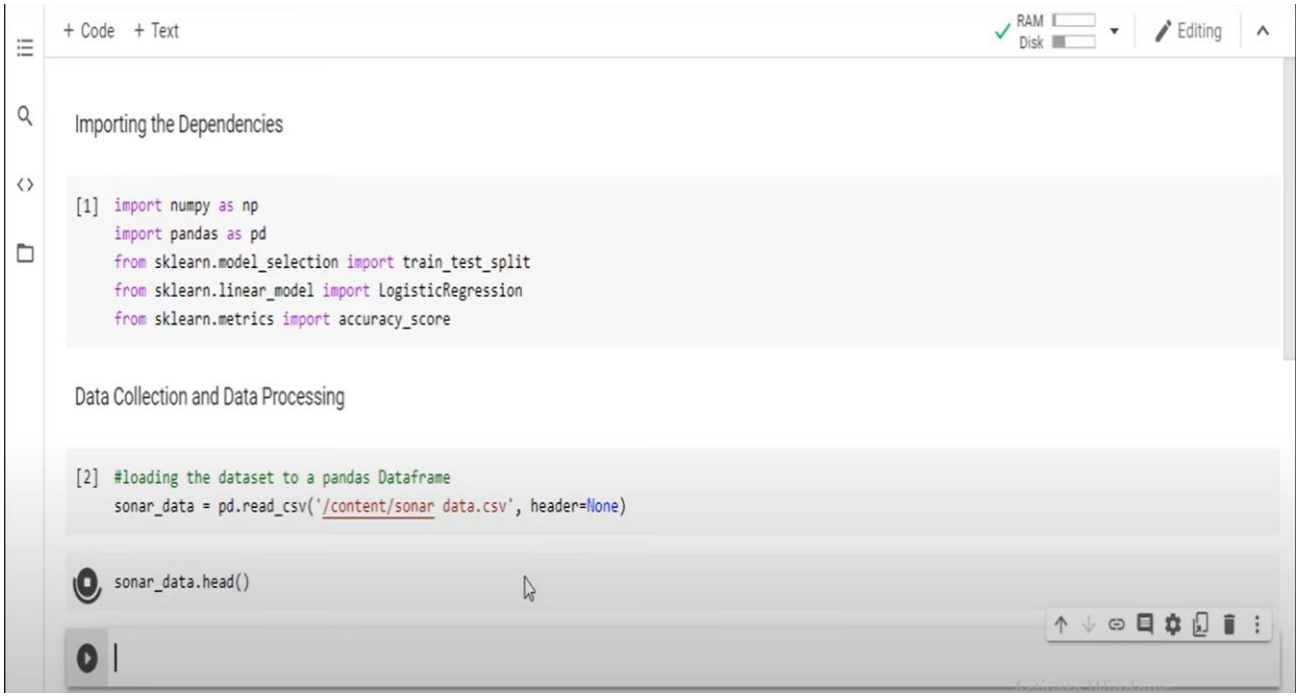
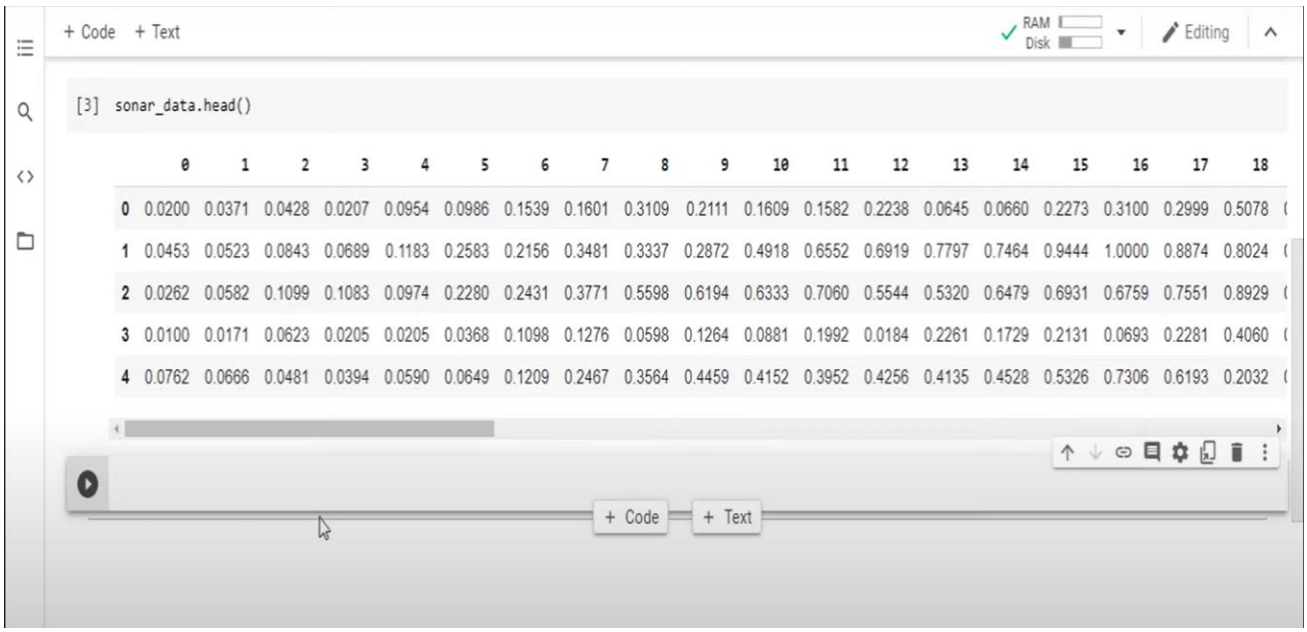
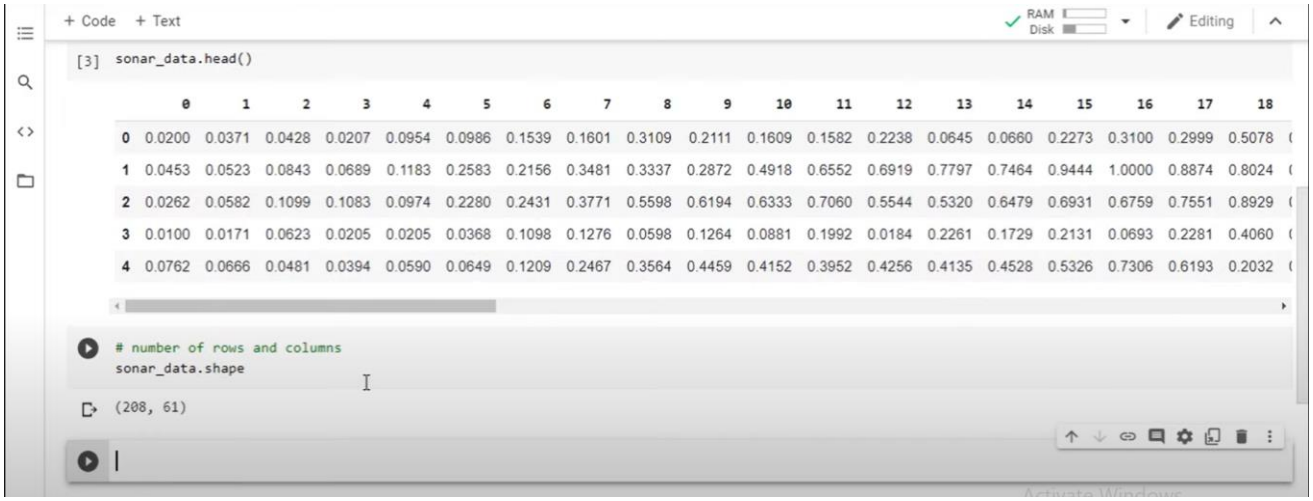
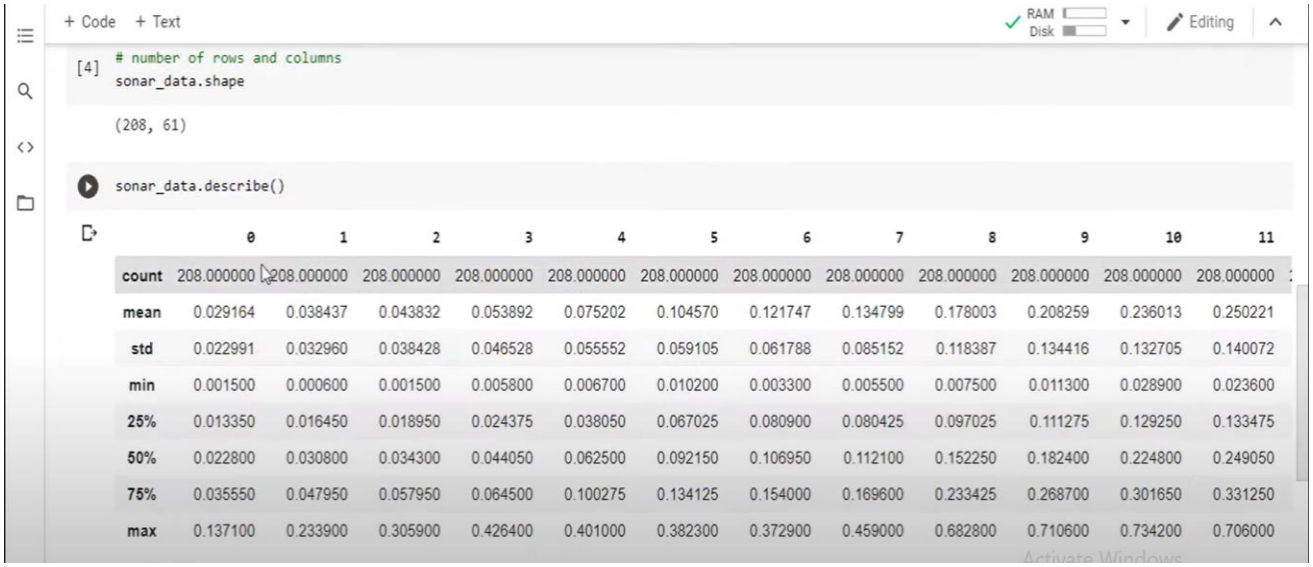




