54     Florida  191050.39
3  144372.41       118671.85        383199.62    New York  182901.99
4  142107.34        91391.77        366168.42     Florida  166187.94
```

```
[4] x=df.iloc[:,:-1].values
    y=df.iloc[:,-1].values
```

```
[5] print(x)
```

```
[[165349.2 136897.8 471784.1 'New York']
 [162597.7 151377.59 443898.53 'California']
 [153441.51 101145.55 407934.54 'Florida']
 [144372.41 118671.85 383199.62 'New York']
 [142107.34 91391.77 366168.42 'Florida']
 [131876.9 99814.71 362861.36 'New York']
 [134615.46 147198.87 127716.82 'California']
 [130298.13 145530.06 323876.68 'Florida']
 [120542.52 148718.95 311613.29 'New York']
```

0s completed at 8:26 PM

Multiple/Polynomial Linear Regression_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk Gemini

```
[6] print(y)
```

```
[192261.83 191792.06 191050.39 182901.99 166187.94 156991.12 156122.51
 155752.6  152211.77 149759.96 146121.95 144259.4  141585.52 134307.35
 132602.65 129917.04 126992.93 125370.37 124266.9  122776.86 118474.03
 111313.02 110352.25 108733.99 108552.04 107404.34 105733.54 105008.31
 103282.38 101004.64  99937.59  97483.56  97427.84  96778.92  96712.8
  96479.51  90708.19  89949.14  81229.06  81005.76  78239.91  77798.83
  71498.49  69758.98  65200.33  64926.08  49490.75  42559.73  35673.41
  14681.4 ]
```

```
from sklearn.compose import ColumnTransformer
from sklearn.preprocessing import OneHotEncoder
ct = ColumnTransformer(transformers=[('encoder', OneHotEncoder(), [3])], remainder='passthrough')
x = np.array(ct.fit_transform(x))
```

```
[8] print(x)
```

```
[[0.0 0.0 1.0 165349.2 136897.8 471784.1]
 [1.0 0.0 0.0 162597.7 151377.59 443898.53]
 [0.0 1.0 0.0 153441.51 101145.55 407934.54]
 [0.0 0.0 1.0 144372.41 118671.85 383199.62]
 [0.0 1.0 0.0 142107.34 91391.77 366168.42]
 [0.0 0.0 1.0 131876.9 99814.71 362861.36]
 [1.0 0.0 0.0 134615.46 147198.87 127716.82]
 [0.0 1.0 0.0 130298.13 145530.06 323876.68]
 [0.0 0.0 1.0 120542.52 148718.95 311613.29]
 [1.0 0.0 0.0 123334.88 108679.17 304981.62]
 [0.0 1.0 0.0 101913.08 110594.11 229160.95]
 [1.0 0.0 0.0 100671.96 91790.61 249744.55]
 [0.0 1.0 0.0 93863.75 127320.38 249839.44]
 [1.0 0.0 0.0 91992.39 135495.07 252664.93]
 [0.0 1.0 0.0 119943.24 156547.42 256512.92]
 [0.0 0.0 1.0 114523.61 122616.84 261776.23]
 [1.0 0.0 0.0 78013.11 121597.55 264346.06]
```

0s completed at 8:26 PM

KUNSH SABHARWAL

Multiple/Polynomial Linear Regression_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk

Gemini

```
print(y)
```

```
[192261.83 191792.06 191050.39 182901.99 166187.94 156991.12 156122.51
 155752.6  152211.77 149759.96 146121.95 144259.4  141585.52 134307.35
 132602.65 129917.04 126992.93 125370.37 124266.9  122776.86 118474.03
 111313.02 110352.25 108733.99 108552.04 107404.34 105733.54 105008.31
 103282.38 101004.64  99937.59  97483.56  97427.84  96778.92  96712.8
  96479.51  90708.19  89949.14  81229.06  81005.76  78239.91  77798.83
  71498.49  69758.98  65200.33  64926.08  49490.75  42559.73  35673.41
  14681.4 ]
```

```
[10] from sklearn.model_selection import train_test_split
     x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.25, random_state = 1)
```

```
[11] print(x_train)
```

```
[[0.0 1.0 0.0 28663.76 127056.21 201126.82]
 [0.0 0.0 1.0 86419.7 153514.11 0.0]
 [1.0 0.0 0.0 23640.93 96189.63 148001.11]
 [1.0 0.0 0.0 0.0 116983.8 45173.06]
 [0.0 1.0 0.0 75328.87 144135.98 134050.07]
 [0.0 1.0 0.0 73994.56 122782.75 303319.26]
 [1.0 0.0 0.0 91992.39 135495.07 252664.93]
 [0.0 1.0 0.0 27892.92 84710.77 164470.71]
 [0.0 0.0 1.0 94657.16 145077.58 282574.31]
 [0.0 0.0 1.0 1000.23 124153.04 1903.93]
 [0.0 0.0 1.0 77044.01 99281.34 140574.81]
 [0.0 1.0 0.0 67532.53 105751.03 304768.73]
 [0.0 1.0 0.0 142107.34 91391.77 366168.42]
 [0.0 1.0 0.0 55493.95 103057.49 214634.81]
 [0.0 1.0 0.0 119943.24 156547.42 256512.92]
 [0.0 1.0 0.0 61994.48 115641.28 91131.24]
 [0.0 1.0 0.0 101913.08 110594.11 229160.95]
 [0.0 1.0 0.0 66051.52 182645.56 118148.2]
 [1.0 0.0 0.0 22177.74 154806.14 28334.72]
```

✓ 0s completed at 8:26 PM

Multiple/Polynomial Linear Regression_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk

Gemini

```
print(x_test)
```

```
[[0.0 0.0 1.0 72107.6 127864.55 353183.81]
 [0.0 0.0 1.0 46014.02 85047.44 205517.64]
 [1.0 0.0 0.0 28754.33 118546.05 172795.67]
 [0.0 0.0 1.0 20229.59 65947.93 185265.1]
 [0.0 1.0 0.0 153441.51 101145.55 407934.54]
 [0.0 0.0 1.0 144372.41 118671.85 383199.62]
 [0.0 0.0 1.0 542.05 51743.15 0.0]
 [0.0 0.0 1.0 65605.48 153032.06 107138.38]
 [0.0 1.0 0.0 1315.46 115816.21 297114.46]
 [0.0 0.0 1.0 61136.38 152701.92 88218.23]
 [1.0 0.0 0.0 63408.86 129219.61 46085.25]
 [1.0 0.0 0.0 38558.51 82982.09 174999.3]
 [0.0 0.0 1.0 78389.47 153773.43 299737.29]]
```

```
[13] print(y_train)
```

```
[ 90708.19 122776.86  71498.49  14681.4  105733.54 110352.25 134307.35
  77798.83 125370.37  64926.08 108552.04 108733.99 166187.94  96778.92
 132602.65  99937.59 146121.95 103282.38  65200.33  96712.8  124266.9
 118474.03 107404.34 156122.51 155752.6   42559.73 191792.06 126992.93
 192261.83 129917.04 156991.12 144259.4  149759.96 152211.77 141585.52
  69758.98  89949.14]
```

```
[14] print(y_test)
```

```
[105008.31  96479.51  78239.91  81229.06 191050.39 182901.99  35673.41
 101004.64  49490.75  97483.56  97427.84  81005.76 111313.02]
```

```
[15] from sklearn.linear_model import LinearRegression
     regressor = LinearRegression()
     regressor.fit(x_train, y_train)
```

```
▾ LinearRegression
```

✓ 0s completed at 8:26 PM

KUNSH SABHARWAL

Multiple/Polynomial Linear Regression_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk Gemini

```
[16] y_pred = regressor.predict(x_test)
     np.set_printoptions(precision=2)
     print(np.concatenate((y_pred.reshape(len(y_pred),1), y_test.reshape(len(y_test),1)),1))
```

```
[[116262.61 105008.31]
 [ 91489.96  96479.51]
 [ 76360.93  78239.91]
 [ 71194.69  81229.06]
 [179490.9  191050.39]
 [172318.4  182901.99]
 [ 50008.92  35673.41]
 [103038.27 101004.64]
 [ 59896.19  49490.75]
 [ 99000.9   97483.56]
 [ 98497.76  97427.84]
 [ 83942.41  81005.76]
 [119227.03 111313.02]]
```

+ Code + Text

POLYNOMIAL LINEAR REGRESSION

```
[17] import numpy as np
     import pandas as pd
     import matplotlib.pyplot as plt
```

```
[18] df1=pd.read_csv("Position_Salaries (1).csv")
```

```
[19] print(df1.head())
```

```
            Position  Level  Salary
0   Business Analyst      1   45000
1  Junior Consultant      2   50000
2  Senior Consultant      3   60000
3            Manager      4   80000
4    Country Manager      5  110000
```

✓ 0s completed at 8:26 PM

Multiple/Polynomial Linear Regression_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk Gemini

```
[20] x1=df1.iloc[:,1:-1].values
     y1=df1.iloc[:,-1].values
```

```
print(x1)
```

```
[[ 1]
 [ 2]
 [ 3]
 [ 4]
 [ 5]
 [ 6]
 [ 7]
 [ 8]
 [ 9]
 [10]]
```

```
[22] print(y1)
```

```
[  45000   50000   60000   80000  110000  150000  200000  300000  500000
 1000000]
```

```
[23] from sklearn.linear_model import LinearRegression
     lin_reg = LinearRegression()
     lin_reg.fit(x1, y1)
```

```
LinearRegression
LinearRegression()
```

```
[24] from sklearn.preprocessing import PolynomialFeatures
     poly_reg = PolynomialFeatures(degree = 4) #answer upto the 4th degree of x
     x_poly = poly_reg.fit_transform(x1)
     lin_reg_2 = LinearRegression()
```

✓ 0s completed at 8:26 PM

Multiple/Polynomial Linear Regression_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk

Gemini

```
[20] x1=df1.iloc[:,1:-1].values
     y1=df1.iloc[:,-1].values
```

```
print(x1)
```

```
[[ 1]
 [ 2]
 [ 3]
 [ 4]
 [ 5]
 [ 6]
 [ 7]
 [ 8]
 [ 9]
 [10]]
```

```
[22] print(y1)
```

```
[  45000   50000   60000   80000  110000  150000  200000  300000  500000
 1000000]
```

```
[23] from sklearn.linear_model import LinearRegression
     lin_reg = LinearRegression()
     lin_reg.fit(x1, y1)
```

```
LinearRegression
LinearRegression()
```

```
[24] from sklearn.preprocessing import PolynomialFeatures
     poly_reg = PolynomialFeatures(degree = 4) #answer upto the 4th degree of x
     x_poly = poly_reg.fit_transform(x1)
     lin_reg_2 = LinearRegression()
```

0s completed at 8:26 PM

Multiple/Polynomial Linear Regression_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

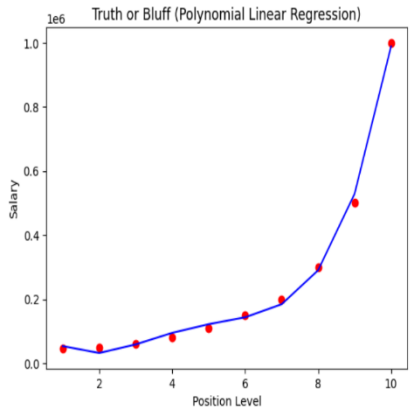
+ Code + Text

RAM Disk

Gemini

```
[25]
```


```
plt.scatter(x1,y1,color='red')
plt.plot(x1,lin_reg_2.predict(poly_reg.fit_transform(x1)),color='blue')
plt.title('Truth or Bluff (Polynomial Linear Regression)')
plt.xlabel('Position Level')
plt.ylabel('Salary')
plt.show()
```




```
[26] Start coding or generate with AI.
```

0s completed at 8:26 PM

Learning Outcome:

EXPERIMENT 3

Problem statement: Study & Implement K-Nearest Neighbour (KNN).

Theory:

Dataset:

Age	Estimated	Purchased
19	19000	0
35	20000	0
26	43000	0
27	57000	0
19	76000	0
27	58000	0
27	84000	0
32	150000	1
25	33000	0
35	65000	0
26	80000	0
26	52000	0
20	86000	0
32	18000	0
18	82000	0
29	80000	0
47	25000	1
45	26000	1
46	28000	1
48	29000	1
45	22000	1
47	49000	1
48	41000	1
45	22000	1
46	23000	1
47	20000	1
49	28000	1

Source Code with Outputs:

Program 3_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk Gemini

```
[7] import numpy as np
    import pandas as pd
    import matplotlib.pyplot as plt
```

```
[8] df=pd.read_csv("Social_Network_Ads (1).csv")
```

```
print(df.head())
```

```
   Age  EstimatedSalary  Purchased
0   19            19000          0
1   35            20000          0
2   26            43000          0
3   27            57000          0
4   19            76000          0
```

```
[10] x=df.iloc[:,:-1].values
     y=df.iloc[:,-1].values
```

```
[11] from sklearn.model_selection import train_test_split
     x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.25, random_state = 1)
```

```
[12] print(x_train)
```

```
[[   20  49000]
 [   46  88000]
 [   31  34000]
 [   47  30000]
```

0s completed at 8:43 PM

Program 3_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk Gemini

```
[12] print(x_train)
```

```
[[   20  49000]
 [   46  88000]
 [   31  34000]
 [   47  30000]
 [   35  50000]
 [   39  96000]
 [   33 113000]
 [   49  86000]
 [   45  79000]
 [   44  39000]
 [   41  59000]
 [   42  53000]
 [   35  73000]
 [   41  72000]
 [   27  96000]
 [   30 116000]
 [   41  52000]
 [   41  52000]
 [   20  82000]
 [   46  41000]
 [   27  31000]
 [   35  71000]
 [   49  28000]
 [   35  91000]
 [   37  75000]
 [   32 117000]
 [   36  75000]
 [   20  86000]
 [   38  50000]
 [   49  36000]
 [   40  65000]
 [   37  77000]
```

0s completed at 8:43 PM

KUNSH SABHARWAL

Program 3_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk

Gemini

