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Practical No.01

Aim : Installation and study of any one Data Analytics Tool Frame work.

Theory :

Programming languages are used to solve a variety of data problems. now we will focus on general ones that use letters, numbers, and symbols to create programs and require formal syntax used by programmers. Often, they're also called text-based programs because you need to write software that will ultimately solve a problem. Examples include C#, Java, PHP, Ruby, Julia, and Python, among many others on the market. Here we will present Python as one of the best tools for data analysts that have coding knowledge as well.

PYTHON

KEY FEATURES: An open-source solution that has simple coding processes and syntax so it's fairly easy to learn Integration with other languages such as C/C++, Java, PHP, C#, etc. Advanced analysis processes through machine learning and text mining Python is extremely accessible to code in comparison to other popular languages such as Java, and its syntax is relatively easy to learn making this tool popular among users that look for an open-source solution and simple coding processes. In data analysis, Python is used for data crawling, cleaning, modeling, and constructing analysis algorithms based on business scenarios. One of the best features is actually its user-friendliness: programmers don't need to remember the architecture of the system nor handle the memory – Python is considered a high-level language that is not subject to the computer's local processor. Another noticeable feature of Python is its portability. Users can simply run the code on several operating systems without making any changes to it so it's not necessary to write completely new code. This makes Python a highly portable language since programmers can run it both on Windows and mac OS. An extensive number of modules, packages and libraries make Python a respected and usable language across industries with companies such as Spotify, Netflix, Dropbox and Reddit as the most popular ones that use this language in their operations. With features such as text mining and machine learning, Python is becoming a respected authority for advanced analysis processes.

Practical No.02

Aim : Design and develop at least 10 problem statements which demonstrate the use of data structure, functions, Importing / Exporting Data in any data analytics tool.

Code :

```
import numpy as np

import pandas as pd

list1 = [1,2,3,4]

array1 = np.array(list1)

print(array1)

print("\nAnother dataSet")

ages = np.array([13,25,19])

series1 = pd.Series(ages,index=['Emma', 'Swetha', 'Serajh'])

print(series1)
```

O/P

```
[1 2 3 4]

Another dataSet

Emma      13

Swetha    25

Serajh    19

dtype: int64
```

Practical No.03

Aim : Design and develop at least 5 problem statements which demonstrate the use of Control Structures of any data analytics tool.

Code :

```
def digitSum(n):
        dsum = 0
        for ele in str(n):
                dsum += int(ele)
        return dsum
List = [367, 111, 562, 945, 6726, 873]
newList = [digitSum(i) for i in List if i & 1]
print(newList)
a = [1, 2, 3, 4]
while a:
    print(a.pop())
for i in range(10):
        print(i)
        if i == 2:
                break
```

Output :

```
[16, 3, 18, 18]
4
3
2
1
0
1
2
```

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Practical No.04

Aim : Implement any 2 Classification techniques using any data analytics tool.

Decision Tree Classification

Code :

```
import numpy as np

import pandas as pd

import matplotlib.pyplot as plt

from sklearn.metrics import classification_report

from sklearn.metrics import confusion_matrix

from sklearn.model_selection import train_test_split

from sklearn.preprocessing import MinMaxScaler

from sklearn.linear_model import LogisticRegression

from sklearn.tree import DecisionTreeClassifier

from sklearn.neighbors import KNeighborsClassifier

from sklearn.discriminant_analysis import LinearDiscriminantAnalysis

from sklearn.svm import SVC

print(fruits.head())

print(fruits.tail())

print(fruits.describe())

feature_names = ['mass', 'width', 'height', 'color_score']

X = fruits[feature_names]
```

```
y = fruits['fruit_label']

X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=0)

scaler = MinMaxScaler()

X_train = scaler.fit_transform(X_train)

X_test = scaler.transform(X_test)

c =  DecisionTreeClassifier().fit(X_train, y_train)

print('Accuracy of Decision Tree classifier on training set: {:.2f}'

     .format(c.score(X_train, y_train)))

print('Accuracy of Decision Tree classifier on test set: {:.2f}'

     .format(c.score(X_test, y_test)))
```