	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0	0.0200	0.0371	0.0428	0.0207	0.0954	0.0986	0.1539	0.1601	0.3109	0.2111	0.1609	0.1582	0.2238	0.0645	0.0660	0.2273	0.3100	0.2999	0.5078
1	0.0453	0.0523	0.0843	0.0689	0.1183	0.2583	0.2156	0.3481	0.3337	0.2872	0.4918	0.6552	0.6919	0.7797	0.7464	0.9444	1.0000	0.8874	0.8024
2	0.0262	0.0582	0.1099	0.1083	0.0974	0.2280	0.2431	0.3771	0.5598	0.6194	0.6333	0.7060	0.5544	0.5320	0.6479	0.6931	0.6759	0.7551	0.8929
3	0.0100	0.0171	0.0623	0.0205	0.0205	0.0368	0.1098	0.1276	0.0598	0.1264	0.0881	0.1992	0.0184	0.2261	0.1729	0.2131	0.0693	0.2281	0.4060
4	0.0762	0.0666	0.0481	0.0394	0.0590	0.0649	0.1209	0.2467	0.3564	0.4459	0.4152	0.3952	0.4256	0.4135	0.4528	0.5326	0.7306	0.6193	0.2032



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0	0.0200	0.0371	0.0428	0.0207	0.0954	0.0986	0.1539	0.1601	0.3109	0.2111	0.1609	0.1582	0.2238	0.0645	0.0660	0.2273	0.3100	0.2999	0.5078
1	0.0453	0.0523	0.0843	0.0689	0.1183	0.2583	0.2156	0.3481	0.3337	0.2872	0.4918	0.6552	0.6919	0.7797	0.7464	0.9444	1.0000	0.8874	0.8024
2	0.0262	0.0582	0.1099	0.1083	0.0974	0.2280	0.2431	0.3771	0.5598	0.6194	0.6333	0.7060	0.5544	0.5320	0.6479	0.6931	0.6759	0.7551	0.8929
3	0.0100	0.0171	0.0623	0.0205	0.0205	0.0368	0.1098	0.1276	0.0598	0.1264	0.0881	0.1992	0.0184	0.2261	0.1729	0.2131	0.0693	0.2281	0.4060
4	0.0762	0.0666	0.0481	0.0394	0.0590	0.0649	0.1209	0.2467	0.3564	0.4459	0.4152	0.3952	0.4256	0.4135	0.4528	0.5326	0.7306	0.6193	0.2032