```
print(y_train)
```

```
[0 1 0 1 0 1 0 1 0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 1 0 0 0 0 0 1 0 0 1 1 1 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 1 0 0 0 1 0 1 1 0 0 0 1 1 0 0 1 1 0 1
 0 0 0 0 0 0 0 1 0 0 0 1 0 0 1 0 1 0 1 0 1 0 0 0 0 1 0 0 1 0 0 1 1 0 1 0 0
 1 1 0 0 0 0 0 1 1 1 0 0 0 1 0 0 0 1 0 1 1 1 0 1 1 0 0 0 0 1 0 0 1 0 1 0 0
 1 1 0 0 0 0 0 1 0 0 1 1 0 0 0 0 1 0 1 0 1 0 0 1 0 1 0 0 0 0 1 0 1 0 0 1 0
 0 0 0 0 1 0 0 0 0 0 1 1 0 0 0 0 1 0 1 0 0 0 0 0 1 0 0 1 1 1 0 0 0 1 0 0 1
 1 0 1 0 1 0 0 0 0 0 1 0 1 0 0 1 1 0 0 1 1 1 0 0 0 1 0 1 1 1 0 0 1 0 0 0 1
 0 0 0 1 0 1 0 1 0 1 1 0 0 1 0 0 1 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1
 0 1 1 0]
```

```
[14] print(x_test)
```

```
[[   36  33000]
 [   39  61000]
 [   36 118000]
 [   39 122000]
 [   26 118000]
 [   38  65000]
 [   20  36000]
 [   49  89000]
 [   31  18000]
 [   48 141000]
 [   34  72000]
 [   39  73000]
 [   35  72000]
 [   48 131000]
 [   53  82000]
 [   56 133000]
 [   60  83000]
 [   27  58000]
 [   28  87000]
```

0s completed at 8:43 PM

Program 3_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk

Gemini

```
[15] print(y_test)
```

```
[0 0 1 1 0 0 0 1 0 0 0 0 0 1 1 1 1 0 0 1 0 1 1 0 1 0 1 0 1 0 0 0 0 1 0 0 0
 0 1 0 1 1 1 0 0 1 1 1 1 0 1 0 0 1 1 1 0 1 0 1 1 0 0 0 0 1 1 0 0 0 0 0 0 1 0
 0 1 0 0 0 0 0 0 1 1 0 0 0 1 0 1 0 1 1 1 0 0 1 1 1 0 0]
```

```
[16] from sklearn.preprocessing import StandardScaler
     sc = StandardScaler()
     x_train = sc.fit_transform(x_train)
     x_test = sc.transform(x_test)
```

```
[17] print(x_train)
```

```
[[-1.68062015e+00 -5.92416706e-01]
 [ 8.69241193e-01  5.63566526e-01]
 [-6.01832657e-01 -1.03702564e+00]
 [ 9.67312783e-01 -1.15558802e+00]
 [-2.09546297e-01 -5.62776110e-01]
 [ 1.82740063e-01  8.00691292e-01]
 [-4.05689477e-01  1.30458142e+00]
 [ 1.16345596e+00  5.04285335e-01]
 [ 7.71169603e-01  2.96801165e-01]
 [ 6.73098013e-01 -8.88822663e-01]
 [ 3.78883243e-01 -2.96010749e-01]
 [ 4.76954833e-01 -4.73854323e-01]
 [-2.09546297e-01  1.18957591e-01]
 [ 3.78883243e-01  8.93169951e-02]
 [-9.94119017e-01  8.00691292e-01]
 [-6.99904247e-01  1.39350321e+00]
 [ 3.78883243e-01 -5.03494919e-01]
 [ 3.78883243e-01 -5.03494919e-01]
 [-1.68062015e+00  3.85722952e-01]
```

0s completed at 8:43 PM

KUNSH SABHARWAL

Program 3_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk

Gemini

```
print(x_test)
```

```
[[-0.11147471 -1.06666624]
 [ 0.18274006 -0.23672956]
 [-0.11147471  1.4527844 ]
 [ 0.18274006  1.57134678]
 [-1.09219061  1.4527844 ]
 [ 0.08466847 -0.11816717]
 [-1.68062015 -0.97774445]
 [ 1.16345596  0.59320712]
 [-0.60183266 -1.51127517]
 [ 1.06538437  2.1345181 ]
 [-0.30761789  0.089317  ]
 [ 0.18274006  0.11895759]
 [-0.2095463   0.089317  ]
 [ 1.06538437  1.83811214]
 [ 1.55574232  0.38572295]
 [ 1.84995709  1.89739333]
 [ 2.24224345  0.41536355]
 [-0.99411902 -0.32565134]
 [-0.89604743  0.53392593]
 [ 2.24224345  0.97853487]
 [ 0.28081165  0.17823878]
 [ 1.26152755  0.56356653]
 [ 0.67309801  2.07523691]
 [ 0.96731278 -0.77026028]
 [ 0.7711696  -1.27415041]
 [-1.09219061 -1.60019696]
 [ 2.04610027 -0.6516979 ]
 [ 1.16345596  0.14859819]
 [ 1.55574232 -1.03702564]
 [ 1.45767073  1.33422201]
 [ 0.18274006 -0.79990088]
 [-1.77869174  0.20787938]
```

0s completed at 8:43 PM

Program 3_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share

+ Code + Text

RAM Disk

Gemini

```
[19] from sklearn.neighbors import KNeighborsClassifier
     classifier = KNeighborsClassifier(n_neighbors = 5, metric = 'minkowski', p = 2)
     classifier.fit(x_train, y_train)
```

```
KNeighborsClassifier
KNeighborsClassifier()
```

```
[20] purchased=classifier.predict(sc.transform([[30,87000]]))
     print(purchased)
```

```
[0]
```

```
[21] y_pred = classifier.predict(x_test)
     print(np.concatenate((y_pred.reshape(len(y_pred),1), y_test.reshape(len(y_test),1)),1))
```