Output :

```
fruit_label fruit_name fruit_subtype  mass  width  height  color_score
0           1      apple  granny_smith   192    8.4     7.3         0.55
1           1      apple  granny_smith   180    8.0     6.8         0.59
2           1      apple  granny_smith   176    7.4     7.2         0.60
3           2   mandarin      mandarin    86    6.2     4.7         0.80
4           2   mandarin      mandarin    84    6.0     4.6         0.79
   fruit_label fruit_name fruit_subtype  mass  width  height  color_score
54           4      lemon       unknown   116    6.1     8.5         0.71
55           4      lemon       unknown   116    6.3     7.7         0.72
56           4      lemon       unknown   116    5.9     8.1         0.73
57           4      lemon       unknown   152    6.5     8.5         0.72
58           4      lemon       unknown   118    6.1     8.1         0.70
       fruit_label        mass      width     height  color_score
count    59.000000   59.000000  59.000000  59.000000     59.000000
mean      2.542373  163.118644   7.105085   7.693220      0.762881
std       1.208048   55.018832   0.816938   1.361017      0.076857
min       1.000000   76.000000   5.800000   4.000000      0.550000
25%       1.000000  140.000000   6.600000   7.200000      0.720000
50%       3.000000  158.000000   7.200000   7.600000      0.750000
75%       4.000000  177.000000   7.500000   8.200000      0.810000
max       4.000000  362.000000   9.600000  10.500000      0.930000
Accuracy of Decision Tree classifier on training set: 1.00
Accuracy of Decision Tree classifier on test set: 0.73
```

KNN

Code:

```
knn = KNeighborsClassifier()

knn.fit(X_train, y_train)

print('Accuracy of K-NN classifier on training set: {:.2f}'

     .format(knn.score(X_train, y_train)))

print('Accuracy of K-NN classifier on test set: {:.2f}'

     .format(knn.score(X_test, y_test)))
```

Output :

```
Accuracy of K-NN classifier on training set: 0.95
Accuracy of K-NN classifier on test set: 1.00
```

SVM :

Code :

```
svm = SVC()

svm.fit(X_train, y_train)

print('Accuracy of SVM classifier on training set: {:.2f}'

     .format(svm.score(X_train, y_train)))

print('Accuracy of SVM classifier on test set: {:.2f}'

     .format(svm.score(X_test, y_test)))
```

Output :

Accuracy of SVM classifier on training set: 0.9
1Accuracy of SVM classifier on test set: 0.80

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Practical No.5

Aim : Implement any 2 Clustering techniques using any data analytics tool.

Implementation of the k-means clustering algorithm

Code :

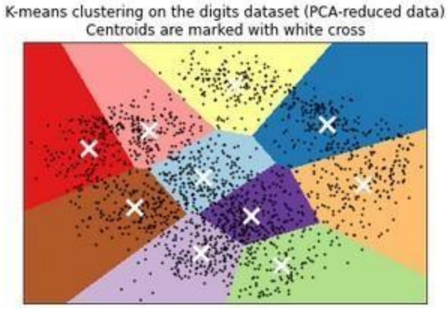
```
import numpy as np

import matplotlib.pyplot as plt


from sklearn.datasets import load_digits

from sklearn.cluster import KMeans

from sklearn.decomposition import PCA


data, labels = load_digits(return_X_y=True)

(n_samples, n_features), n_digits = data.shape, np.unique(labels).size


reduced_data = PCA(n_components=2).fit_transform(data)

kmeans = KMeans(init="k-means++", n_clusters=n_digits, n_init=4)

kmeans.fit(reduced_data)


# Step size of the mesh. Decrease to increase the quality of the VQ.

h = 0.02  # point in the mesh [x_min, x_max]x[y_min, y_max].


# Plot the decision boundary. For that, we will assign a color to each

x_min, x_max = reduced_data[:, 0].min() - 1, reduced_data[:, 0].max() + 1
```

```
y_min, y_max = reduced_data[:, 1].min() - 1, reduced_data[:, 1].max() + 1

xx, yy = np.meshgrid(np.arange(x_min, x_max, h), np.arange(y_min, y_max, h))


# Obtain labels for each point in mesh. Use last trained model.

Z = kmeans.predict(np.c_[xx.ravel(), yy.ravel()])


# Put the result into a color plot

Z = Z.reshape(xx.shape)

plt.figure(1)

plt.clf()

plt.imshow(

    Z,

    interpolation="nearest",

    extent=(xx.min(), xx.max(), yy.min(), yy.max()),

    cmap=plt.cm.Paired,

    aspect="auto",

    origin="lower",

)


plt.plot(reduced_data[:, 0], reduced_data[:, 1], "k.", markersize=2)

# Plot the centroids as a white X

centroids = kmeans.cluster_centers_

plt.scatter(
```

```
    centroids[:, 0],
    centroids[:, 1],
    marker="x",
    s=169,
    linewidths=3,
    color="w",
    zorder=10,
)
plt.title(
    "K-means clustering on the digits dataset (PCA-reduced data)\n"
    "Centroids are marked with white cross"
)
plt.xlim(x_min, x_max)
plt.ylim(y_min, y_max)
plt.xticks(())
plt.yticks(())
plt.show()
```