+ Code + Text

RAM Disk

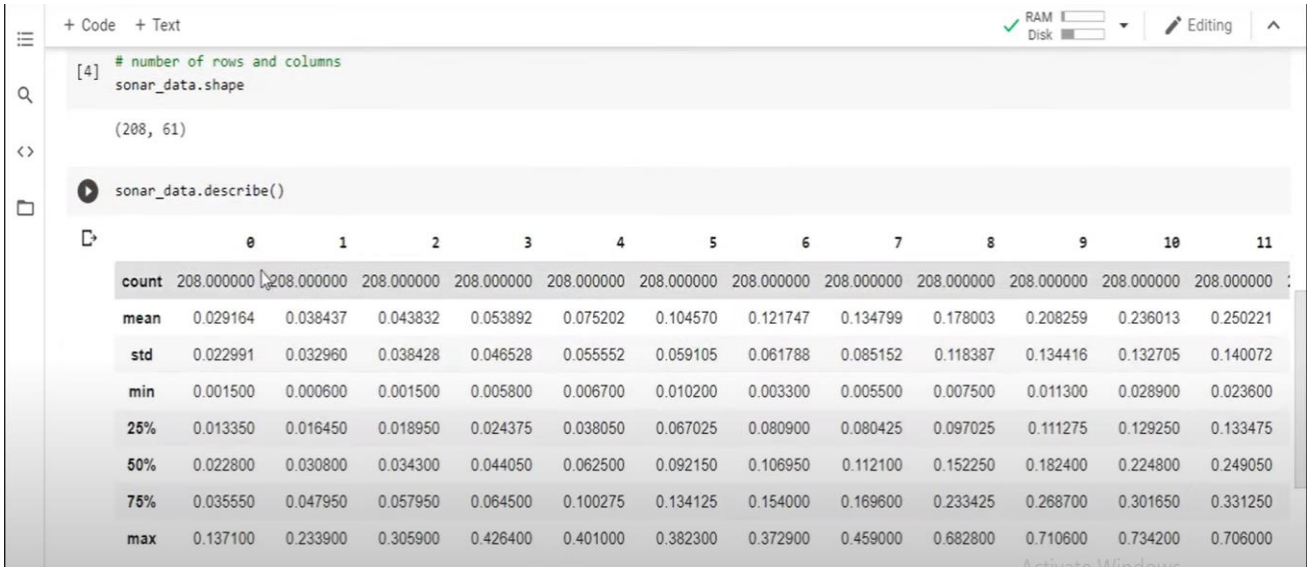
Editing

```
[4] # number of rows and columns
    sonar_data.shape
```

```
(208, 61)
```

```
sonar_data.describe()
```

	0	1	2	3	4	5	6	7	8	9	10	11
count	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000
mean	0.029164	0.038437	0.043832	0.053892	0.075202	0.104570	0.121747	0.134799	0.178003	0.208259	0.236013	0.250221
std	0.022991	0.032960	0.038428	0.046528	0.055552	0.059105	0.061788	0.085152	0.118387	0.134416	0.132705	0.140072
min	0.001500	0.000600	0.001500	0.005800	0.006700	0.010200	0.003300	0.005500	0.007500	0.011300	0.028900	0.023600
25%	0.013350	0.016450	0.018950	0.024375	0.038050	0.067025	0.080900	0.080425	0.097025	0.111275	0.129250	0.133475
50%	0.022800	0.030800	0.034300	0.044050	0.062500	0.092150	0.106950	0.112100	0.152250	0.182400	0.224800	0.249050
75%	0.035550	0.047950	0.057950	0.064500	0.100275	0.134125	0.154000	0.169600	0.233425	0.268700	0.301650	0.331250
max	0.137100	0.233900	0.305900	0.426400	0.401000	0.382300	0.372900	0.459000	0.682800	0.710600	0.734200	0.706000



+ Code + Text

RAM Disk

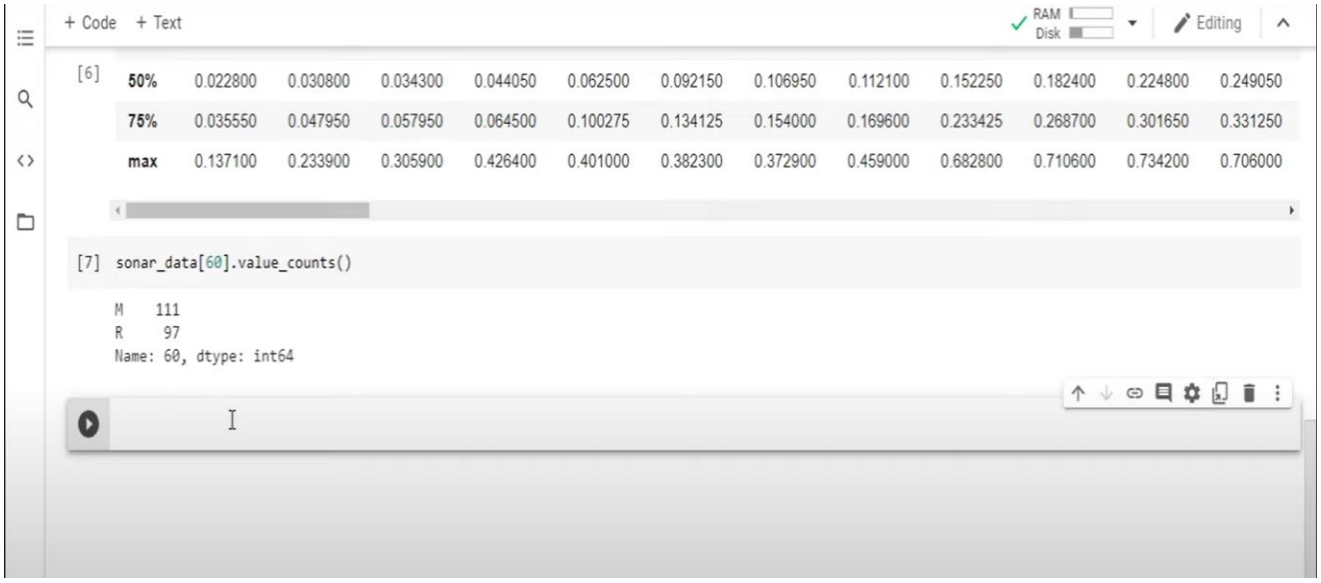
Editing

[4] # number of rows and columns
sonar_data.shape

(208, 61)

sonar_data.describe()

