1 [1]:	#load the import pa import nu import ma	ervised ML				
n [2]:	#to avoid import wa warnings.	use('ggplo' unwanted w	t') arnings ngs('ignore')			
ı [3]: ıt[3]:	df=pd.rea			PetalLengthCm  1.4  1.4	0.2 Iris-setos	a
	2 3 3 4 4 5 145 146 146 147	4.7 4.6 5.0  6.7 6.3	3.2 3.1 3.6  3.0 2.5	1.3 1.5 1.4  5.2 5.0	0.2 Iris-setos 0.2 Iris-setos 0.2 Iris-setos 2.3 Iris-virginic	a a a 
ı [4]:	<ul><li>147 148</li><li>148 149</li><li>149 150</li><li>150 rows × 6</li><li>df.shape</li></ul>		3.0 3.4 3.0 rows, total co	5.2 5.4 5.1	2.3 Iris-virginic	a
it[4]: i [5]: it[5]:	df.head(5	5)	, inplace= Tr VidthCm PetalLo	rue) engthCm PetalW 1.4	VidthCm Species  0.2 Iris-setosa	
ı [6]:	1 2 3 4 df.head()	4.9 4.7 4.6 5.0 #firs	3.0 3.2 3.1 3.6 t 5 rows	1.4 1.3 1.5 1.4	<ul><li>0.2 Iris-setosa</li><li>0.2 Iris-setosa</li><li>0.2 Iris-setosa</li><li>0.2 Iris-setosa</li></ul>	
ıt[6]:	SepalLeng  0  1  2  3  4	5.1 4.9 4.7 4.6 5.0	3.5 3.0 3.2 3.1 3.6	1.4 1.4 1.3 1.5 1.4	0.2 Iris-setosa 0.2 Iris-setosa 0.2 Iris-setosa 0.2 Iris-setosa 0.2 Iris-setosa 0.2 Iris-setosa	
ı [7]: ıt[7]:	df.tail() SepalL  145 146 147			S.2 5.0 5.2	2.3 Iris-virginica 1.9 Iris-virginica 2.0 Iris-virginica	
n [8]: nt[8]:	148 149  df.sample  SepalLe		3.4 3.0  andomly 5 row  WidthCm Petall 2.9	5.4 5.1  VS  LengthCm Petal 1.4	2.3 Iris-virginica 1.8 Iris-virginica  WidthCm Species 0.2 Iris-setosa	
ı [9]:	95 69 98 16 df.isnull	5.7 5.6 5.1 5.4	3.0 2.5 2.5 3.9	4.2 3.9 3.0 1.3	1.2 Iris-versicolor 1.1 Iris-versicolor 1.1 Iris-versicolor 0.4 Iris-setosa	
it[9]:	SepalLengt SepalWidth PetalLengt PetalWidth Species dtype: int	nCm 0 chCm 0 nCm 0 0 :64	rmation of th			
	RangeIndex Data colum # Colum 0 Sepal 1 Sepal 2 Petal 3 Petal 4 Specidtypes: fl	t: 150 entri nns (total 5 nn N LengthCm 1 LengthCm 1 LengthCm 1 LengthCm 1 Les 1 Loat64(4), co	on-Null Count  50 non-null 50 non-null 50 non-null 50 non-null bject(1)			
[11]:	df['Speci	es']  Iris-setosa Iris-setosa Iris-setosa Iris-setosa Iris-setosa				
[12]:	146 Iri 147 Iri 148 Iri 149 Iri Name: Spec	s-virginica s-virginica s-virginica s-virginica s-virginica cies, Length	ecies'])	: object abel='count'>		
.[12];	50 - 40 - 20 -		Species , yia	abel- Count >		
[13]:	10	is-setosa	lris-versicolor Species	lris-virginica		
[13]:		ILengthCm Se 150.000000 5.843333 0.828066 4.300000 5.100000	2.000000 2.800000	150.000000 3.758667 1.764420 1.000000 1.600000	150.000000 1.198667 0.763161 0.100000 0.300000	
[14]:	50% 75% max  x_df=df x=df.iloc x	5.800000 6.400000 7.900000	3.000000 3.300000 4.400000	4.350000 5.100000 6.900000	1.300000 1.800000 2.500000	