```
[[0 0]
 [0 0]
 [1 1]
 [1 1]
 [1 0]
 [0 0]
 [0 0]
 [1 1]
 [0 0]
 [1 0]
 [0 0]
 [0 0]
 [0 0]
 [1 1]
 [1 1]
```

0s completed at 8:43 PM

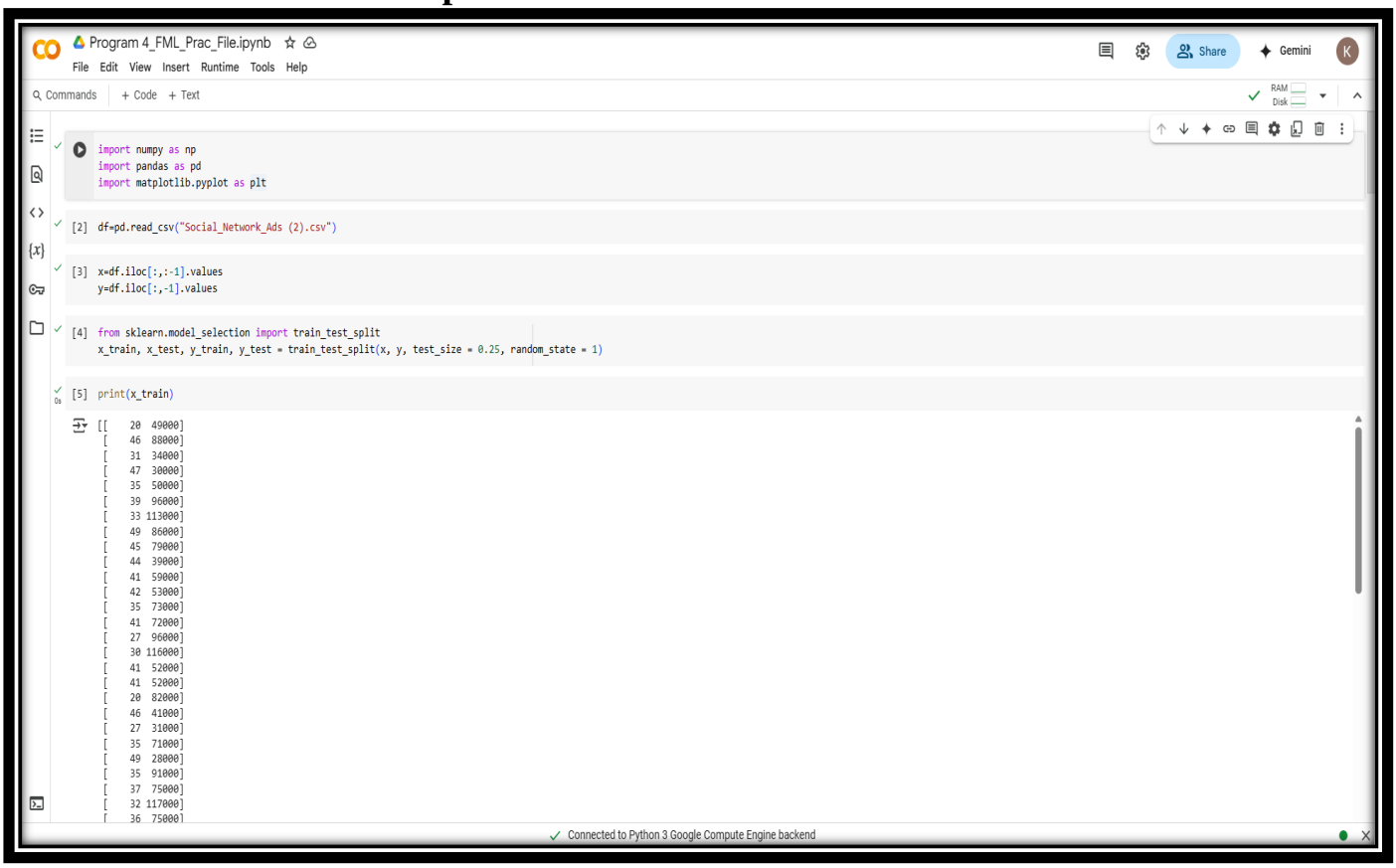
Learning Outcome:

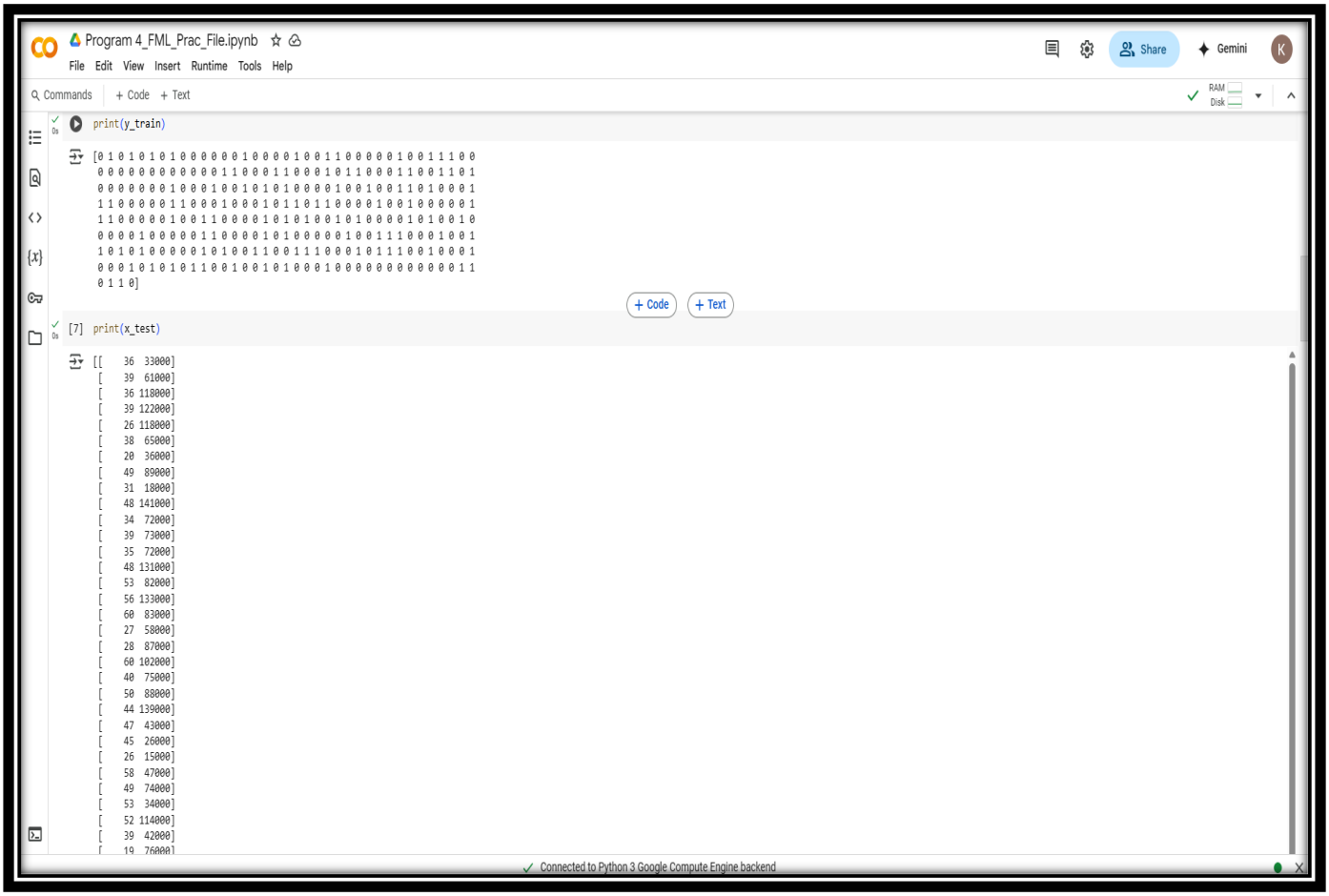
EXPERIMENT 4

Problem statement: Study & Implement classification using SVM.

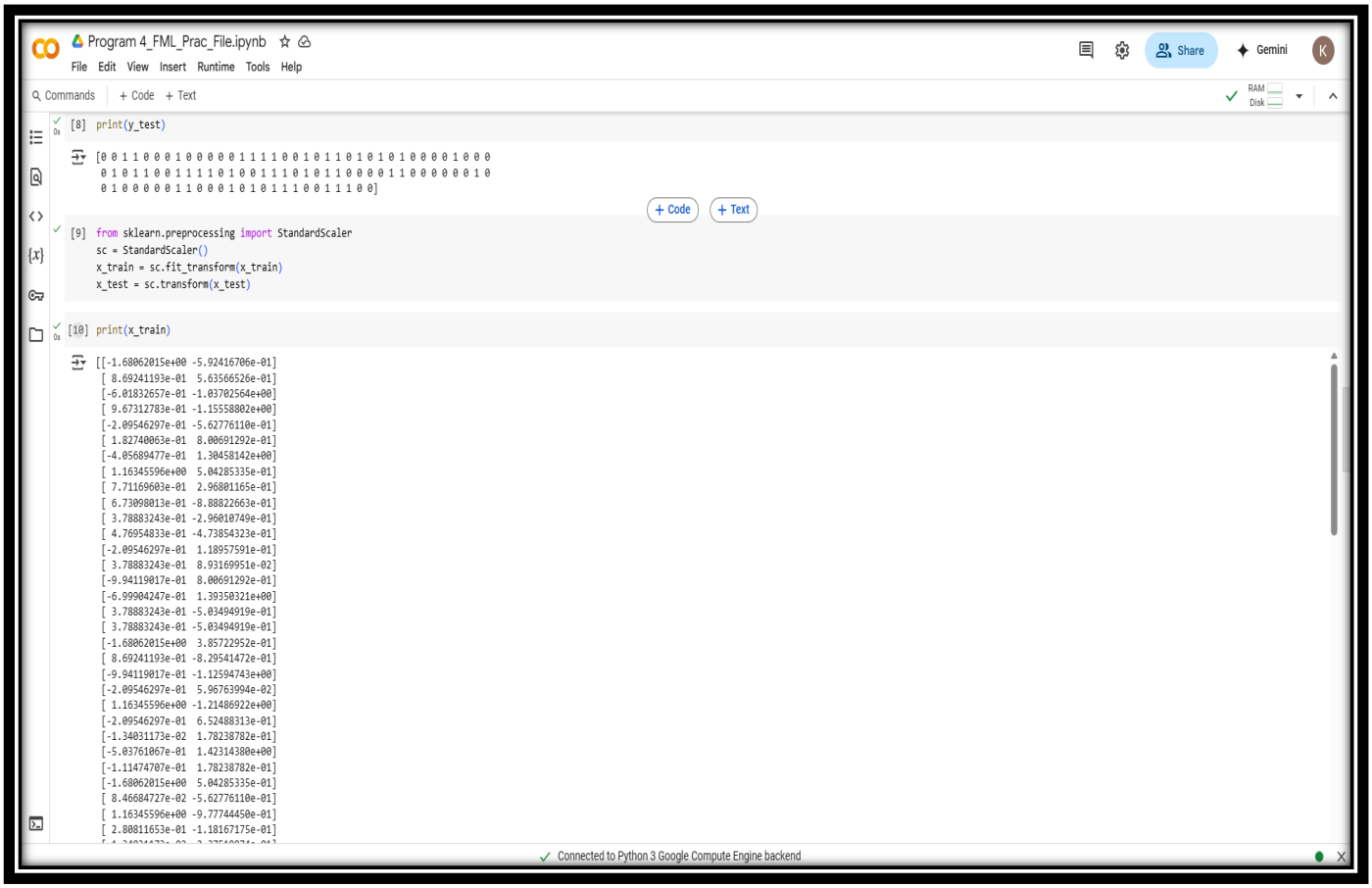
Theory:

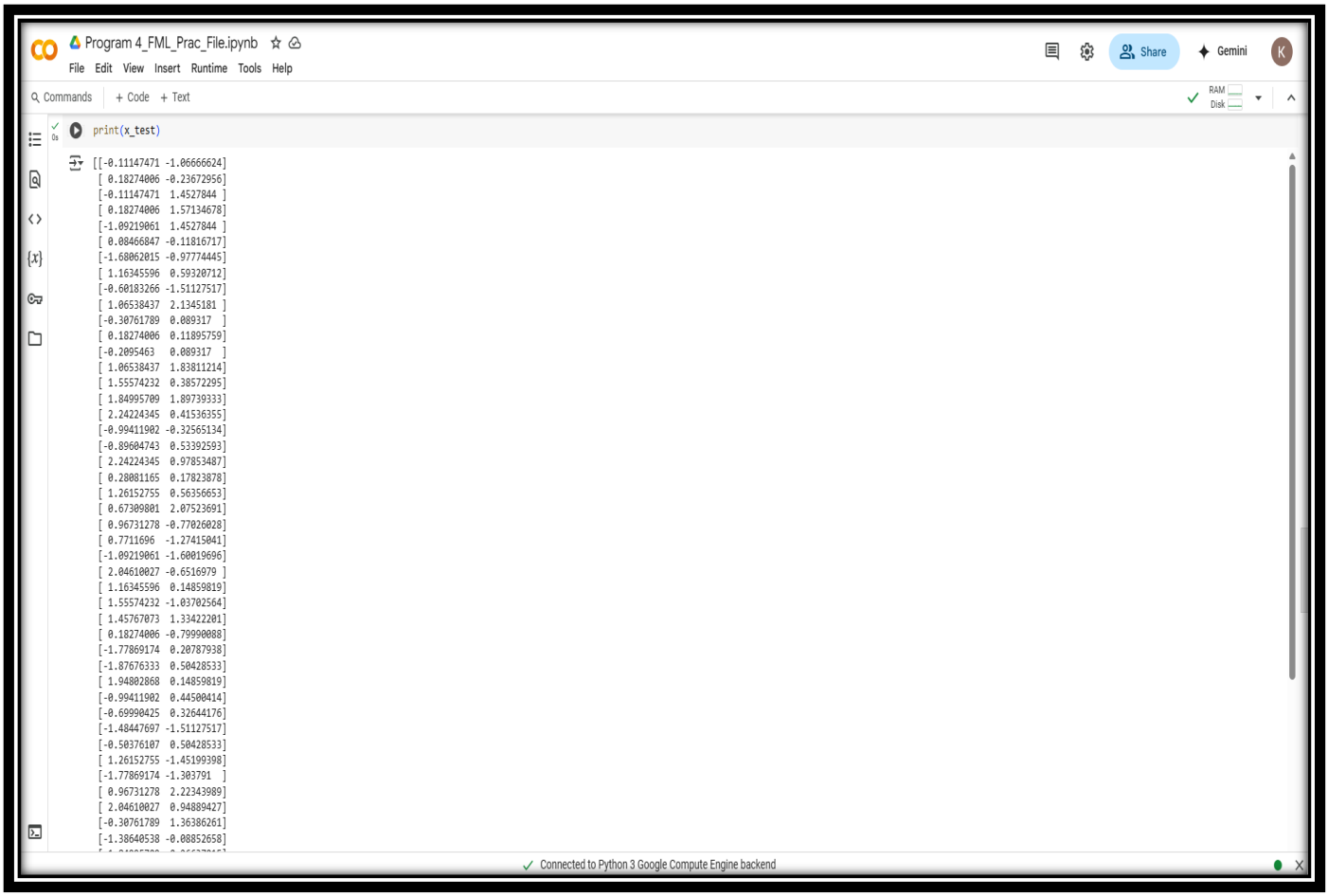
Source Code with Outputs:

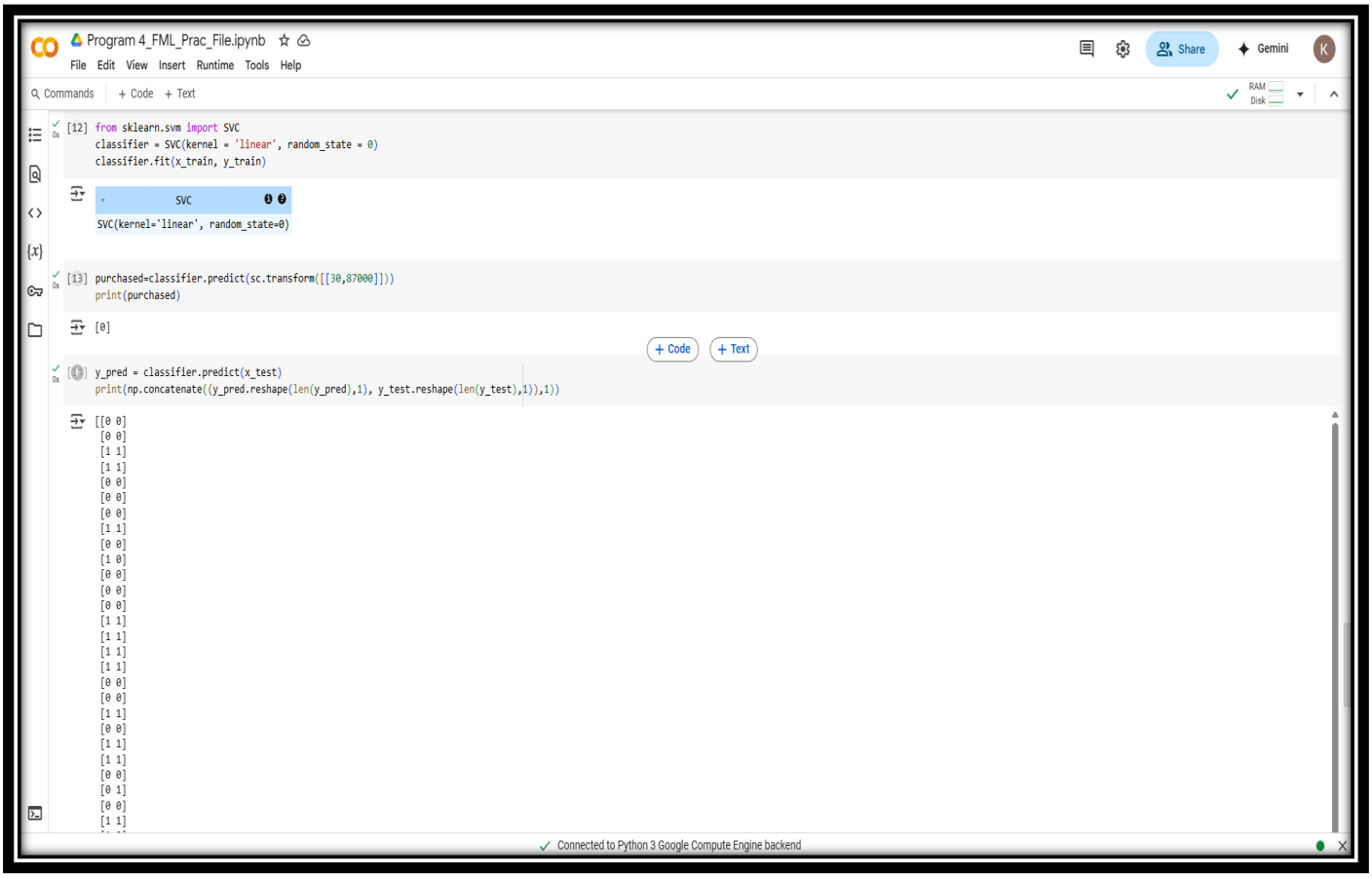




KUNSH SABHARWAL







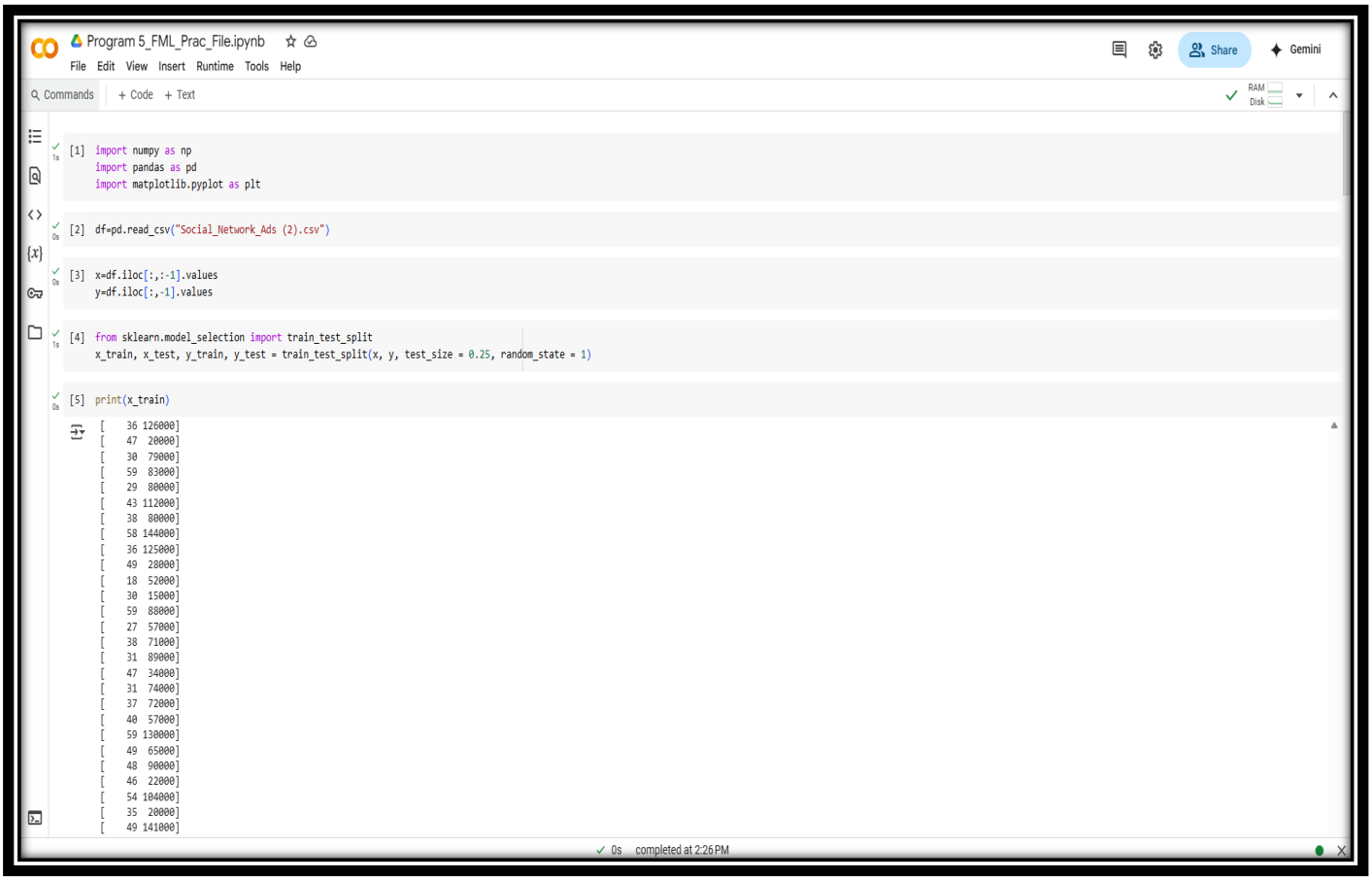
Learning Outcome:

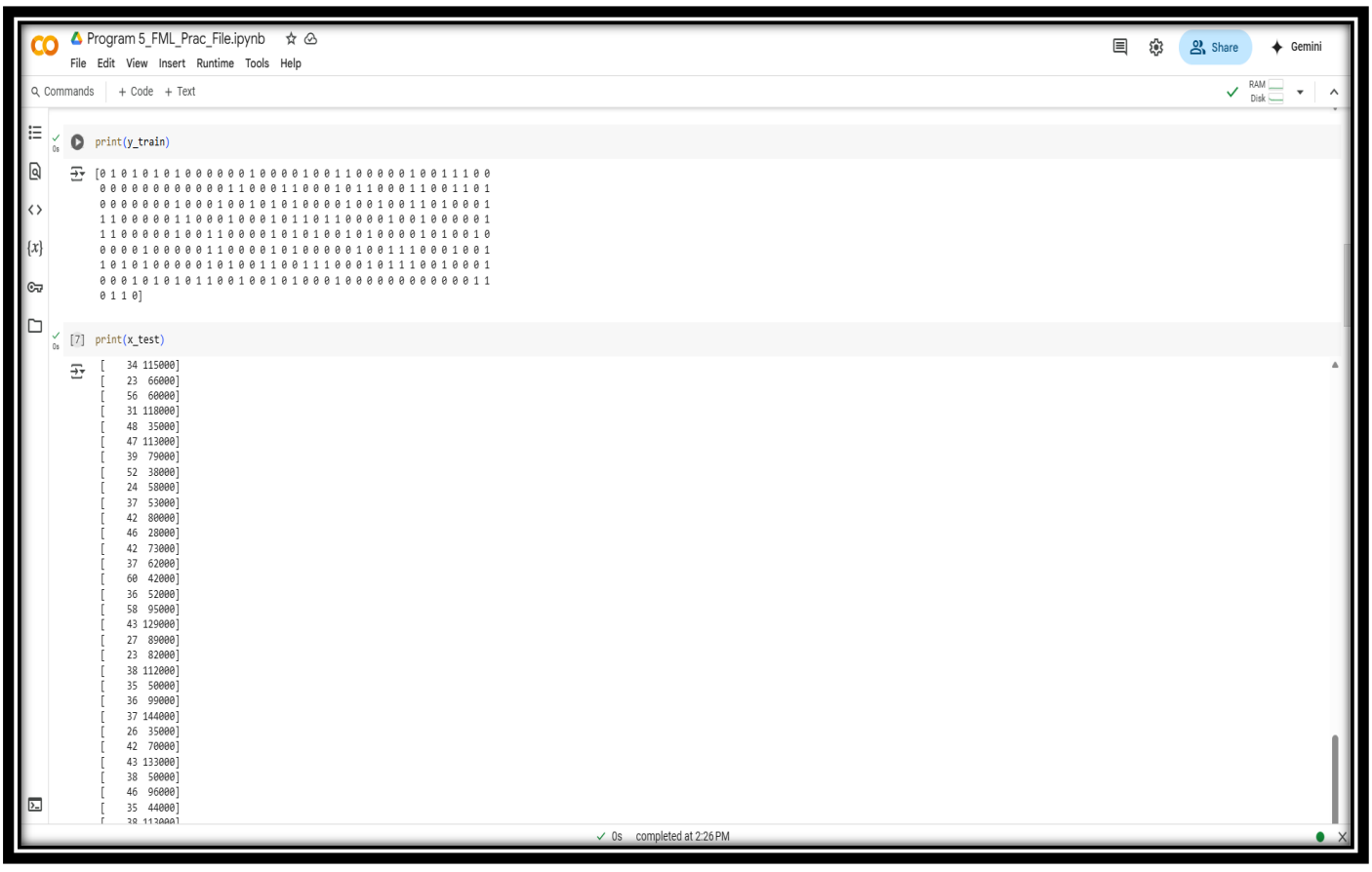
EXPERIMENT 5

Problem statement: Study & Implement Bagging using Random Forests.

Theory:

Source Code:


Program 5_FML_Prac_File.ipynb
File Edit View Insert Runtime Tools Help
Share
Gemini
Commands
+ Code + Text
RAM
Disk
[1] import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
[2] df=pd.read_csv("Social_Network_Ads (2).csv")
[3] x=df.iloc[:,:-1].values
y=df.iloc[:,-1].values
[4] from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.25, random_state = 1)
[5] print(x_train)
[36 126000]
[47 20000]
[30 79000]
[59 83000]
[29 80000]
[43 112000]
[38 80000]
[58 144000]
[36 125000]
[49 28000]
[18 52000]
[30 15000]
[59 88000]
[27 57000]
[38 71000]
[31 89000]
[47 34000]
[31 74000]
[37 72000]
[40 57000]
[59 130000]
[49 65000]
[48 90000]
[46 22000]
[54 104000]
[35 20000]
[49 141000]
0s completed at 2:26 PM


Program 5_FML_Prac_File.ipynb
File Edit View Insert Runtime Tools Help
Share
Gemini
Commands
+ Code + Text
RAM
Disk
print(y_train)
[0 1 0 1 0 1 0 1 0 0 0 0 0 1 0 0 0 0 1 0 0 1 1 0 0 0 0 0 1 0 0 1 1 1 0 0
0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 1 0 0 0 1 0 1 1 0 0 0 1 1 0 0 1 1 0 1
0 0 0 0 0 0 0 1 0 0 0 1 0 0 1 0 0 1 0 1 0 1 0 0 0 0 1 0 0 1 0 1 1 0 1 0
1 1 0 0 0 0 0 1 1 0 0 0 0 1 0 1 0 0 1 0 1 0 0 0 0 1 0 1 1 0 0 0 0 1 0 1
1 1 0 0 0 0 0 1 0 0 1 1 0 0 0 0 1 0 1 0 1 0 0 1 0 1 0 0 0 0 1 0 1 0 0 1
0 0 0 1 0 0 0 0 0 1 1 0 0 0 0 1 0 1 0 0 0 0 0 1 0 0 1 1 1 0 0 0 0 1 0 0 1
1 0 1 0 1 0 0 0 0 0 1 0 1 0 0 1 1 0 0 1 1 1 1 0 0 0 1 0 1 1 1 0 0 1 0 0 0 1
0 0 0 1 0 1 0 1 0 1 1 0 0 1 0 0 1 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1
0 1 1 0]
[7] print(x_test)
[34 115000]
[23 66000]
[56 60000]
[31 118000]
[48 35000]
[47 113000]
[39 79000]
[52 38000]
[24 58000]
[37 53000]
[42 80000]
[46 28000]
[42 73000]
[37 62000]
[60 42000]
[36 52000]
[58 95000]
[43 129000]
[27 89000]
[23 82000]
[38 112000]
[35 50000]
[36 99000]
[37 144000]
[26 35000]
[42 70000]
[43 133000]
[38 50000]
[46 96000]
[35 44000]
0s completed at 2:26 PM

KUNSH SABHARWAL

Program 5_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share Gemini

Commands + Code + Text

RAM Disk