	0	1	2	3	4	5	6	7	8	9	10	11
count	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000
mean	0.029164	0.038437	0.043832	0.053892	0.075202	0.104570	0.121747	0.134799	0.178003	0.208259	0.236013	0.250221
std	0.022991	0.032960	0.038428	0.046528	0.055552	0.059105	0.061788	0.085152	0.118387	0.134416	0.132705	0.140072
min	0.001500	0.000600	0.001500	0.005800	0.006700	0.010200	0.003300	0.005500	0.007500	0.011300	0.028900	0.023600
25%	0.013350	0.016450	0.018950	0.024375	0.038050	0.067025	0.080900	0.080425	0.097025	0.111275	0.129250	0.133475
50%	0.022800	0.030800	0.034300	0.044050	0.062500	0.092150	0.106950	0.112100	0.152250	0.182400	0.224800	0.249050
75%	0.035550	0.047950	0.057950	0.064500	0.100275	0.134125	0.154000	0.169600	0.233425	0.268700	0.301650	0.331250
max	0.137100	0.233900	0.305900	0.426400	0.401000	0.382300	0.372900	0.459000	0.682800	0.710600	0.734200	0.706000



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RAM Disk

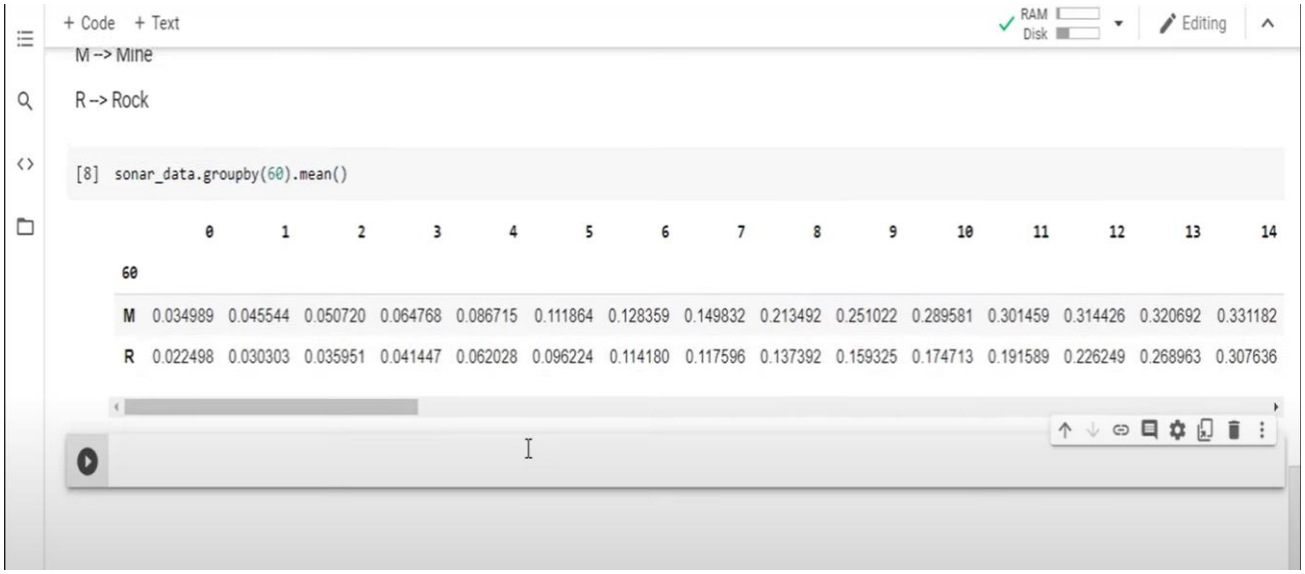
Editing

```
[6]
```

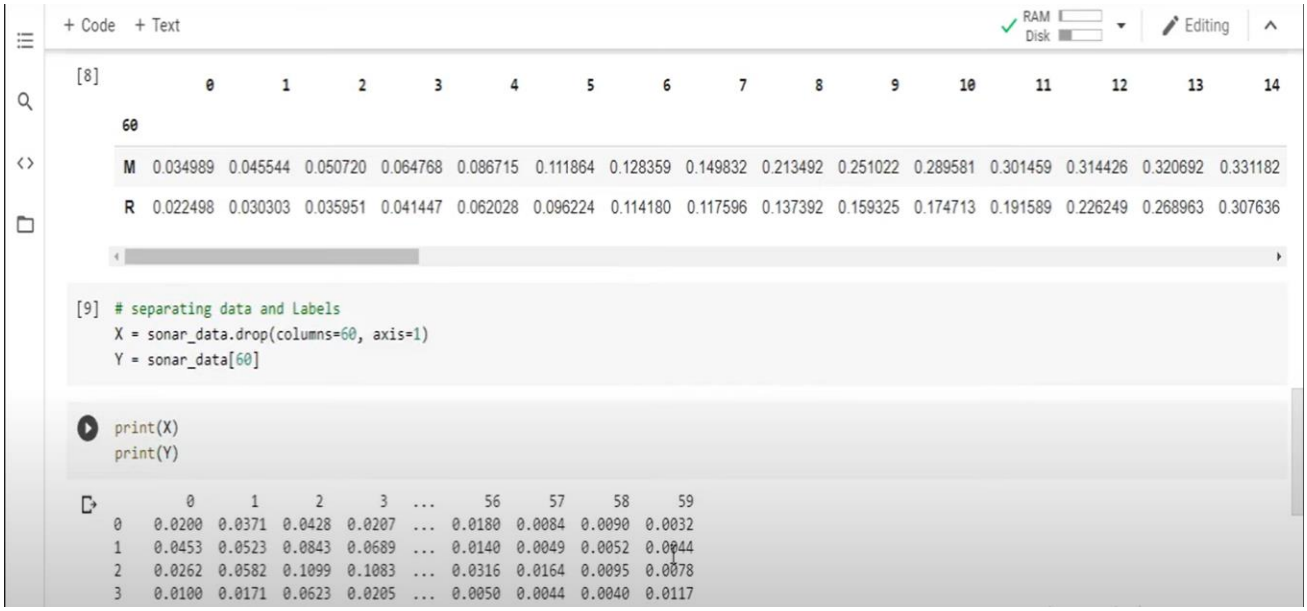
50%	0.022800	0.030800	0.034300	0.044050	0.062500	0.092150	0.106950	0.112100	0.152250	0.182400	0.224800	0.249050
75%	0.035550	0.047950	0.057950	0.064500	0.100275	0.134125	0.154000	0.169600	0.233425	0.268700	0.301650	0.331250
max	0.137100	0.233900	0.305900	0.426400	0.401000	0.382300	0.372900	0.459000	0.682800	0.710600	0.734200	0.706000

```
[7] sonar_data[60].value_counts()
```

```
M    111
R     97
Name: 60, dtype: int64
```