[14]:	[4. [4. [5. [5. [4. [5.	1, 3.5, 1.4 9, 3. , 1.4 7, 3.2, 1.3 6, 3.1, 1.5 , 3.6, 1.4 4, 3.9, 1.7 6, 3.4, 1.4 , 3.4, 1.5 4, 2.9, 1.4 9, 3.1, 1.5	0.2], 0.2], 0.2], 1, 0.2], 1, 0.4], 1, 0.3], 1, 0.2],			
	[4. [4. [5. [5. [5. [5.	8, 3.4, 1.6 8, 3. , 1.4 3, 3. , 1.1 8, 4. , 1.2 7, 4.4, 1.5 4, 3.9, 1.3 1, 3.5, 1.4 7, 3.8, 1.7 1, 3.8, 1.5 4, 3.4, 1.7 1, 3.7, 1.5	0.1], 0.1], 2, 0.2], 6, 0.4], 7, 0.3], 7, 0.3], 7, 0.3],			
	[4. [5. [5. [5. [5. [4.	6, 3.6, 1. 1, 3.3, 1.7 8, 3.4, 1.9 , 3. , 1.6 2, 3.5, 1.5 2, 3.4, 1.4 7, 3.2, 1.6 8, 3.1, 1.6	0.2], 0.5], 0.2], 0.2], 0.4], 0.2], 0.2], 0.2], 0.2],			
	[5. [4. [5. [5. [4. [4. [5.	4, 3.4, 1.5 2, 4.1, 1.5 5, 4.2, 1.4 9, 3.1, 1.5 , 3.2, 1.2 5, 3.5, 1.3 9, 3.1, 1.5 4, 3. , 1.3 1, 3.4, 1.5	0.1], 0.2], 0.1], 2.0.2], 3.0.2], 5.0.1], 6.0.2], 6.0.2],			
	[4. [5. [4. [5. [4. [5.	5, 2.3, 1.3 4, 3.2, 1.3 , 3.5, 1.6 1, 3.8, 1.9 8, 3. , 1.4 1, 3.8, 1.6 6, 3.2, 1.4 3, 3.7, 1.5 , 3.3, 1.4 , 3.2, 4.7	3, 0.2], 5, 0.6], 7, 0.4], 8, 0.3], 6, 0.2], 9, 0.2], 9, 0.2],			
	[6. [6. [6. [6. [4. [6.	4, 3.2, 4.5 9, 3.1, 4.5 5, 2.3, 4.5 5, 2.8, 4.6 7, 2.8, 4.5 3, 3.3, 4.7 9, 2.4, 3.3 6, 2.9, 4.6 2, 2.7, 3.5 , 2. , 3.5	i, 1.5], i, 1.5], i, 1.3], i, 1.5], i, 1.3], i, 1.6], i, 1. ], i, 1.3],			
	[6. [6. [5. [5. [6. [5.	9, 3. , 4.2 , 2.2, 4. 1, 2.9, 4.7 6, 2.9, 3.6 7, 3.1, 4.4 6, 3. , 4.5 8, 2.7, 4.1 2, 2.2, 4.5 6, 2.5, 3.9 9, 3.2, 4.8	, 1. ], , 1.4], , 1.3], , 1.5], , 1. ], , 1. ], , 1.5], , 1.5],			
	[6. [6. [6. [6. [6. [5.	1, 2.8, 4. 3, 2.5, 4.9 1, 2.8, 4.7 4, 2.9, 4.3 6, 3. , 4.4 8, 2.8, 4.8 7, 3. , 5. , 2.9, 4.5 7, 2.6, 3.5 5, 2.4, 3.8	7, 1.5], 7, 1.2], 8, 1.3], 8, 1.4], 9, 1.4], 1, 1.7], 1, 1.5], 1, 1.5],			
	[5. [6. [6. [6. [5. [5.	5, 2.4, 3.7 8, 2.7, 3.9 , 2.7, 5.1 4, 3., 4.5 , 3.4, 4.5 7, 3.1, 4.7 3, 2.3, 4.4 6, 3., 4.1 5, 2.5, 4. 5, 2.6, 4.4	1.2], 1.6], 5, 1.6], 6, 1.5], 7, 1.5], 1, 1.3], 1, 1.3], 1, 1.3],			
	[5. [5. [5. [6. [5. [6.	8, 2.6, 4. , 2.3, 3.3 6, 2.7, 4.2 7, 3. , 4.2 7, 2.9, 4.2 2, 2.9, 4.3 1, 2.5, 3. 7, 2.8, 4.1 3, 3.3, 6. 8, 2.7, 5.1	, 1.2], 3, 1. ], 2, 1.3], 3, 1.3], 3, 1.3], 1, 1.1], 1, 1.3], 1, 2.5], 1, 1.9],			
	[6. [6. [7. [4. [7. [6. [6.	1, 3. , 5.9 3, 2.9, 5.6 5, 3. , 5.8 6, 3. , 6.6 9, 2.5, 4.5 3, 2.9, 6.3 7, 2.5, 5.8 2, 3.6, 6.1 5, 3.2, 5.1 4, 2.7, 5.3 8, 3. , 5.5	1.8], 2.2], 3, 2.1], 4, 1.7], 8, 1.8], 8, 1.8], 1, 2.5], 1, 2. ],			