```
print(y_test)
```

```
[0 0 1 1 0 0 0 1 0 0 0 0 0 1 1 1 1 0 0 1 0 1 1 0 1 0 1 0 1 0 0 0 0 1 0 0 0
 0 1 0 1 1 0 0 1 1 1 1 1 0 1 0 0 1 1 1 0 1 0 1 1 0 1 1 0 0 0 0 1 1 0 0 0 0 0 0 1 0
 0 1 0 0 0 0 0 1 1 0 0 0 1 0 1 0 1 1 1 0 0 1 1 1 0 0]
```

```
[9] from sklearn.preprocessing import StandardScaler
    sc = StandardScaler()
    x_train = sc.fit_transform(x_train)
    x_test = sc.transform(x_test)
```

```
[10] print(x_train)
```

```
[-1.11474707e-01  1.68990916e+00]
[ 9.67312783e-01 -1.45199398e+00]
[-6.99904247e-01  2.96801165e-01]
[ 2.14417186e+00  4.15363548e-01]
[-7.97975837e-01  3.26441761e-01]
[ 5.75026423e-01  1.27494082e+00]
[ 8.46684727e-02  3.26441761e-01]
[ 2.04610027e+00  2.22343989e+00]
[-1.11474707e-01  1.66026857e+00]
[ 1.16345596e+00 -1.21486922e+00]
[-1.87676333e+00 -5.03494919e-01]
[-6.99904247e-01 -1.60019696e+00]
[ 2.14417186e+00  5.63566526e-01]
[-9.94119017e-01 -3.55291941e-01]
[ 8.46684727e-02  5.96763994e-02]
[-6.01832657e-01  5.93207122e-01]
[ 9.67312783e-01 -1.03702564e+00]
[-6.01832657e-01  1.48598186e-01]
[-1.34031173e-02  8.93169951e-02]
[ 2.80811653e-01 -3.55291941e-01]
[ 2.14417186e+00  1.80847155e+00]
[ 1.16345596e+00 -1.18167175e-01]
[ 1.06538437e+00  6.22847718e-01]
[ 8.69241193e-01 -1.39271279e+00]
[ 1.65381391e+00  1.03781606e+00]
[-2.09546297e-01 -1.45199398e+00]
[ 1.16345596e+00  2.13451810e+00]
[ 1.06538437e+00 -8.29541472e-01]
[-2.09546297e-01 -4.14573132e-01]
[-1.11474707e-01 -2.66370153e-01]
[-5.03761067e-01  2.40128346e+00]
```

0s completed at 2:26 PM

Program 5_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share Gemini

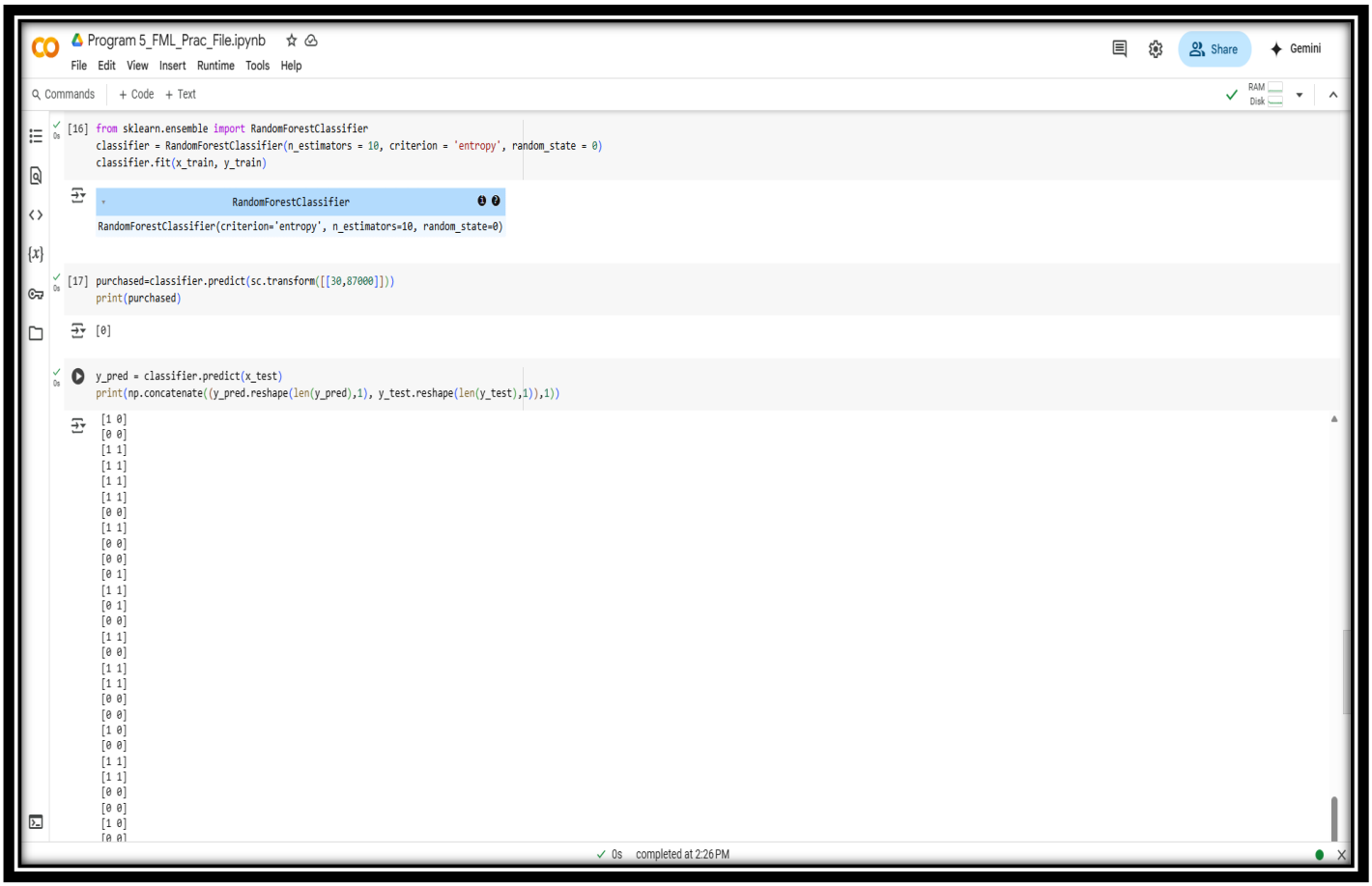
Commands + Code + Text

RAM Disk