60	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
M	0.034989	0.045544	0.050720	0.064768	0.086715	0.111864	0.128359	0.149832	0.213492	0.251022	0.289581	0.301459	0.314426	0.320692	0.331182
R	0.022498	0.030303	0.035951	0.041447	0.062028	0.096224	0.114180	0.117596	0.137392	0.159325	0.174713	0.191589	0.226249	0.268963	0.307636

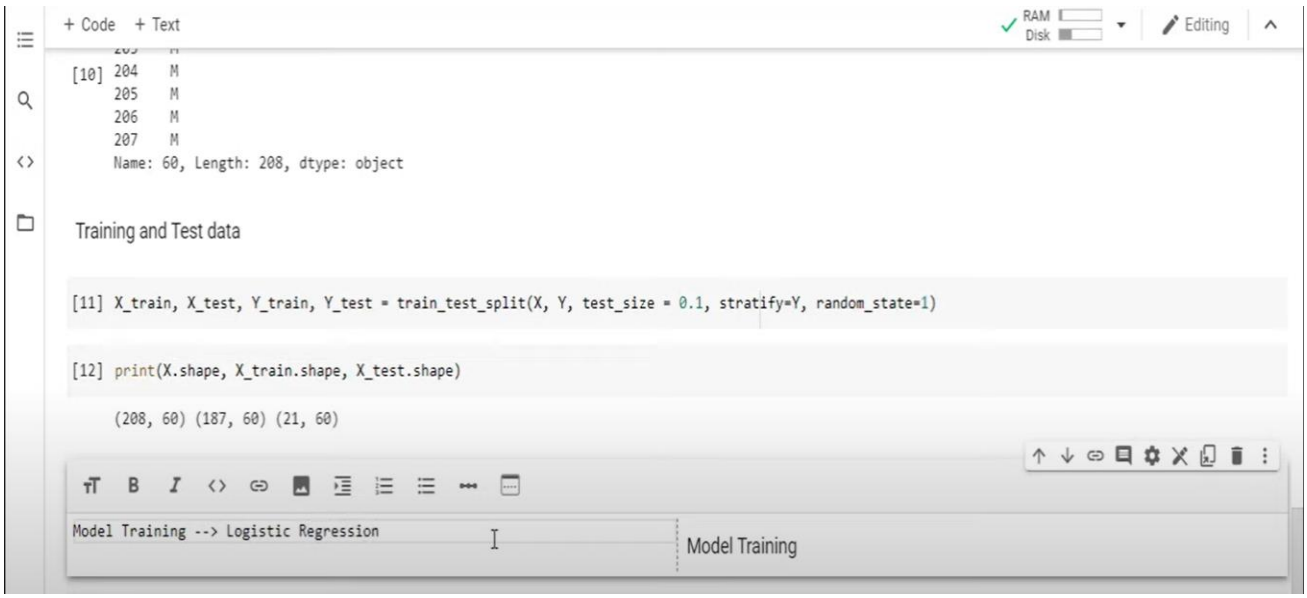


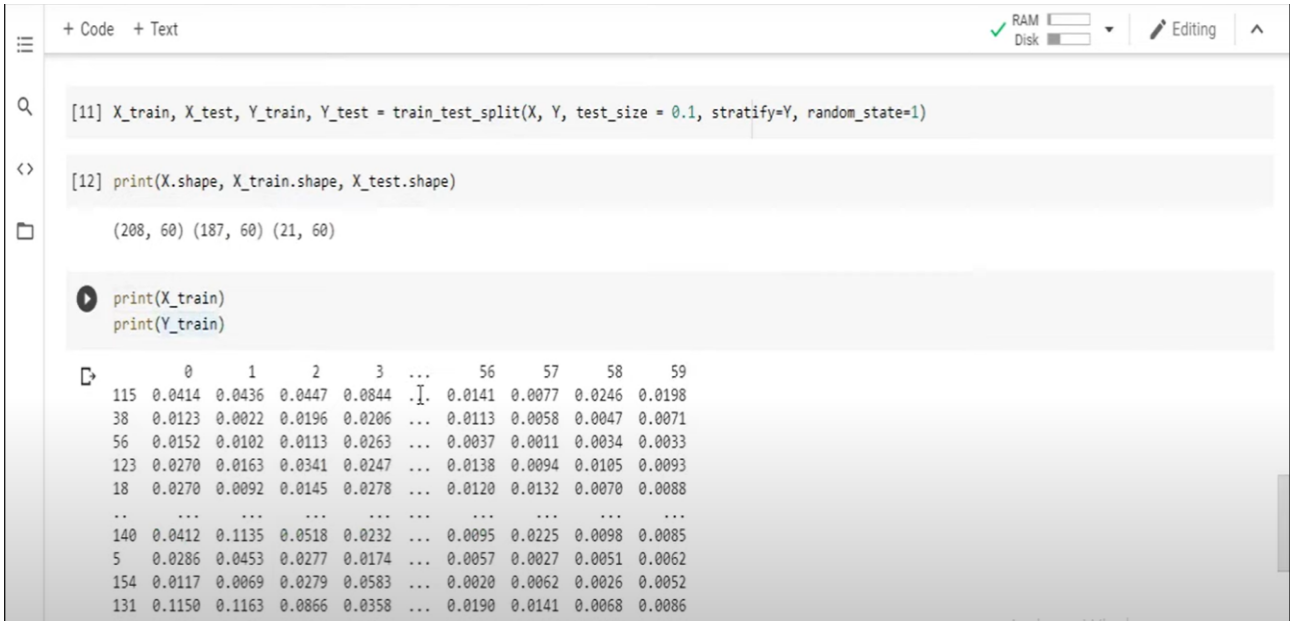
60	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
M	0.034989	0.045544	0.050720	0.064768	0.086715	0.111864	0.128359	0.149832	0.213492	0.251022	0.289581	0.301459	0.314426	0.320692	0.331182
R	0.022498	0.030303	0.035951	0.041447	0.062028	0.096224	0.114180	0.117596	0.137392	0.159325	0.174713	0.191589	0.226249	0.268963	0.307636

```
[9] # separating data and Labels
    X = sonar_data.drop(columns=60, axis=1)
    Y = sonar_data[60]

    print(X)
    print(Y)
```

```
          0       1       2       3   ...      56      57      58      59
0    0.0200  0.0371  0.0428  0.0207  ...  0.0180  0.0084  0.0090  0.0032
1    0.0453  0.0523  0.0843  0.0689  ...  0.0140  0.0049  0.0052  0.0044
2    0.0262  0.0582  0.1099  0.1083  ...  0.0316  0.0164  0.0095  0.0078
3    0.0100  0.0171  0.0623  0.0205  ...  0.0050  0.0044  0.0040  0.0117
```