	[5. [6. [7. [7. [6. [5.	7, 2.5, 5. 8, 2.8, 5.1 4, 3.2, 5.3 5, 3., 5.5 7, 3.8, 6.7 7, 2.6, 6.9 , 2.2, 5. 9, 3.2, 5.7 6, 2.8, 4.9 7, 2.8, 6.7 3, 2.7, 4.9	2.4], 3, 2.3], 5, 1.8], 7, 2.2], 9, 2.3], 1.5], 1, 2.3], 1, 2. ],			
	[6. [7. [6. [6. [7. [7. [7.	7, 3.3, 5.7 2, 3.2, 6. 2, 2.8, 4.8 1, 3. , 4.9 4, 2.8, 5.6 2, 3. , 5.8 4, 2.8, 6.1 9, 3.8, 6.4 4, 2.8, 5.6 3, 2.8, 5.1	2.1], , 1.8], 8, 1.8], 9, 1.8], 6, 2.1], 8, 1.6], 1, 1.9], 1, 2. ],			
	[7. [6. [6. [6. [6. [5.	1, 2.6, 5.6 7, 3., 6.1 3, 3.4, 5.6 4, 3.1, 5.5 9, 3.1, 5.4 7, 3.1, 5.6 9, 3.1, 5.1 8, 2.7, 5.1 8, 3.2, 5.9 7, 3.3, 5.7	2.3], 5, 2.4], 6, 1.8], 7, 2.1], 7, 2.4], 1, 2.3], 1, 1.9],			
[15]: :[15]:	[6. [6. [6. [5. x_df.plot	7, 3. , 5.2 3, 2.5, 5. 5, 3. , 5.2 2, 3.4, 5.4 9, 3. , 5.1 (kind="line	2, 2.3], , 1.9], 2, 2. ], 4, 2.3], 1.8]])			
	7 - Sepa Peta 6 - Peta 5 - Peta 3 -	IlLengthCm IlWidthCm IlWidthCm IWidthCm	W/////////////////////////////////////	MMMM MM/MM		
[16]: :[16]:		lot(data=x_	80 100 df) rGrid at 0x1	120 140 f1cd452af0>		
]:	SepalLengthCm 2 SepalLengthCm	_ Lu.rai	⊍X11	-41 U >		
	4.5 - 4.0 - WOrldthing 3.5 - 3.0 - 2.5 - 2.0 -	00 00 00 00 00 00 00 00 00 00 00 00 00				
	7 - 6 - 6 - 2 - 5 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2					
	2.5 - 2.0 - Land the control of the	6 7	8 2 3		2 4 6 0	
[17]:	<pre>from skle wcss=[] for i in     kmean</pre>	epalLengthCm  earn.cluster #(WCss is  range (1,11 s=KMeans(n_ n_ s.fit(x)	<pre>import KMear the sum of s ): clusters=i,ir init=10,rando</pre>	square of the nit="k-means+	PetalLengthCm  distances of each da +", max_iter=300,/	PetalWidthCm
	wcss. wcss  #Elbow me  plt.plot( plt.title plt.xlabe labels= [	append(kmea  thod to fin  range(1,11)  ('Elbow met l('no of cl "Number of	hod') usters') Clusters","wo	css"]	acecolor='black') f squares) #(wcss i	s Jow fo
		d(labels=la	·		f squares) #(wcss i	.or nigher
	500 - 400 - 300 - 200 - 100 -	2		-8	10	
	metho cluster	n clearl d" from rs is wh	the abo	hy it is o	called as "Elb oh, the optim	
	identifie identifie  array([1,	leans(n_clus d_clusters= d_clusters 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0,	1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 2, 0, 0, 0, 0,	1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 2, 0,	ax_iter=300,n_init=10 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 2, 2, 2, 0, 2,	1, 1, 1, 1, 0, 0, 0, 0,
[31]:	0, 2, 2,	0, 0, 0, 0, 2, 2, 0, 0, 0, 2, 2, 2, uster_cente 9016129 , 2	0, 0, 0, 0, 2, 2, 2, 2, 2, 0, 2, 2, rs_ 2.7483871 , 4 3.418 , 1	0, 0, 0, 2, 0, 2, 0, 2,	0, 2, 2, 2, 2, 0, 2, 0, 2, 2, 0, 0, 2, 2, 2, 0, 2, 2, 0]) 43387097], 244 ],	2, 2,