```
print(x_test)
```

```
[-0.30761789  1.36386261]
[-1.38640538 -0.08852658]
[ 1.84995709 -0.26637015]
[-0.60183266  1.4527844 ]
[ 1.06538437 -1.00738505]
[ 0.96731278  1.30458142]
[ 0.18274006  0.29680117]
[ 1.45767073 -0.91846326]
[-1.28833379 -0.32565134]
[-0.01340312 -0.47385432]
[ 0.47695483  0.32644176]
[ 0.86924119 -1.21486922]
[ 0.47695483  0.11895759]
[-0.01340312 -0.20708896]
[ 2.24224345 -0.79990088]
[-0.11147471 -0.50349492]
[ 2.04610027  0.7710507 ]
[ 0.57502642  1.77883095]
[-0.99411902  0.59320712]
[-1.38640538  0.38572295]
[ 0.08466847  1.27494082]
[-0.2095463  -0.56277611]
[-0.11147471  0.88961308]
[-0.01340312  2.22343989]
[-1.09219061 -1.00738505]
[ 0.47695483  0.0300358 ]
[ 0.57502642  1.89739333]
[ 0.08466847 -0.56277611]
[ 0.86924119  0.80069129]
[-0.2095463  -0.74061968]
[ 0.08466847  1.30458142]
[ 0.18274006  0.0596764 ]
[-1.09219061 -0.50349492]
[ 1.65381391  1.15637844]
[-0.40568948 -0.53313551]
[-1.09219061 -1.57055636]
[-0.69990425  0.53392593]
[-0.2095463  -0.26637015]
[-0.79797584 -1.21486922]
[ 0.7711696  -1.39271279]
[ 0.86924119  1.4231438 ]
[-0.50376107 -1.51127517]
[-1.48447697  0.35608236]
[-1.1902622   0.53392593]
```

0s completed at 2:26 PM



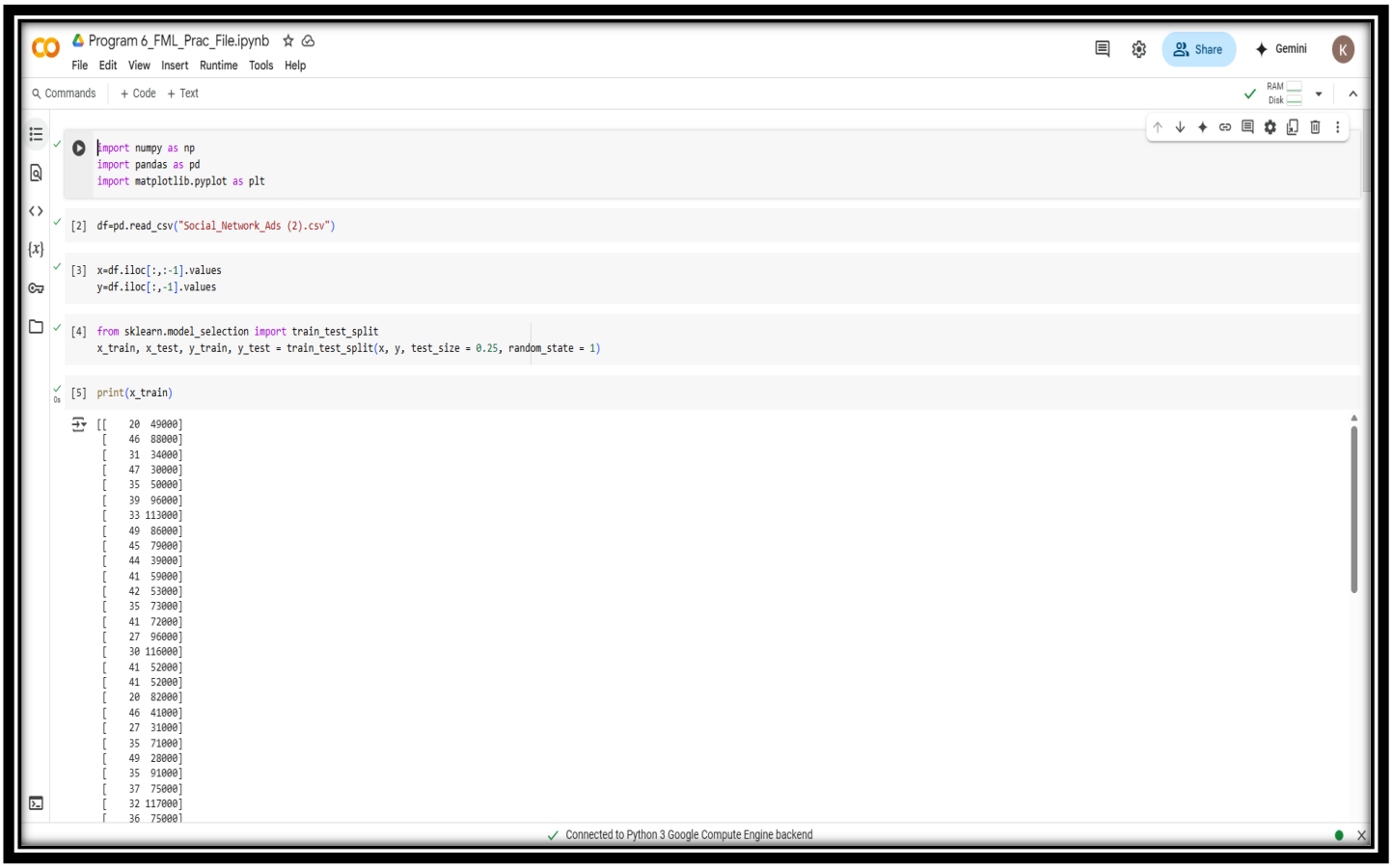
Learning Outcome:

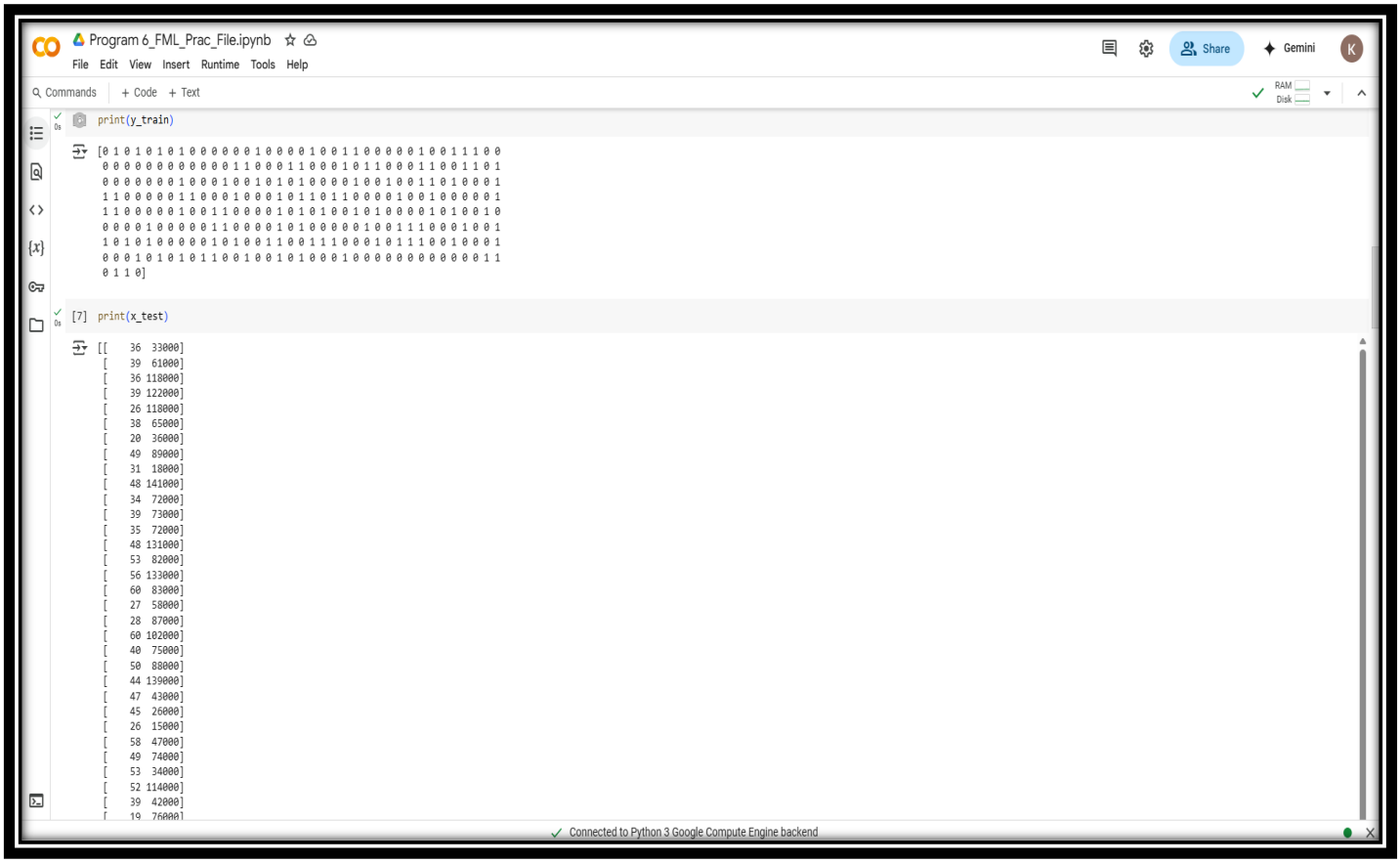
EXPERIMENT 6

Problem statement: Study & Implement Naïve-Bayes.

Theory:

Source Code with Outputs:





KUNSH SABHARWAL

Program 6_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share Gemini

Commands + Code + Text

RAM Disk

```
[8] print(y_test)
```

```
[0 0 1 1 0 0 0 1 0 0 0 0 0 1 1 1 1 0 0 1 0 1 1 1 0 1 0 1 0 1 0 0 0 0 1 0 0 0
 0 1 0 1 1 1 0 0 1 1 1 1 0 1 0 0 1 1 1 0 1 0 1 1 1 0 0 0 0 1 1 0 0 0 0 0 0 1 0
 0 1 0 0 0 0 0 1 1 0 0 0 1 0 1 0 1 1 1 1 0 0 1 1 1 0 0]
```

```
[9] from sklearn.preprocessing import StandardScaler
    sc = StandardScaler()
    x_train = sc.fit_transform(x_train)
    x_test = sc.transform(x_test)
```