Output :

```
plt.yticks(())
plt.show()
```




```
In [ ]:
```

Implementation of the DBSCAN(Density Based) clustering algorithm

Code:

```
import numpy as np

import matplotlib.pyplot as plt



from sklearn.cluster import DBSCAN

from sklearn import metrics

from sklearn.datasets import make_blobs

from sklearn.preprocessing import StandardScaler

centers = [[1, 1], [-1, -1], [1, -1]]

X, labels_true = make_blobs(

    n_samples=750, centers=centers, cluster_std=0.4, random_state=0

)


X = StandardScaler().fit_transform(X)
```

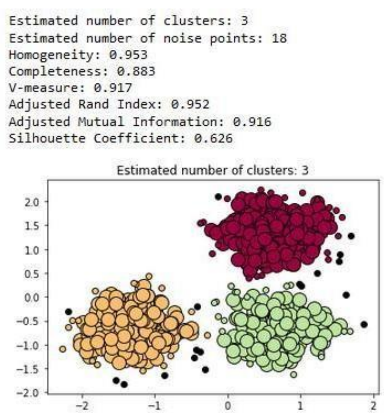
```
db = DBSCAN(eps=0.3, min_samples=10).fit(X)

core_samples_mask = np.zeros_like(db.labels_, dtype=bool)

core_samples_mask[db.core_sample_indices_] = True

labels = db.labels_


# Number of clusters in labels, ignoring noise if present.

n_clusters_ = len(set(labels)) - (1 if -1 in labels else 0)

n_noise_ = list(labels).count(-1)


print("Estimated number of clusters: %d" % n_clusters_)

print("Estimated number of noise points: %d" % n_noise_)

print("Homogeneity: %0.3f" % metrics.homogeneity_score(labels_true, labels))

print("Completeness: %0.3f" % metrics.completeness_score(labels_true, labels))

print("V-measure: %0.3f" % metrics.v_measure_score(labels_true, labels))

print("Adjusted Rand Index: %0.3f" % metrics.adjusted_rand_score(labels_true, labels))

print(

    "Adjusted Mutual Information: %0.3f"

    % metrics.adjusted_mutual_info_score(labels_true, labels)

)

print("Silhouette Coefficient: %0.3f" % metrics.silhouette_score(X, labels))


# Black removed and is used for noise instead.

unique_labels = set(labels)
```

```
colors = [plt.cm.Spectral(each) for each in np.linspace(0, 1, len(unique_labels))]

for k, col in zip(unique_labels, colors):

    if k == -1:

        # Black used for noise.

        col = [0, 0, 0, 1]


    class_member_mask = labels == k


    xy = X[class_member_mask & core_samples_mask]

    plt.plot(

        xy[:, 0],

        xy[:, 1],

        "o",

        markerfacecolor=tuple(col),

        markeredgecolor="k",

        markersize=14,

    )


    xy = X[class_member_mask & ~core_samples_mask]

    plt.plot(

        xy[:, 0],

        xy[:, 1],

        "o",
```

```
        markerfacecolor=tuple(col),

        markeredgecolor="k",

        markersize=6,

    )



plt.title("Estimated number of clusters: %d" % n_clusters_)

plt.show()
```

Output:

Estimated number of clusters: 3
Estimated number of noise points: 18
Homogeneity: 0.953
Completeness: 0.883
V-measure: 0.917
Adjusted Rand Index: 0.952
Adjusted Mutual Information: 0.916
Silhouette Coefficient: 0.626