[31]:	[5.		fied_clusters = 'red', labe	el='Iris_seto: s ==1,0], x[io pel='Iris_ver:	<pre>dentified_clusters == sa') dentified_clusters == sicolor') dentified_clusters ==</pre>	1,1],
[31]: :[31]:	#Visualis plt.scatt plt.scatt plt.scatt #plotting	er(x[identi s=100, c er(x[identi s=100, c er(x[identi s=100, c	<pre>= 'blue', lat fied_clusters = 'green', lat ids of the cl</pre>			
[31]: :[31]: :[32]:	#Visualis plt.scatt plt.scatt plt.scatt plt.scatt plt.scatt plt.scatt	er(x[identi s=100, c er(x[identi s=100, c er(x[identi s=100, c the centro er(kmeans.c s=100, c	<pre>= 'blue', lab fied_clusters = 'green', la  ids of the cl luster_center</pre>	rs_[:,0] ,kmea Label <mark>='Centro</mark> :	ans.cluster_centers_[ ids')	:,1],
[31]: :[31]: :[32]: :[35]:	#Visualis plt.scatt plt.scatt plt.scatt plt.scatt plt.scatt  #plotting plt.scatt plt.legen <matplotli -="" -<="" 2.0="" 2.5="" 3.0="" 3.5="" 4.0="" 4.5="" td=""><td>er(x[identi s=100, c er(x[identi s=100, c er(x[identi s=100, c the centro er(kmeans.c s=100, c d()</td><td>= 'blue', lat fied_clusters = 'green', lat ids of the cl luster_center = 'yellow', late egend at 0x1f2</td><td>rs_[:,0] ,kmea Label='Centro:  1cf2c4d30&gt;  Iris_setosa Iris_versicolor Iris_virginica Centroids</td><td>ids')</td><td>:,1],</td></matplotli>	er(x[identi s=100, c er(x[identi s=100, c er(x[identi s=100, c the centro er(kmeans.c s=100, c d()	= 'blue', lat fied_clusters = 'green', lat ids of the cl luster_center = 'yellow', late egend at 0x1f2	rs_[:,0] ,kmea Label='Centro:  1cf2c4d30>  Iris_setosa Iris_versicolor Iris_virginica Centroids	ids')	:,1],
[31]: :[31]: :[32]: :[35]:	#Visualis plt.scatt plt.scatt plt.scatt plt.scatt plt.scatt #plotting plt.scatt plt.legen <matplotli -="" 3.0="" 3.5="" 4.0="" 4.5="" 4.5<="" td=""><td>er(x[identi s=100, c er(x[identi s=100, c er(x[identi s=100, c the centro er(kmeans.c s=100, c</td><td>= 'blue', lab fied_clusters = 'green', la  ids of the cl luster_center = 'yellow', l  egend at 0x1f:</td><td>rs_[:,0] ,kmealabel='Centro: label='Centro: lcf2c4d30&gt;  lris_setosa lris_versicolor lris_virginica</td><td>ids')</td><td>:,1],</td></matplotli>	er(x[identi s=100, c er(x[identi s=100, c er(x[identi s=100, c the centro er(kmeans.c s=100, c	= 'blue', lab fied_clusters = 'green', la  ids of the cl luster_center = 'yellow', l  egend at 0x1f:	rs_[:,0] ,kmealabel='Centro: label='Centro: lcf2c4d30>  lris_setosa lris_versicolor lris_virginica	ids')	:,1],
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