```
[10] print(x_train)
```

```
[[-1.68062015e+00 -5.92416706e-01]
 [ 8.69241193e-01  5.63566526e-01]
 [-6.01832657e-01 -1.03702564e+00]
 [ 9.67312783e-01 -1.15558802e+00]
 [-2.09546297e-01 -5.62776110e-01]
 [ 1.82740063e+00  8.00691292e-01]
 [-4.05689477e-01  1.30458142e+00]
 [ 1.16345596e+00  5.04285335e-01]
 [ 7.71169603e-01  2.96801165e-01]
 [ 6.73098013e-01 -8.88822663e-01]
 [ 3.78883243e-01 -2.96010749e-01]
 [ 4.76954833e-01 -4.73854323e-01]
 [-2.09546297e-01  1.18957591e-01]
 [ 3.78883243e-01  8.93169951e-02]
 [-9.94119017e-01  8.00691292e-01]
 [-6.99904247e-01  1.39350321e+00]
 [ 3.78883243e-01 -5.03494919e-01]
 [ 3.78883243e-01 -5.03494919e-01]
 [-1.68062015e+00  3.85722952e-01]
 [ 8.69241193e-01 -8.29541472e-01]
 [-9.94119017e-01 -1.12594743e+00]
 [-2.09546297e-01  5.96763994e-02]
 [ 1.16345596e+00 -1.21486922e+00]
 [-2.09546297e-01  6.52488313e-01]
 [-1.34031173e-02  1.78238782e-01]
 [-5.03761067e-01  1.42314380e+00]
 [-1.11474707e-01  1.78238782e-01]
 [-1.68062015e+00  5.04285335e-01]
 [ 8.46684727e-02 -5.62776110e-01]
 [ 1.16345596e+00 -9.77744450e-01]
```

Connected to Python 3 Google Compute Engine backend

Program 6_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share Gemini

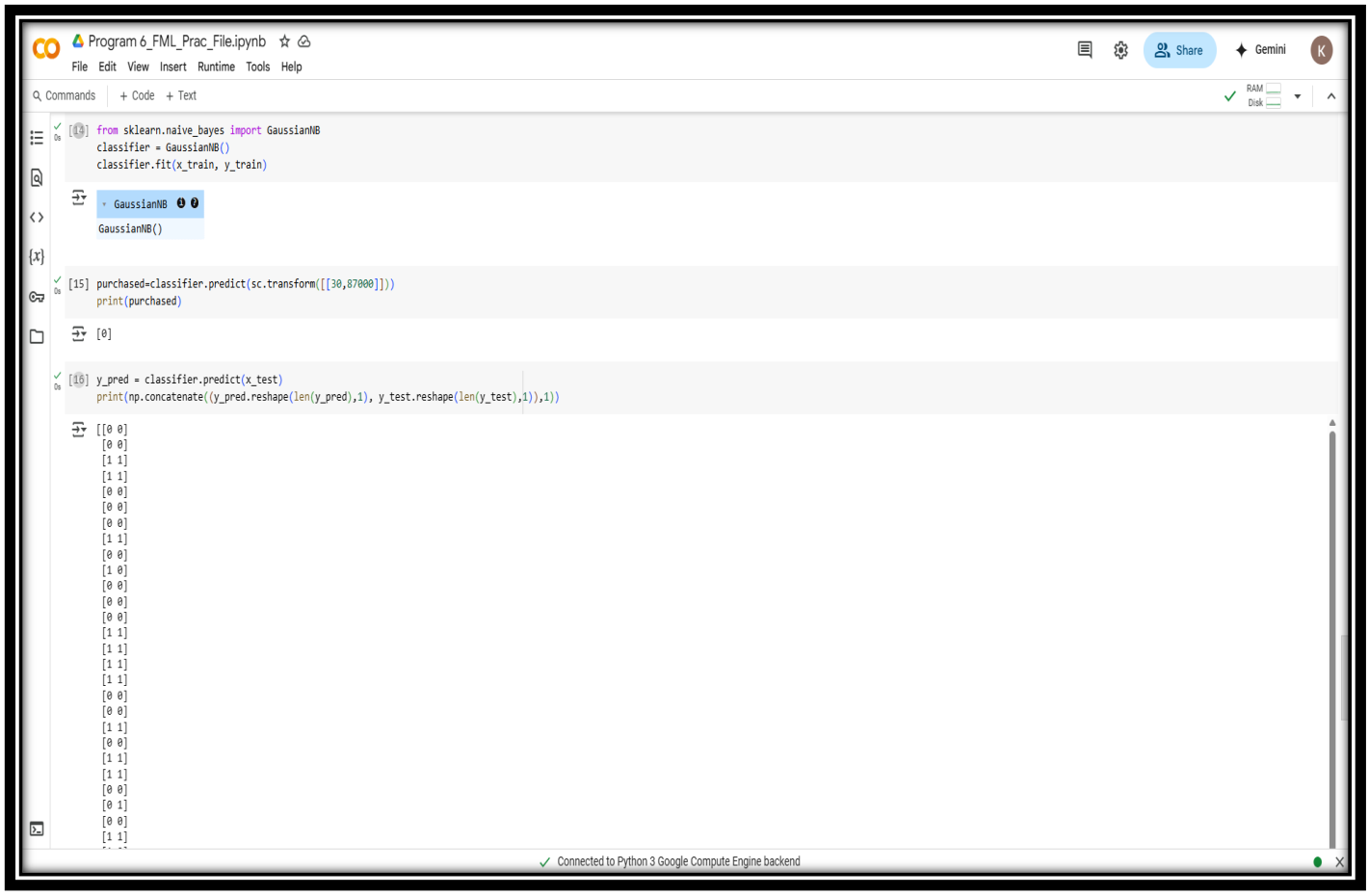
Commands + Code + Text

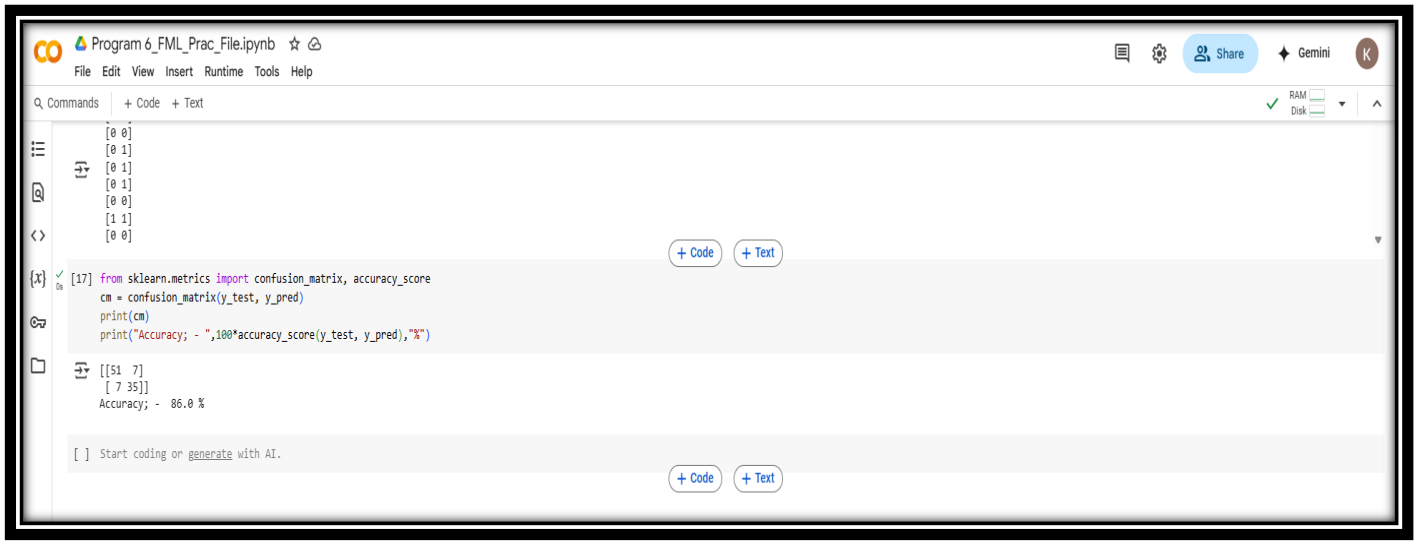
RAM Disk