+ Code + Text

RAM Disk Editing

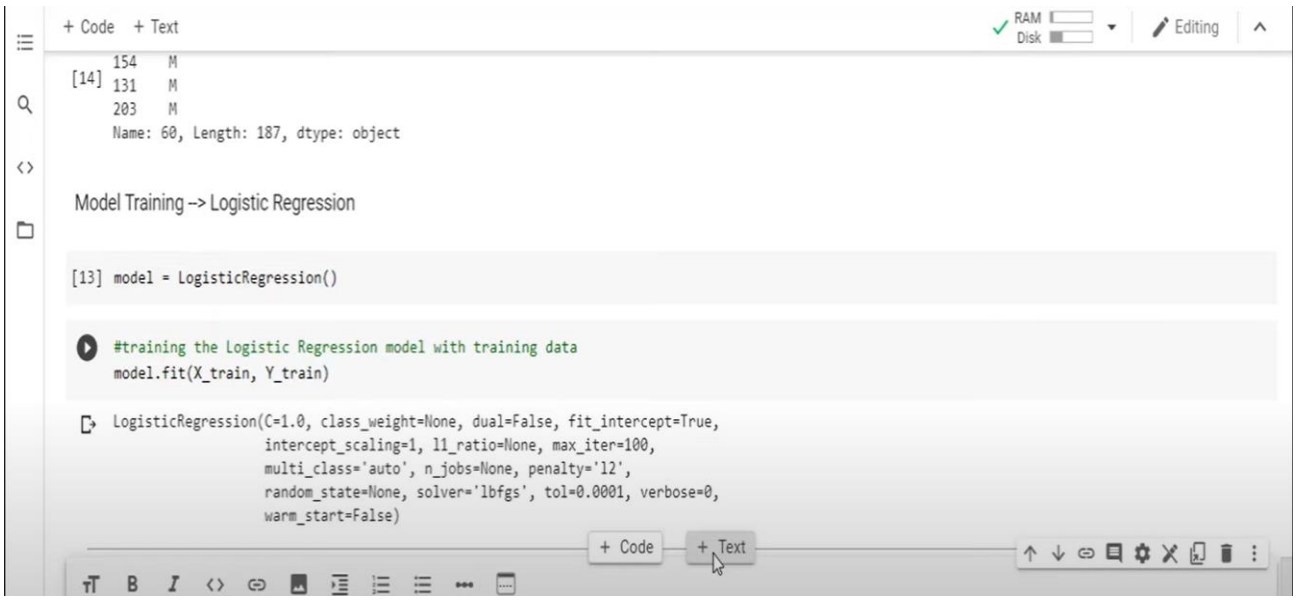
```
[11] X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size = 0.1, stratify=Y, random_state=1)

[12] print(X.shape, X_train.shape, X_test.shape)

     (208, 60) (187, 60) (21, 60)

     print(X_train)
     print(Y_train)

            0       1       2       3   ...      56      57      58      59
     115  0.0414  0.0436  0.0447  0.0844  ...  0.0141  0.0077  0.0246  0.0198
     38   0.0123  0.0022  0.0196  0.0206  ...  0.0113  0.0058  0.0047  0.0071
     56   0.0152  0.0102  0.0113  0.0263  ...  0.0037  0.0011  0.0034  0.0033
     123  0.0270  0.0163  0.0341  0.0247  ...  0.0138  0.0094  0.0105  0.0093
     18   0.0270  0.0092  0.0145  0.0278  ...  0.0120  0.0132  0.0070  0.0088
     ..      ...     ...     ...     ...  ...     ...     ...     ...     ...
     140  0.0412  0.1135  0.0518  0.0232  ...  0.0095  0.0225  0.0098  0.0085
     5    0.0286  0.0453  0.0277  0.0174  ...  0.0057  0.0027  0.0051  0.0062
     154  0.0117  0.0069  0.0279  0.0583  ...  0.0020  0.0062  0.0026  0.0052
     131  0.1150  0.1163  0.0866  0.0358  ...  0.0190  0.0141  0.0068  0.0086
```



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RAM Disk Editing

```
[14] 154    M
     131    M
     203    M
     Name: 60, Length: 187, dtype: object
```

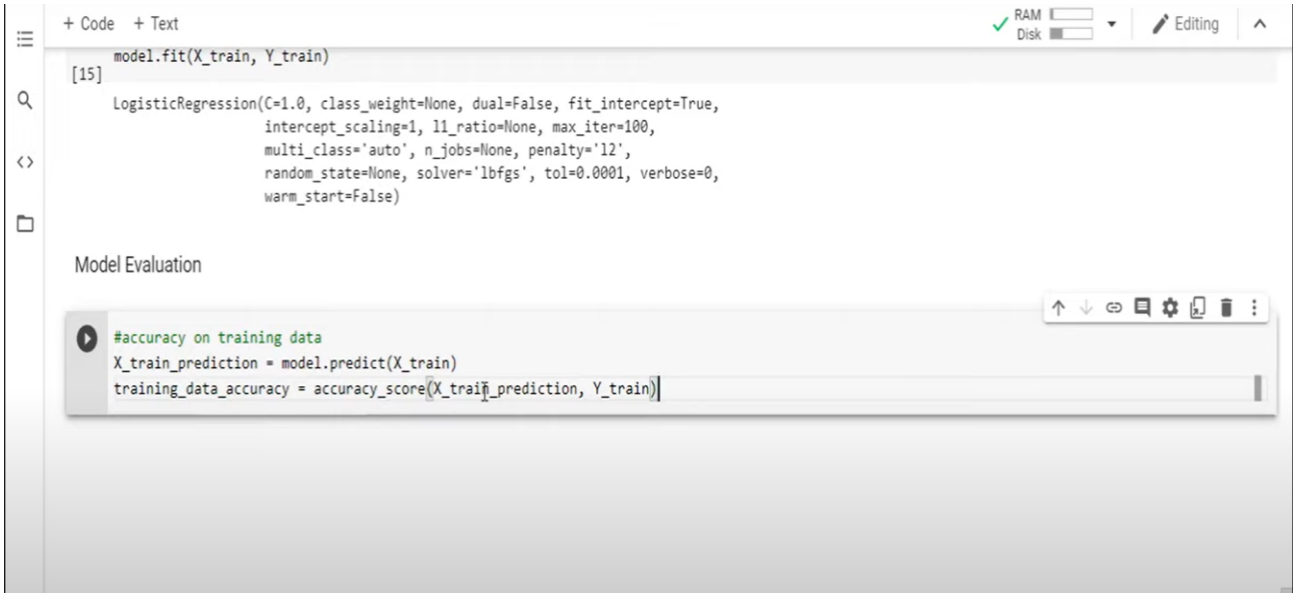
Model Training --> Logistic Regression

```
[13] model = LogisticRegression()

     #training the Logistic Regression model with training data
     model.fit(X_train, Y_train)

     LogisticRegression(C=1.0, class_weight=None, dual=False, fit_intercept=True,
                        intercept_scaling=1, l1_ratio=None, max_iter=100,
                        multi_class='auto', n_jobs=None, penalty='l2',
                        random_state=None, solver='lbfgs', tol=0.0001, verbose=0,
                        warm_start=False)
```

+ Code + Text



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RAM Disk Editing

```
[15] model.fit(X_train, Y_train)

     LogisticRegression(C=1.0, class_weight=None, dual=False, fit_intercept=True,
                        intercept_scaling=1, l1_ratio=None, max_iter=100,
                        multi_class='auto', n_jobs=None, penalty='l2',
                        random_state=None, solver='lbfgs', tol=0.0001, verbose=0,
                        warm_start=False)
```

Model Evaluation

```
     #accuracy on training data
     X_train_prediction = model.predict(X_train)
     training_data_accuracy = accuracy_score(X_train_prediction, Y_train)
```


+ Code
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RAM
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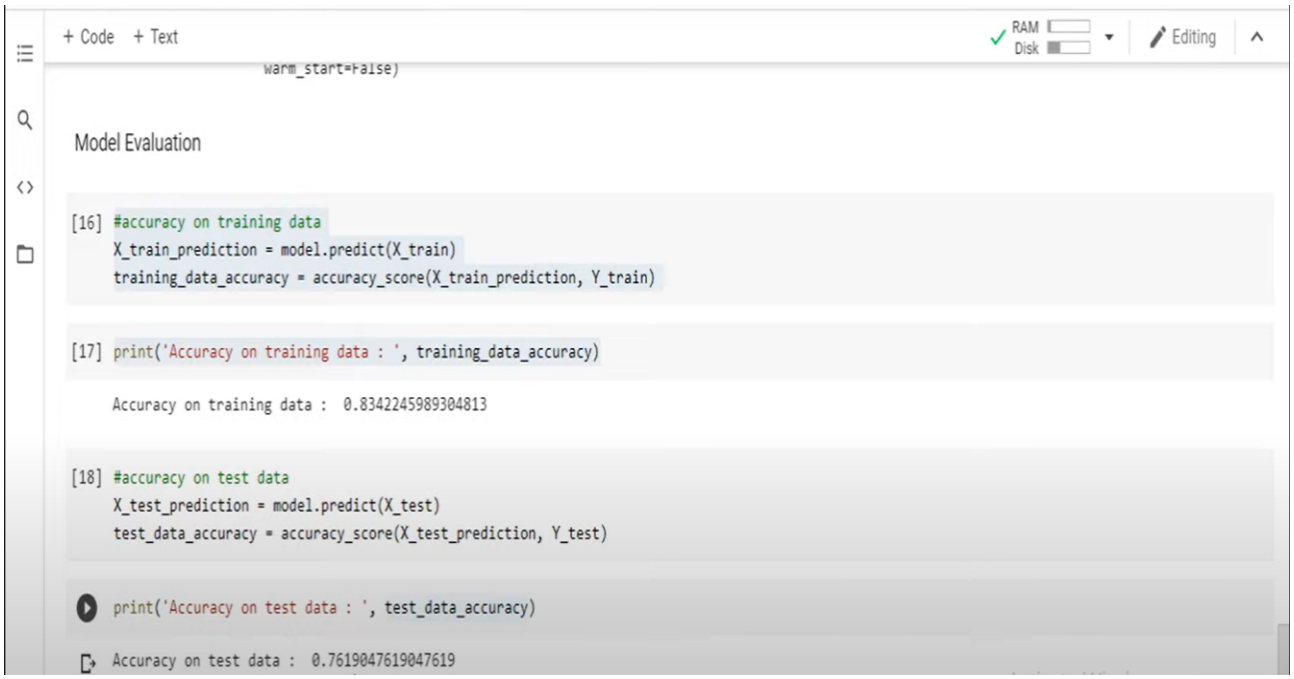
Editing
warm_start=False)
Model Evaluation
[16] #accuracy on training data
X_train_prediction = model.predict(X_train)
training_data_accuracy = accuracy_score(X_train_prediction, Y_train)
[17] print('Accuracy on training data : ', training_data_accuracy)
Accuracy on training data : 0.8342245989304813
[18] #accuracy on test data
X_test_prediction = model.predict(X_test)
test_data_accuracy = accuracy_score(X_test_prediction, Y_test)
print('Accuracy on test data : ', test_data_accuracy)
Accuracy on test data : 0.7619047619047619