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Practical No.06

Aim : Implement any 2 Association Rule Mining techniques using any data analytics tool.
Code :

```
import numpy as np

import pandas as pd

from mlxtend.frequent_patterns import apriori, association_rules

import numpy as np

import pandas as pd

from mlxtend.frequent_patterns import apriori, association_rules

data.columns

data.Country.unique()

data['Description'] = data['Description'].str.strip()


# Dropping the rows without any invoice number

data.dropna(axis = 0, subset =['InvoiceNo'], inplace = True)

data['InvoiceNo'] = data['InvoiceNo'].astype('str')


# Dropping all transactions which were done on credit

data = data[~data['InvoiceNo'].str.contains('C')]

basket_France = (data[data['Country'] =="France"]

        .groupby(['InvoiceNo', 'Description'])['Quantity']

        .sum().unstack().reset_index().fillna(0)

        .set_index('InvoiceNo'))
```

```
# Transactions done in the United Kingdom
basket_UK = (data[data['Country'] =="United Kingdom"]
        .groupby(['InvoiceNo', 'Description'])['Quantity']
        .sum().unstack().reset_index().fillna(0)
        .set_index('InvoiceNo'))


# Transactions done in Portugal
basket_Por = (data[data['Country'] =="Portugal"]
        .groupby(['InvoiceNo', 'Description'])['Quantity']
        .sum().unstack().reset_index().fillna(0)
        .set_index('InvoiceNo'))


basket_Sweden = (data[data['Country'] =="Sweden"]
        .groupby(['InvoiceNo', 'Description'])['Quantity']
        .sum().unstack().reset_index().fillna(0)
        .set_index('InvoiceNo'))
frq_items = apriori(basket_France, min_support = 0.05, use_colnames = True)


# Collecting the inferred rules in a dataframe
rules = association_rules(frq_items, metric ="lift", min_threshold = 1)
rules = rules.sort_values(['confidence', 'lift'], ascending =[False, False])
print(rules.head())
```

Output :

	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	6	2010-12-01 08:26:00	2.55	17850.0	United Kingdom
1	536365	71053	WHITE METAL LANTERN	6	2010-12-01 08:26:00	3.39	17850.0	United Kingdom
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	8	2010-12-01 08:26:00	2.75	17850.0	United Kingdom
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	6	2010-12-01 08:26:00	3.39	17850.0	United Kingdom
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	6	2010-12-01 08:26:00	3.39	17850.0	United Kingdom

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	conviction
44	(JUMBO BAG WOODLAND ANIMALS)	(POSTAGE)	0.076531	0.765306	0.076531	1.000	1.306667	0.017961	inf
258	(PLASTERS IN TIN CIRCUS PARADE, RED TOADSTOOL ...	(POSTAGE)	0.051020	0.765306	0.051020	1.000	1.306667	0.011974	inf
270	(PLASTERS IN TIN WOODLAND ANIMALS, RED TOADSTO...	(POSTAGE)	0.053571	0.765306	0.053571	1.000	1.306667	0.012573	inf
301	(SET/6 RED SPOTTY PAPER CUPS, SET/20 RED RETRO...	(SET/6 RED SPOTTY PAPER PLATES)	0.102041	0.127551	0.099490	0.975	7.644000	0.086474	34.897959
302	(SET/6 RED SPOTTY PAPER PLATES, SET/20 RED RET...	(SET/6 RED SPOTTY PAPER CUPS)	0.102041	0.137755	0.099490	0.975	7.077778	0.085433	34.489796

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Practical No. 07

Aim : Visualize all the statistical measures (mean, mode, median, range, inter quartile range, etc.) using Histograms, Boxplots, scatter plots, etc.

Code :

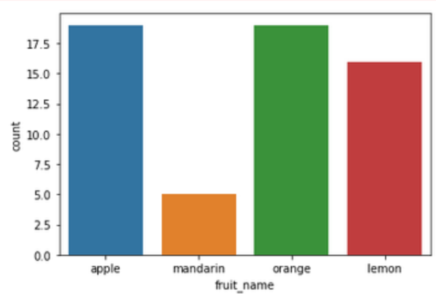
import seaborn as sns

sns.countplot(fruits['fruit_name'],label="Count")

plt.show()

```
In [7]: import seaborn as sns
        sns.countplot(fruits['fruit_name'],label="Count")
        plt.show()
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword
arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit
keyword will result in an error or misinterpretation.
  warnings.warn(
```

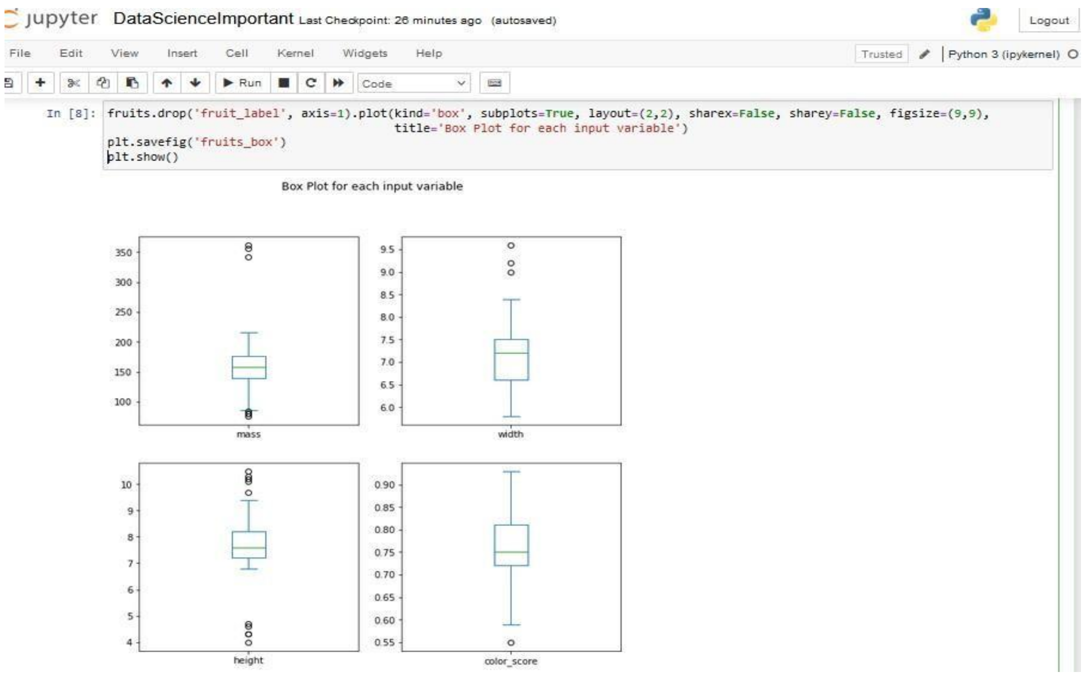


fruits.drop('fruit_label', axis=1).plot(kind='box', subplots=True, layout=(2,2), sharex=False, sharey=False, figsize=(9,9),

title='Box Plot for each input variable')

plt.savefig('fruits_box')

plt.show()



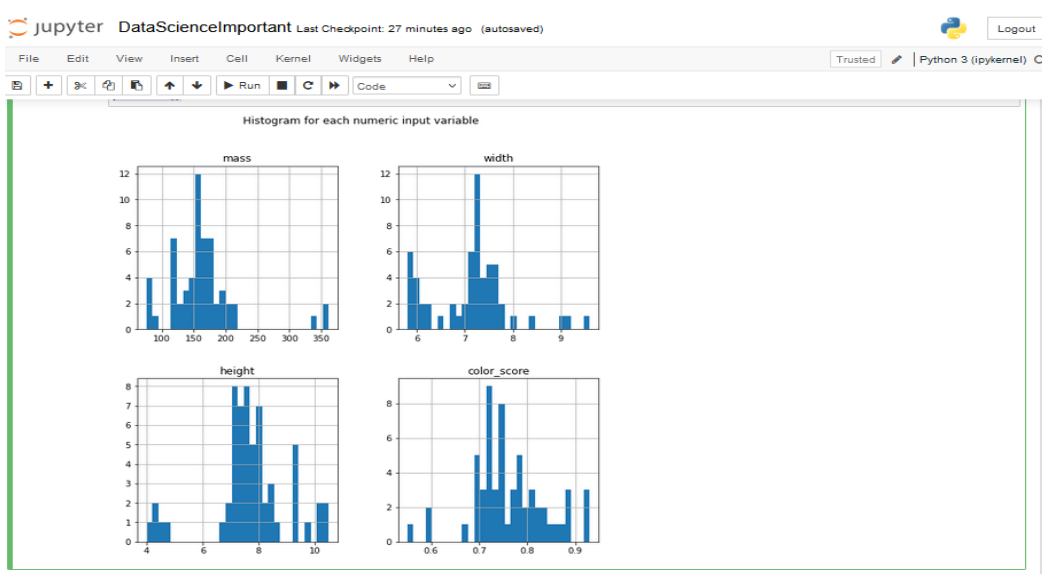
import pylab as pl

fruits.drop('fruit_label' ,axis=1).hist(bins=30, figsize=(9,9))

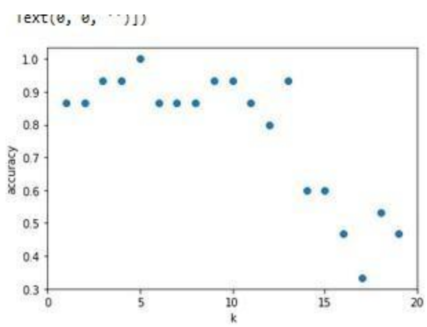
pl.suptitle("Histogram for each numeric input variable")

plt.savefig('fruits_hist')

plt.show()



```
k_range = range(1, 20)

scores = []

for k in k_range:

    knn = KNeighborsClassifier(n_neighbors = k)

    knn.fit(X_train, y_train)

    scores.append(knn.score(X_test, y_test))

plt.figure()

plt.xlabel('k')

plt.ylabel('accuracy')

plt.scatter(k_range, scores)

plt.xticks([0,5,10,15,20])
```



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Practical No.08

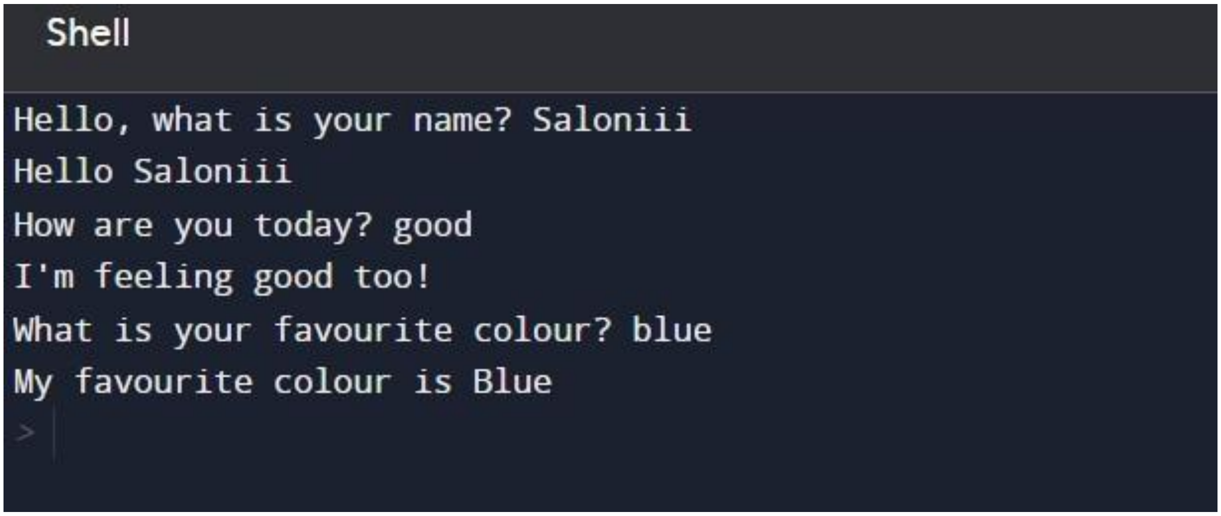
Aim : Design and Develop real-time Data Science Application (e.g. Image Recognition/ Intelligent Assistant/ Recommendation System/ Fake News Detection/Emotion Recognition/Chatbot/Other)

Code : Chatbat

```
import time

import random

name = input("Hello, what is your name? ")

time.sleep(2)

print("Hello " + name)

feeling = input("How are you today? ")

time.sleep(2)

if "good" in feeling:

    print("I'm feeling good too!")

else:

    print("I'm sorry to hear that!")



time.sleep(2)

favcolour = input("What is your favourite colour? ")



colours = ["Red","Green","Blue"]



time.sleep(2)
```

```
print("My favourite colour is " + random.choice(colours))
```

Output



```
Shell
Hello, what is your name? Saloniii
Hello Saloniii
How are you today? good
I'm feeling good too!
What is your favourite colour? blue
My favourite colour is Blue
>
```