```
print(x_test)
```

```
[[-0.11147471 -1.06666624]
 [ 0.18274006 -0.23672956]
 [-0.11147471  1.4527844 ]
 [ 0.18274006  1.57134678]
 [-1.09219061  1.4527844 ]
 [ 0.08466847 -0.11816717]
 [-1.68062015 -0.97774445]
 [ 1.16345596  0.59320712]
 [-0.60183266 -1.51127517]
 [ 1.06538437  2.1345181 ]
 [-0.30761789  0.089317  ]
 [ 0.18274006  0.11895759]
 [-0.2095463   0.089317  ]
 [ 1.06538437  1.83811214]
 [ 1.55574232  0.38572295]
 [ 1.84995709  1.89739333]
 [ 2.24224345  0.41536355]
 [-0.99411902 -0.32565134]
 [-0.89604743  0.53392593]
 [ 2.24224345  0.97853487]
 [ 0.28081165  0.17823878]
 [ 1.26152755  0.56356653]
 [ 0.67309801  2.07523691]
 [ 0.96731278 -0.77026028]
 [ 0.7711696  -1.27415041]
 [-1.09219061 -1.60019696]
 [ 2.04610027 -0.6516979 ]
 [ 1.16345596  0.14859819]
 [ 1.55574232 -1.03702564]
 [ 1.45767073  1.33422201]
 [ 0.18274006 -0.79990088]
 [-1.77869174  0.20787938]
 [-1.87676333  0.50428533]
 [ 1.94802868  0.14859819]
 [-0.99411902  0.44500414]
 [-0.69990425  0.32644176]
 [-1.48447697 -1.51127517]
 [-0.50376107  0.50428533]
 [ 1.26152755 -1.45199398]
 [-1.77869174 -1.303791  ]
 [ 0.96731278  2.22343989]
 [ 2.04610027  0.94889427]
 [-0.30761789  1.36386261]
 [-1.38640538 -0.08852658]
 [ 1.84995709 -0.26637015]
```

Connected to Python 3 Google Compute Engine backend





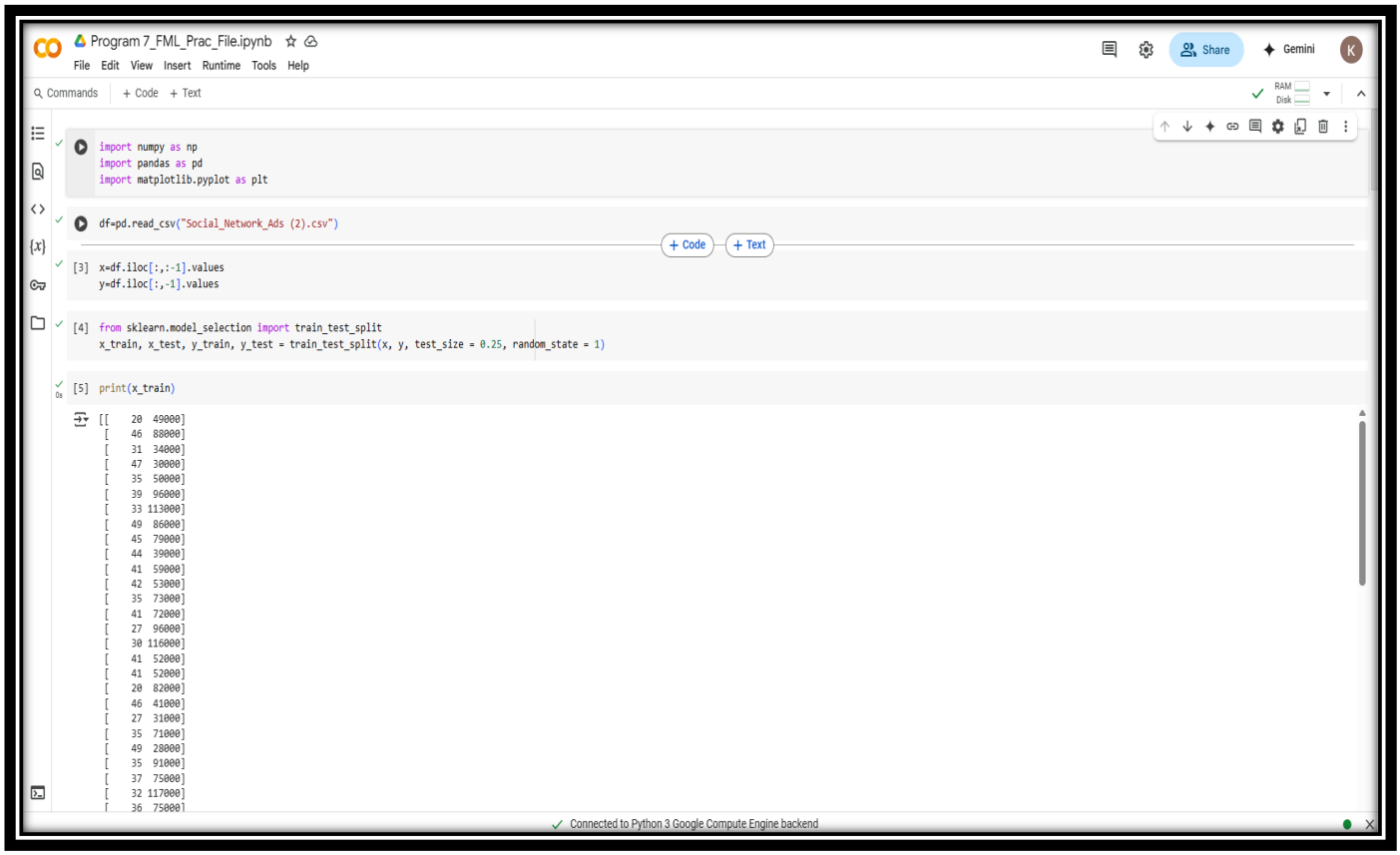
Learning Outcome:

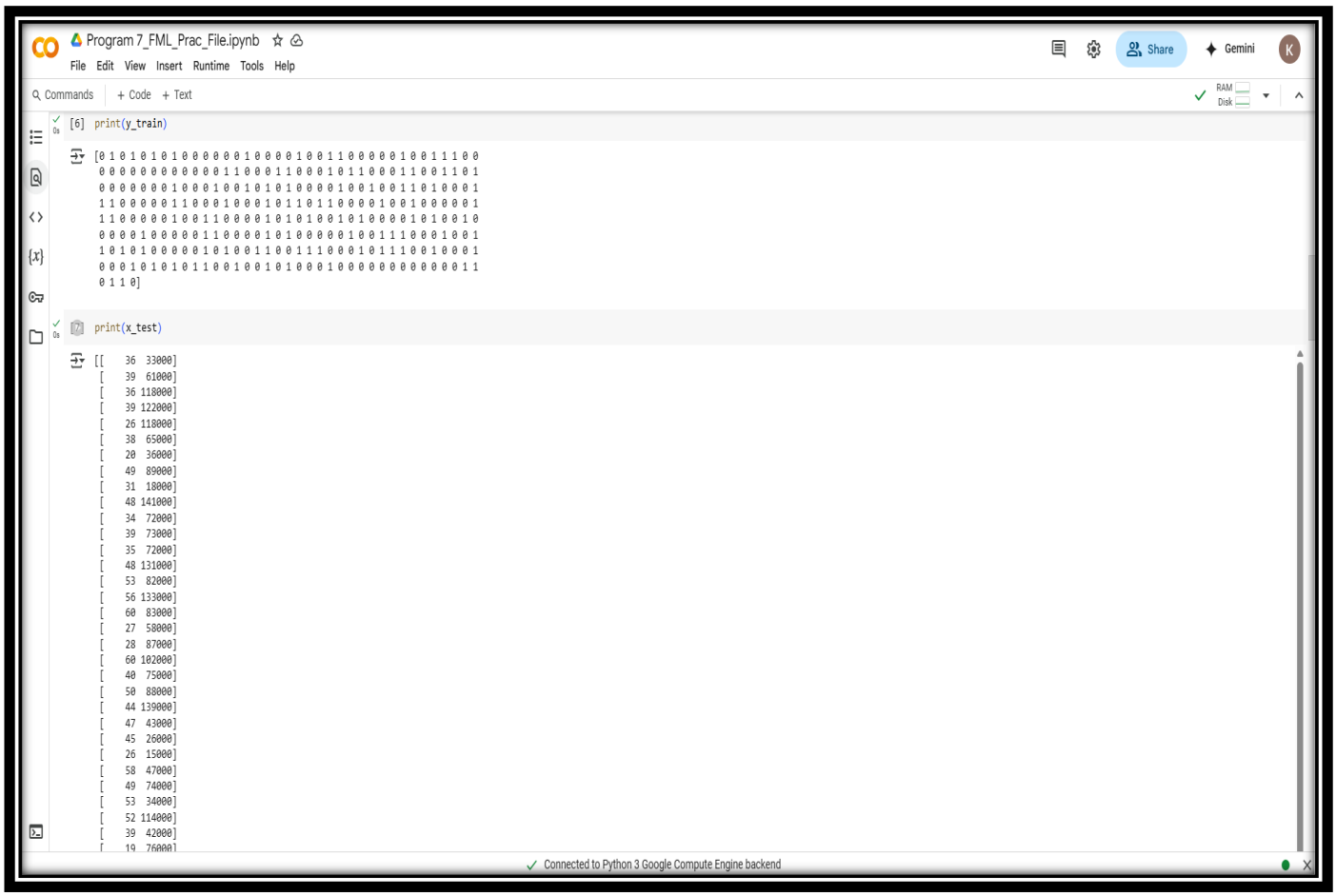
EXPERIMENT 7

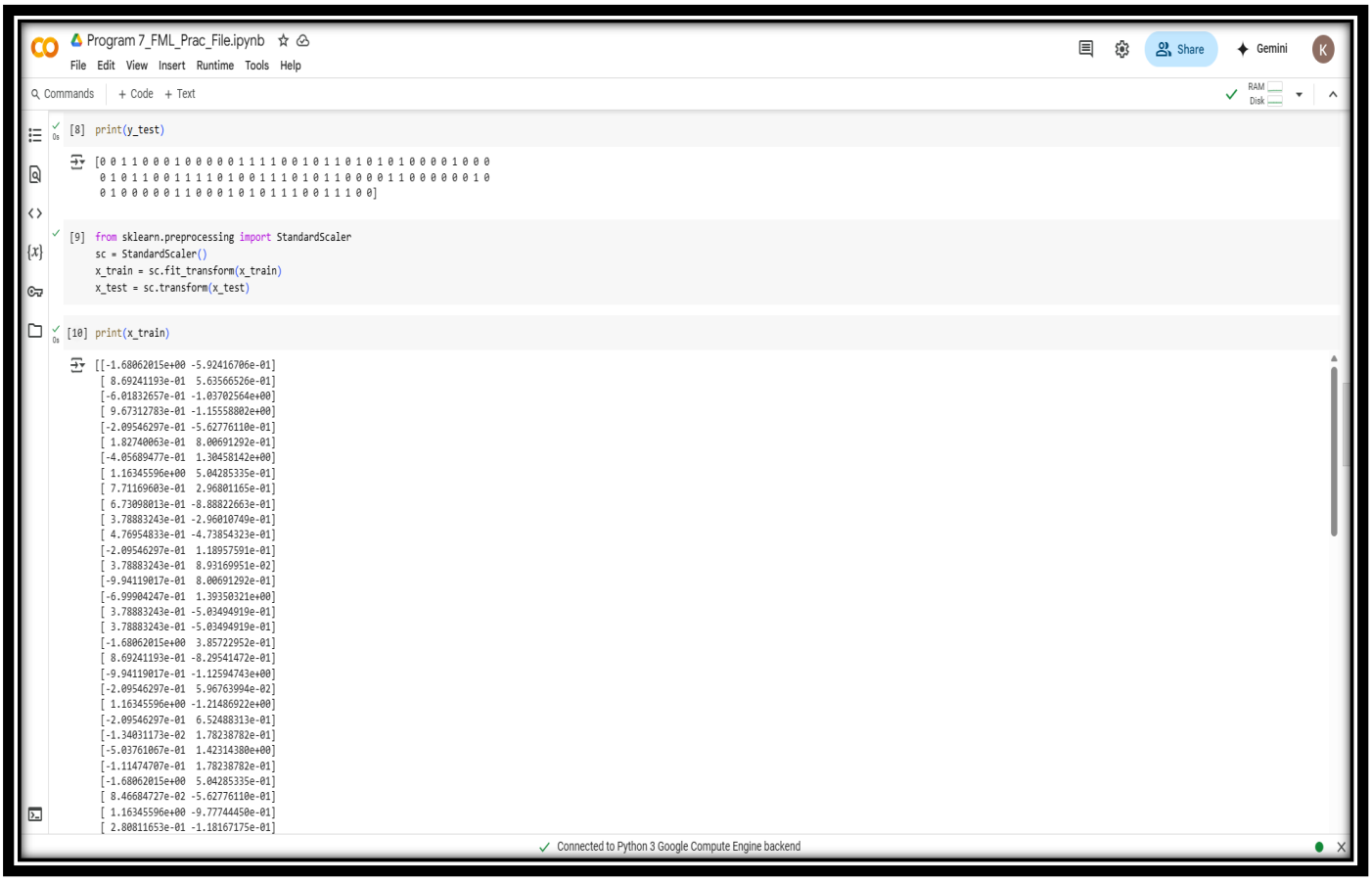
Problem statement: Study & Implement Decision Trees.

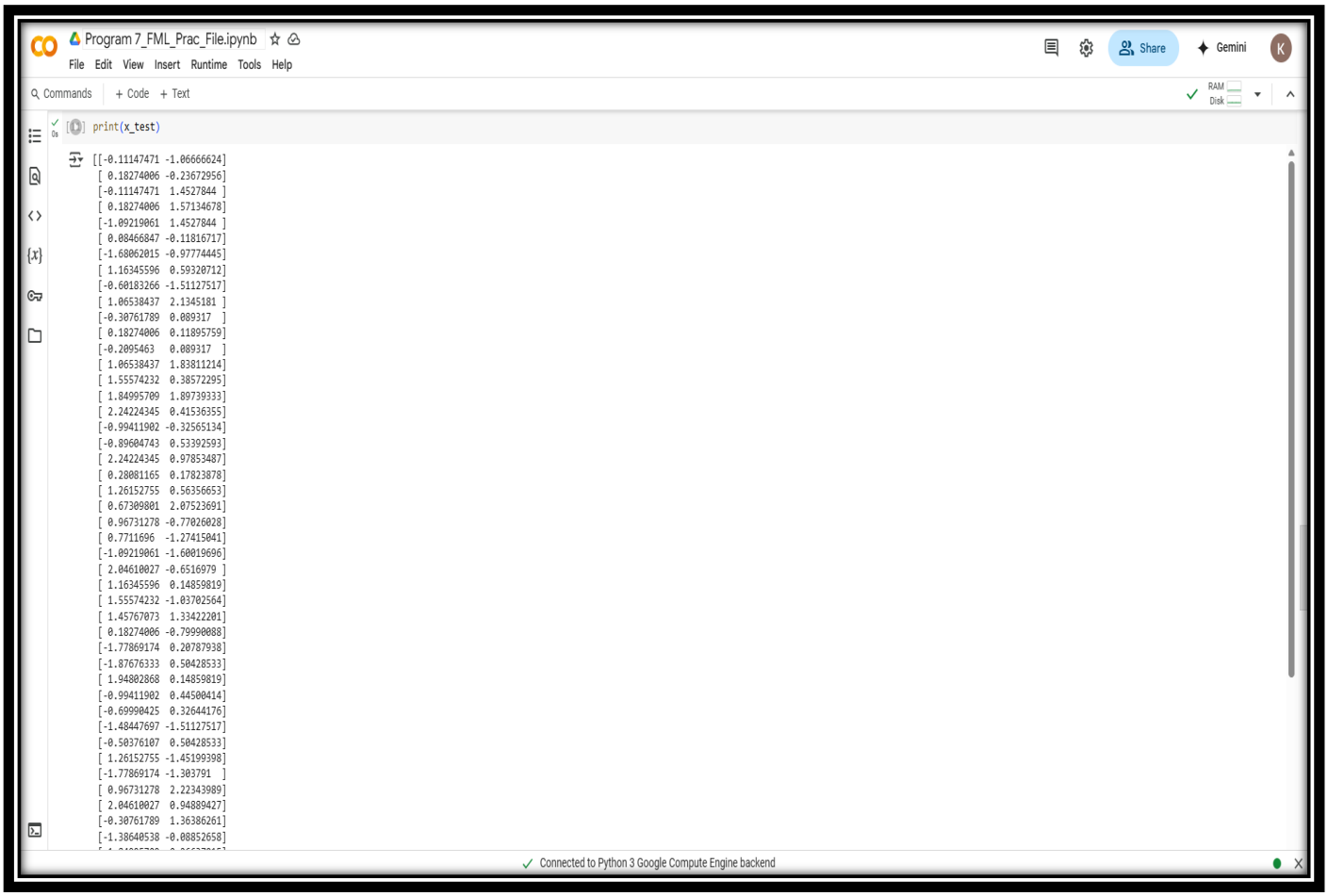
Theory:

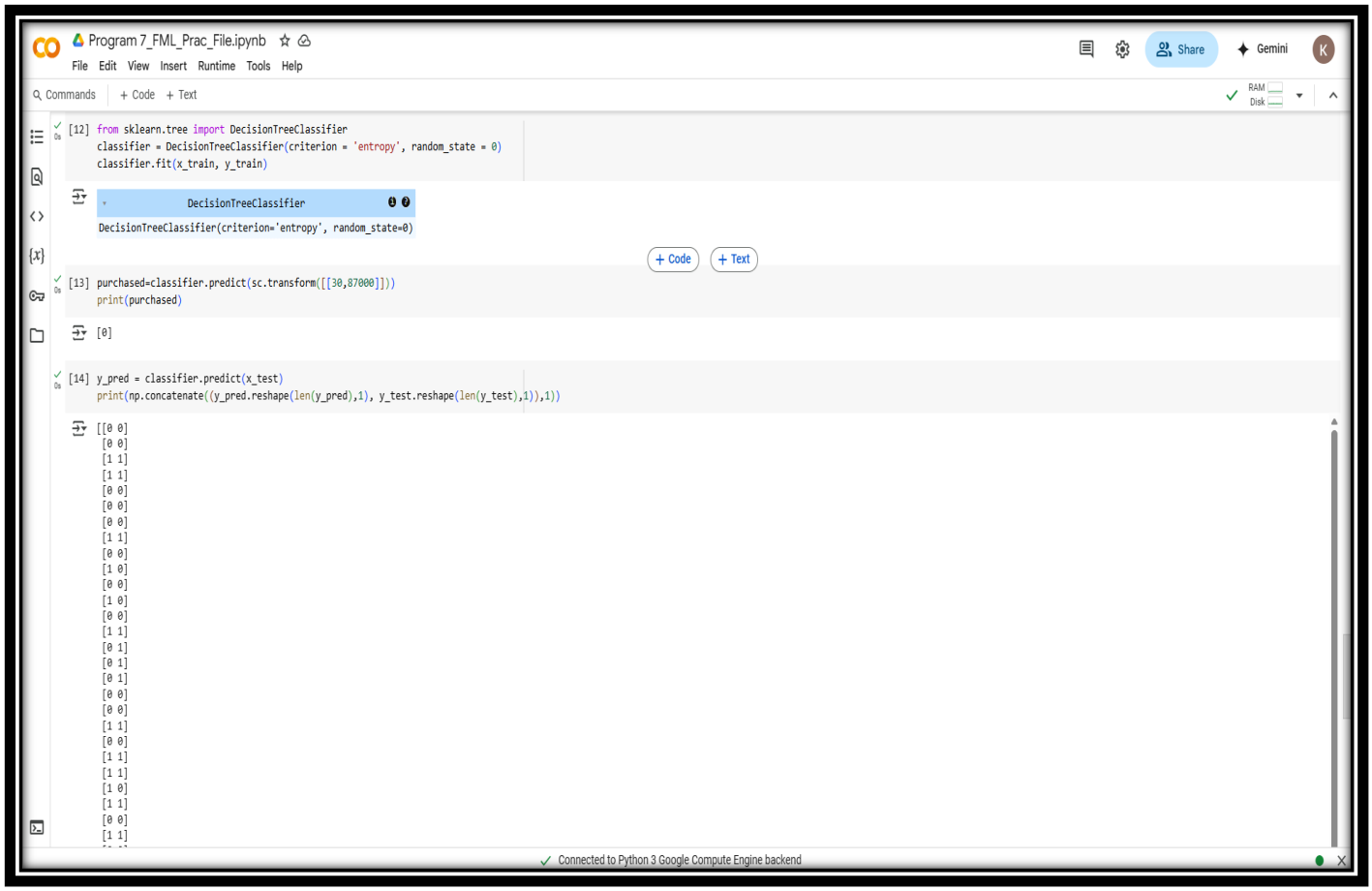
Source Code with Outputs:






Program 7_FML_Prac_File.ipynb
File Edit View Insert Runtime Tools Help
Share
Gemini
Commands
+ Code
+ Text
RAM
Disk
[8] print(y_test)
[0 0 1 1 0 0 0 1 0 0 0 0 0 1 1 1 1 0 0 1 0 1 1 1 0 1 0 1 0 1 0 0 0 0 1 0 0 0
0 1 0 1 1 1 0 0 1 1 1 1 1 0 1 0 0 1 1 1 0 1 0 1 1 1 0 0 0 0 1 1 0 0 0 0 0 0 1 0
0 1 0 0 0 0 0 1 1 0 0 0 1 0 1 0 1 1 1 0 0 1 1 1 0 0]
[9] from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
x_train = sc.fit_transform(x_train)
x_test = sc.transform(x_test)
[10] print(x_train)
[[-1.68062015e+00 -5.92416706e-01]
[8.69241193e-01 5.63566526e-01]
[-6.01832657e-01 -1.03702564e+00]
[9.67312783e-01 -1.15558802e+00]
[-2.09546297e-01 -5.62776110e-01]
[1.82740063e-01 8.00691292e-01]
[-4.05689477e-01 1.30458142e+00]
[1.16345596e+00 5.04285335e-01]
[7.71169603e-01 2.96801165e-01]
[6.73098013e-01 -8.88822663e-01]
[3.78883243e-01 -2.96010749e-01]
[4.76954833e-01 -4.73854323e-01]
[-2.09546297e-01 1.18957591e-01]
[3.78883243e-01 8.93169951e-02]
[-9.94119017e-01 8.00691292e-01]
[-6.99904247e-01 1.39350321e+00]
[3.78883243e-01 -5.03494919e-01]
[3.78883243e-01 -5.03494919e-01]
[-1.68062015e+00 3.85722952e-01]
[8.69241193e-01 -8.29541472e-01]
[-9.94119017e-01 -1.12594743e+00]
[-2.09546297e-01 5.96763994e-02]
[1.16345596e+00 -1.21486922e+00]
[-2.09546297e-01 6.52488313e-01]
[-1.34031173e-02 1.78238782e-01]
[-5.03761067e-01 1.42314380e+00]
[-1.11474707e-01 1.78238782e-01]
[-1.68062015e+00 5.04285335e-01]
[8.46684727e-02 -5.62776110e-01]