+ Code
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RAM
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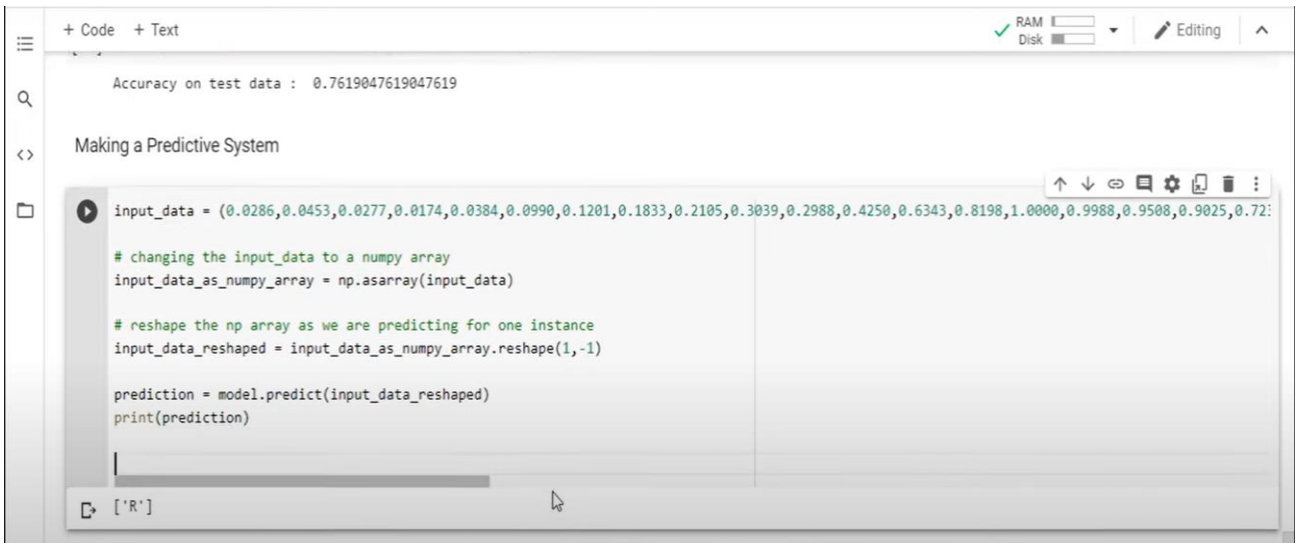
Editing
warm_start=False)
Model Evaluation
[16] #accuracy on training data
X_train_prediction = model.predict(X_train)
training_data_accuracy = accuracy_score(X_train_prediction, Y_train)
[17] print('Accuracy on training data : ', training_data_accuracy)
Accuracy on training data : 0.8342245989304813
[18] #accuracy on test data
X_test_prediction = model.predict(X_test)
test_data_accuracy = accuracy_score(X_test_prediction, Y_test)
print('Accuracy on test data : ', test_data_accuracy)
Accuracy on test data : 0.7619047619047619


+ Code
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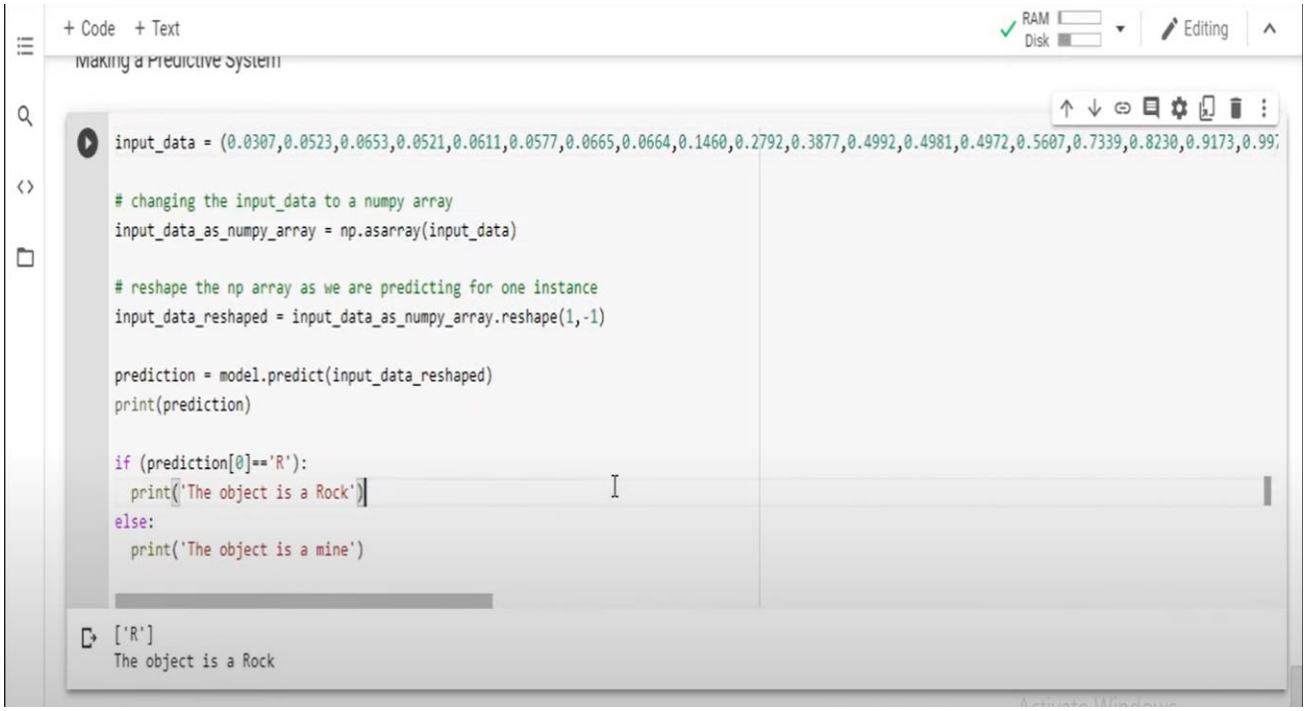
RAM
Disk
Editing
Accuracy on test data : 0.7619047619047619
Making a Predictive System
input_data = (0.0286,0.0453,0.0277,0.0174,0.0384,0.0990,0.1201,0.1833,0.2105,0.3039,0.2988,0.4250,0.6343,0.8198,1.0000,0.9988,0.9508,0.9025,0.72
# changing the input_data to a numpy array
input_data_as_numpy_array = np.asarray(input_data)
# reshape the np array as we are predicting for one instance
input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)
prediction = model.predict(input_data_reshaped)
print(prediction)
['R']


+ Code + Text
RAM
Disk
Editing
Making a Predictive System
input_data = (0.0307,0.0523,0.0653,0.0521,0.0611,0.0577,0.0665,0.0664,0.1460,0.2792,0.3877,0.4992,0.4981,0.4972,0.5607,0.7339,0.8230,0.9173,0.997
# changing the input_data to a numpy array
input_data_as_numpy_array = np.asarray(input_data)
# reshape the np array as we are predicting for one instance
input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)
prediction = model.predict(input_data_reshaped)
print(prediction)
if (prediction[0]=='R'):
print('The object is a Rock')
else:
print('The object is a mine')
['R']
The object is a Rock


+ Code + Text
RAM
Disk
Editing
Making a Predictive System
input_data = (0.0307,0.0523,0.0653,0.0521,0.0611,0.0577,0.0665,0.0664,0.1460,0.2792,0.3877,0.4992,0.4981,0.4972,0.5607,0.7339,0.8230,0.9173,0.997
# changing the input_data to a numpy array
input_data_as_numpy_array = np.asarray(input_data)
# reshape the np array as we are predicting for one instance
input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)
prediction = model.predict(input_data_reshaped)
print(prediction)
if (prediction[0]=='R'):
print('The object is a Rock')
else:
print('The object is a mine')
['M']
The object is a mine