In [1]:
```
#Name : Rajshri Satpute
#Roll No. : 55
#Year : 3rd year
#Section : B
#Date : 02/08/2024
```

In [2]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import warnings
```

In [3]:
```
import os
```

In [4]:
```
os.chdir("C:\\Users\\fatin\\OneDrive\\Desktop")
```

In [5]:
```
df = pd.read_csv("Iris.csv")
```

In [6]:
```
df.head()
```

Out[6]:

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa

In [7]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 6 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   Id             150 non-null    int64  
 1   SepalLengthCm  150 non-null    float64
 2   SepalWidthCm   150 non-null    float64
 3   PetalLengthCm  150 non-null    float64
 4   PetalWidthCm   150 non-null    float64
 5   Species        150 non-null    object 
dtypes: float64(4), int64(1), object(1)
memory usage: 7.2+ KB
```

In [8]:
```
df.describe()
```

Out[8]:

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm
count	150.000000	150.000000	150.000000	150.000000	150.000000
mean	75.500000	5.843333	3.054000	3.758667	1.198667
std	43.445368	0.828066	0.433594	1.764420	0.763161
min	1.000000	4.300000	2.000000	1.000000	0.100000
25%	38.250000	5.100000	2.800000	1.600000	0.300000
50%	75.500000	5.800000	3.000000	4.350000	1.300000
75%	112.750000	6.400000	3.300000	5.100000	1.800000
max	150.000000	7.900000	4.400000	6.900000	2.500000

In [9]:
```
df['Species'].value_counts()
```

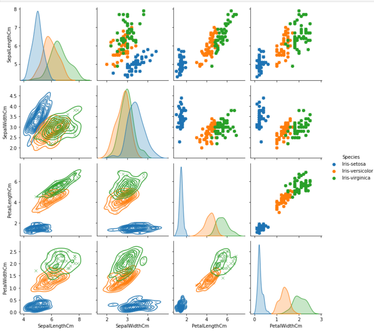
Out[9]:
```
Iris-setosa        50
Iris-versicolor    50
Iris-virginica     50
Name: Species, dtype: int64
```

In [10]:
```
rows, col = df.shape
print("Rows : %s, column : %s" % (rows, col))
```

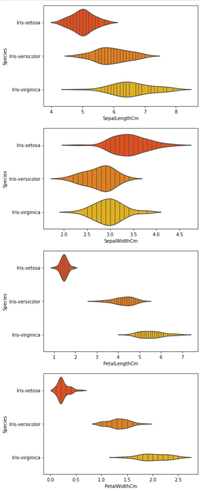
```
Rows : 150, column : 6
```

Data Visualization

In [11]:
```
snsdata = df.drop(['Id'], axis=1)
g = sns.pairplot(snsdata, hue='Species', markers='x')
g = g.map_upper(plt.scatter)
g = g.map_lower(sns.kdeplot)
```



In [12]:
```
sns.violinplot(x='SepalLengthCm', y='Species', data=df, inner='stick', palette='autumn')
plt.show()
sns.violinplot(x='SepalWidthCm', y='Species', data=df, inner='stick', palette='autumn')
plt.show()
sns.violinplot(x='PetalLengthCm', y='Species', data=df, inner='stick', palette='autumn')
plt.show()
sns.violinplot(x='PetalWidthCm', y='Species', data=df, inner='stick', palette='autumn')
plt.show()
```



Multivariate Linear Regression Model

In [13]:
```
mapping = {
    'Iris-setosa' : 1,
    'Iris-versicolor' : 2,
    'Iris-virginica' : 3
}

X = df.drop(['Id', 'Species'], axis=1).values
y = df.Species.replace(mapping).values.reshape(rows,1)

X = np.hstack(((np.ones((rows,1))), X))
```

In [14]:
```
np.random.seed(0)
theta = np.random.randn(1,5)

print("Theta : %s" % (theta))
```

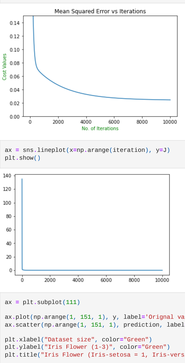
```
Theta : [[1.76405235 0.40015721 0.97873798 2.2408932  1.86755799]]
```

In [15]:
```
iteration = 10000
learning_rate = 0.003
J = np.zeros(iteration)
```

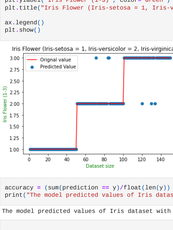
In [16]:
```
# Let's train our model to compute values of theta
for i in range(iteration):
    J[i] = (1/(2 * rows) * np.sum((np.dot(X, theta.T) - y) ** 2 ))
    theta -= ((learning_rate/rows) * np.dot((np.dot(X, theta.T) - y).reshape(1,rows), X))

prediction = np.round(np.dot(X, theta.T))

ax = plt.subplot(111)
ax.plot(np.arange(iteration), J)
ax.set_ylim([0,0.15])
plt.xlabel("Cost Values", color="Green")
plt.xlabel("No. of Iterations", color="Green")
plt.title("Mean Squared Error vs Iterations")
plt.show()
```



In [17]:
```
ax = sns.lineplot(x=np.arange(iteration), y=J)
plt.show()
```



In [18]:
```
ax = plt.subplot(111)

ax.plot(np.arange(1, 151, 1), y, label='Orignal value', color='red')
ax.scatter(np.arange(1, 151, 1), prediction, label='Predicted Value')

plt.xlabel("Dataset size", color="Green")
plt.ylabel("Iris Flower (1-3)", color="Green")
plt.title("Iris Flower (Iris-setosa = 1, Iris-versicolor = 2, Iris-virginica = 3)")

ax.legend()
plt.show()
```


In [19]:
```
accuracy = (sum(prediction == y)/float(len(y)) * 100)[0]
print("The model predicted values of Iris dataset with an overall accuracy of %s" % (accuracy))
```

```
The model predicted values of Iris dataset with an overall accuracy of 96.0
```

In [ ]:
```

```