[1.16345596e+00 -9.77744450e-01]
[2.80811653e-01 -1.18167175e-01]
Connected to Python 3 Google Compute Engine backend


Program 7_FML_Prac_File.ipynb
File Edit View Insert Runtime Tools Help
Share
Gemini
Commands
+ Code
+ Text
RAM
Disk
print(x_test)
[[-0.11147471 -1.06666624]
[0.18274006 -0.23672956]
[-0.11147471 1.4527844]
[0.18274006 1.57134678]
[-1.09219061 1.4527844]
[0.08466847 -0.11816717]
[-1.68062015 -0.97774445]
[1.16345596 0.59320712]
[-0.60183266 -1.51127517]
[1.06538437 2.1345181]
[-0.30761789 0.089317]
[0.18274006 0.11895759]
[-0.2095463 0.089317]
[1.06538437 1.83811214]
[1.55574232 0.38572295]
[1.84995709 1.89739333]
[2.24224345 0.41536355]
[-0.99411902 -0.32565134]
[-0.89604743 0.53392593]
[2.24224345 0.97853487]
[0.28081165 0.17823878]
[1.26152755 0.56356653]
[0.67309801 2.07523691]
[0.96731278 -0.77026028]
[0.7711696 -1.27415041]
[-1.09219061 -1.60019696]
[2.04610027 -0.6516979]
[1.16345596 0.14859819]
[1.55574232 -1.03702564]
[1.45767073 1.33422201]
[0.18274006 -0.79990088]
[-1.77869174 0.20787938]
[-1.87676333 0.50428533]
[1.94802868 0.14859819]
[-0.99411902 0.44500414]
[-0.69990425 0.32644176]
[-1.48447697 -1.51127517]
[-0.50376107 0.50428533]
[1.26152755 -1.45199398]
[-1.77869174 -1.303791]
[0.96731278 2.22343989]
[2.04610027 0.94889427]
[-0.30761789 1.36386261]
[-1.38640538 -0.08852658]
Connected to Python 3 Google Compute Engine backend



Learning Outcome:

EXPERIMENT 8

Problem statement: Study & Implement K- Means Clustering to find natural patterns in Data.

Theory:

Dataset:

	A	B	C	D	E	F	G
1	Customer	Genre	Age	Annual In	Spending Score (1-100)		
2	1	Male	19	15	39		
3	2	Male	21	15	81		
4	3	Female	20	16	6		
5	4	Female	23	16	77		
6	5	Female	31	17	40		
7	6	Female	22	17	76		
8	7	Female	35	18	6		
9	8	Female	23	18	94		
10	9	Male	64	19	3		
11	10	Female	30	19	72		
12	11	Male	67	19	14		
13	12	Female	35	19	99		
14	13	Female	58	20	15		
15	14	Female	24	20	77		
16	15	Male	37	20	13		
17	16	Male	22	20	79		
18	17	Female	35	21	35		
19	18	Male	20	21	66		
20	19	Male	52	23	29		
21	20	Female	35	23	98		
22	21	Male	35	24	35		
23	22	Male	25	24	73		
24	23	Female	46	25	5		
25	24	Male	31	25	73		
26	25	Female	54	28	14		
27	26	Male	29	28	82		
28	27	Female	45	28	32		
29	28	Male	35	28	61		
30	29	Female	40	29	31		
31	30	Female	23	29	87		
32	31	Male	60	30	4		

Mall_Customers

Source Code and Output:

Program 8_FML_Prac_File.ipynb

File Edit View Insert Runtime Tools Help

Share Gemini

Commands + Code + Text

RAM Disk

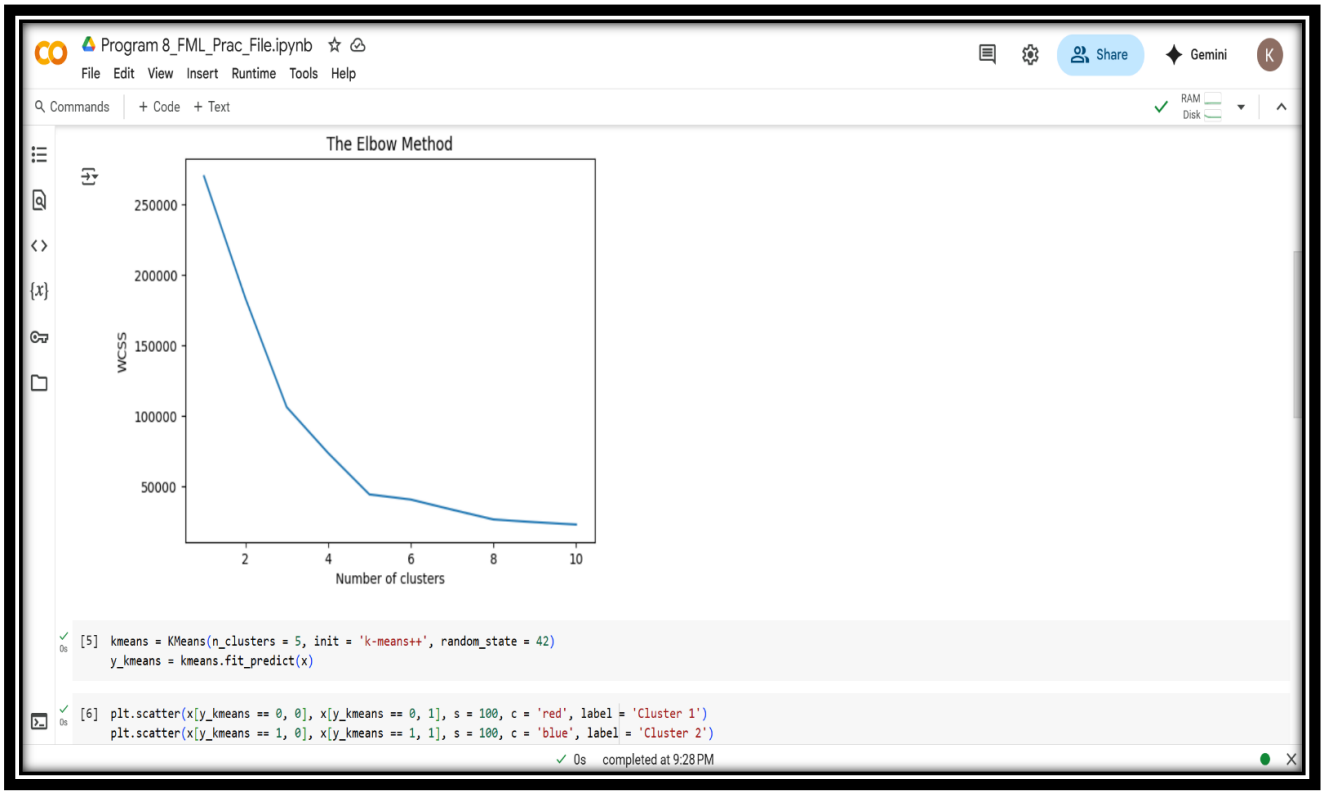
```
[1] import numpy as np
    import pandas as pd
    import matplotlib.pyplot as plt
```

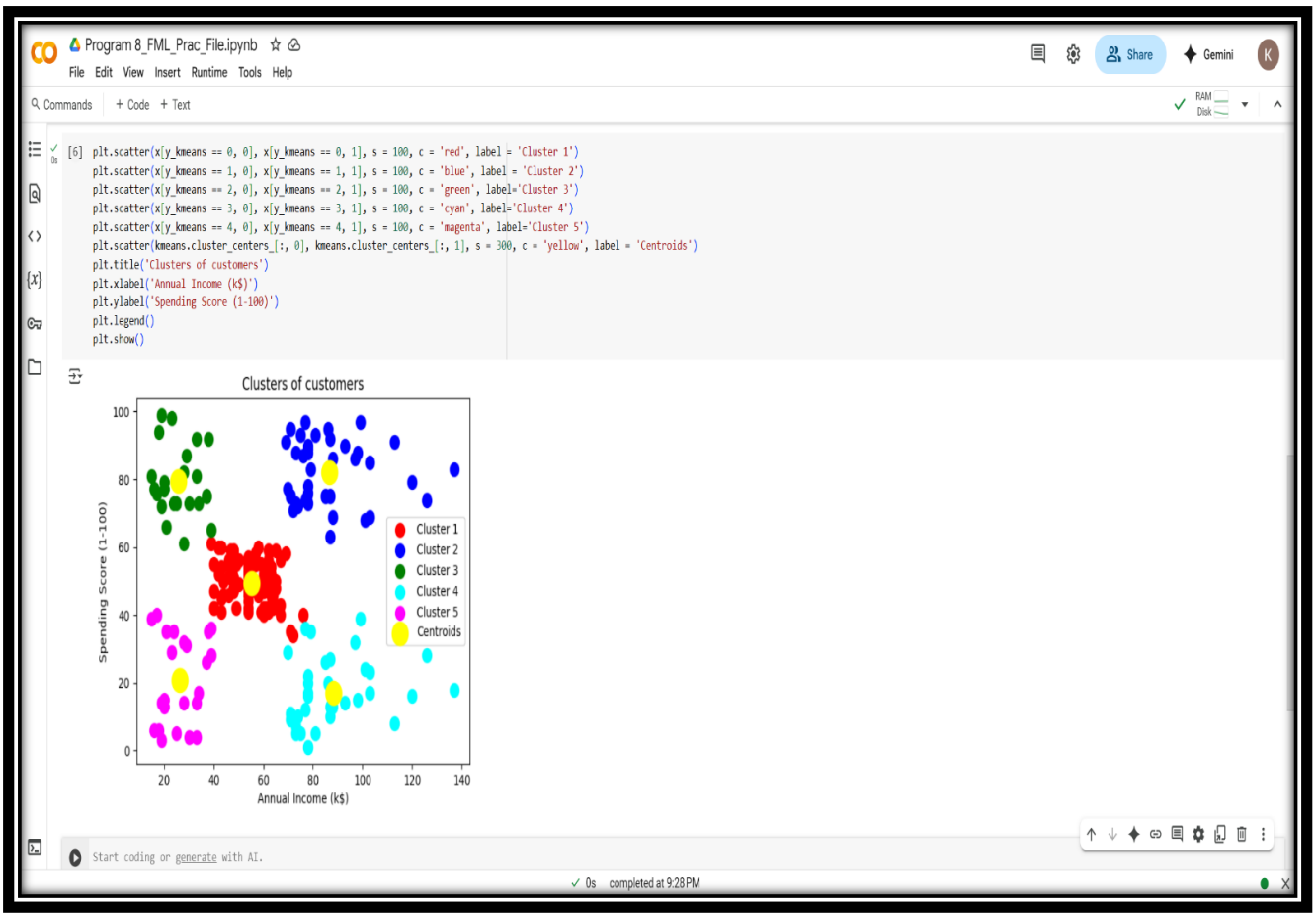
```
[2] df=pd.read_csv("Mall_Customers.csv")
    x=df.iloc[:,[3,4]].values
```

```
[3] from sklearn.cluster import KMeans
    wcss = []
    for i in range(1,11):
      kmeans=KMeans(n_clusters=i,init='k-means++',random_state=42)
      kmeans.fit(x)
      wcss.append(kmeans.inertia_)
```

```
[4] plt.plot(range(1,11),wcss)
    plt.title('The Elbow Method')
    plt.xlabel('Number of clusters')
    plt.ylabel('WCSS')
    plt.show()
```

✓ 0s completed at 9:28 PM





Learning Outcome: