In [1]:

```
import warnings;warnings.simplefilter('ignore')
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

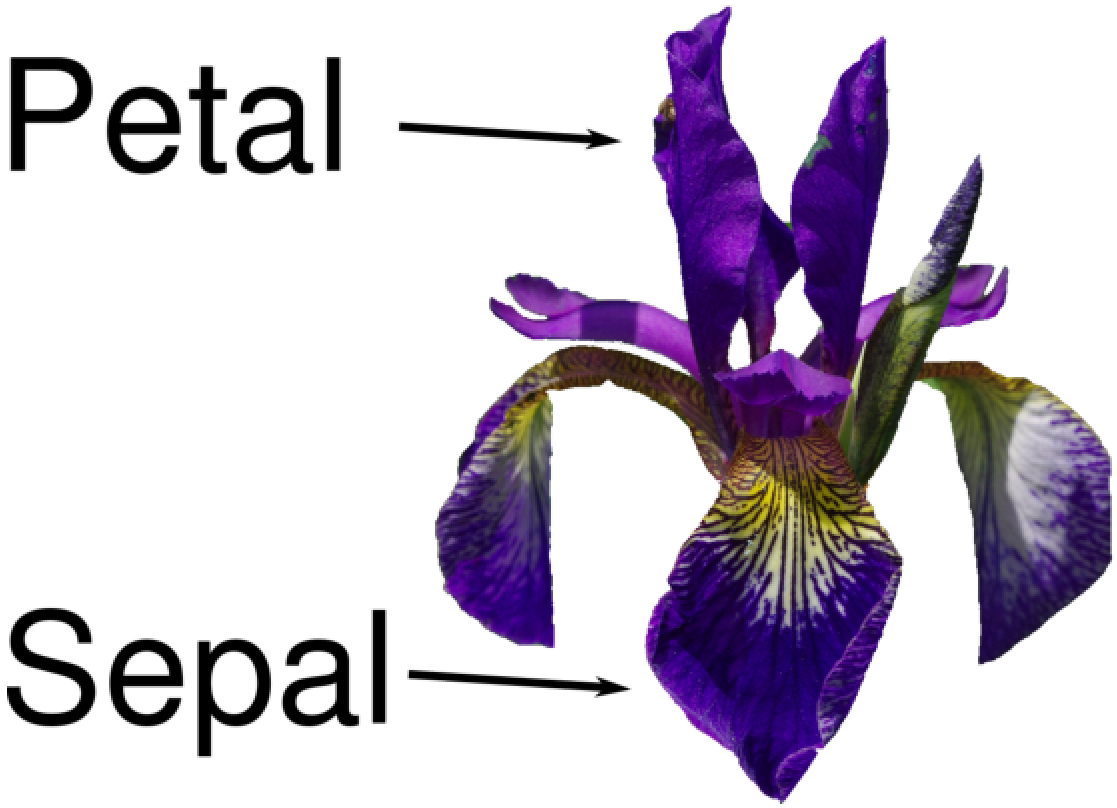
SUPERVISED LEARNING

In [2]:

```
d=plt.imread('./iris_petal_sepal.png')
plt.figure(figsize=(10,10))
plt.axis('off')
plt.imshow(d)
```

Out[2]:

```
<matplotlib.image.AxesImage at 0x1ef1ee2beb0>
```



In [3]:

```
from sklearn.datasets import load_iris
iris = load_iris()
print(iris['feature_names'])
print(iris['target_names'])
x = iris.data
y = iris.target
#读取iris数据 4特征，3分类
#input/feature: 花瓣的长度和宽度 花萼的长度和宽度
#output/target/label: setosa versicolor virginica
```

```
['sepal length (cm)', 'sepal width (cm)', 'petal length (cm)', 'petal width (cm)']
['setosa' 'versicolor' 'virginica']
```

In [4]:

```
x[:5]
```

Out[4]:

```
array([[5.1, 3.5, 1.4, 0.2],
       [4.9, 3. , 1.4, 0.2],
       [4.7, 3.2, 1.3, 0.2],
       [4.6, 3.1, 1.5, 0.2],
       [5. , 3.6, 1.4, 0.2]])
```

```
In [5]:  x.shape
```

```
Out[5]: (150, 4)
```

```
In [6]:  y
```

```
Out[6]: array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
               0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
               0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
               1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
               1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
               2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
               2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2])
```

```
In [7]:  y.shape
```

```
Out[7]: (150,)
```

```
In [8]:  from sklearn.model_selection import train_test_split
         x_train, x_test, y_train, y_test = train_test_split(x, y,train_size=0.7,random_state=0)
```

```
In [9]:  x_train.shape
```

```
Out[9]: (105, 4)
```

```
In [10]:  y_train.shape
```

```
Out[10]: (105,)
```

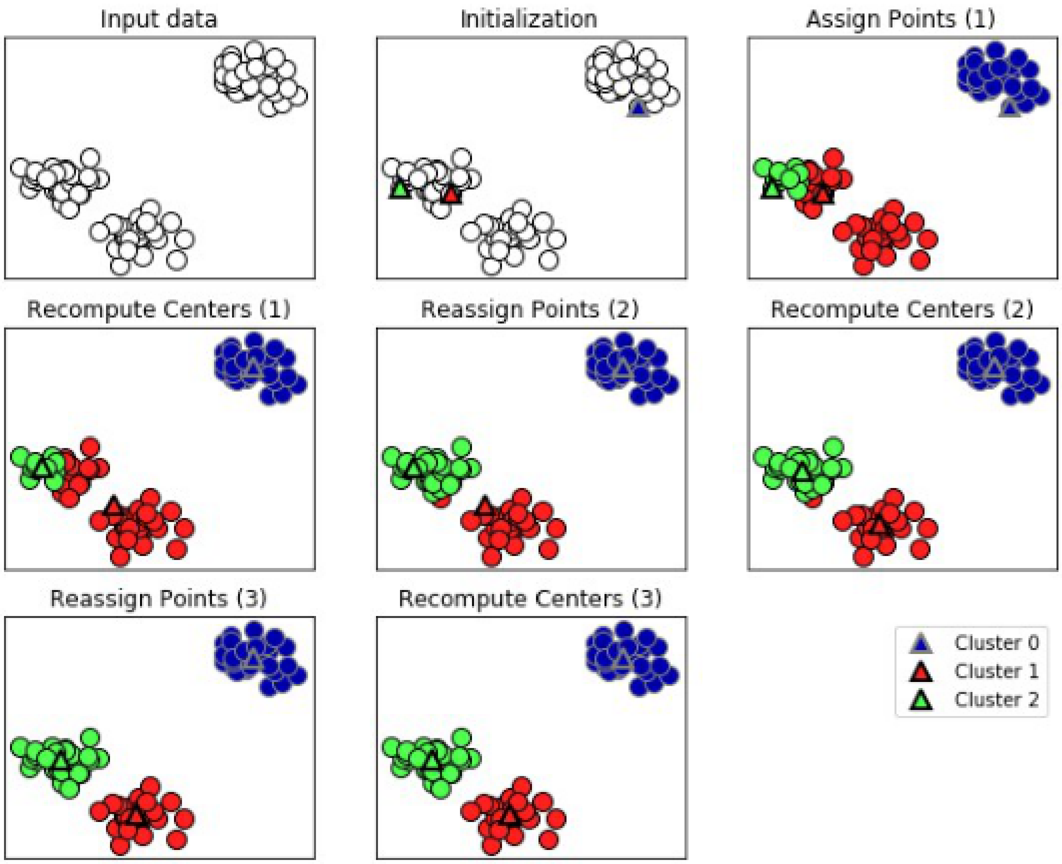
```
In [11]:  from sklearn.neighbors import KNeighborsClassifier
          knn = KNeighborsClassifier(n_neighbors=6)
          knn.fit(x_train, y_train)
          print("train score:"+str(knn.score(x_train,y_train)))
          print("test score:"+str(knn.score(x_test, y_test)))

          train score:0.9619047619047619
          test score:0.9777777777777777
```

UNSUPERVISED LEARNING(k均值聚类)

```
In [12]:  d=plt.imread('./Screenshot 2021-06-29 160320.jpg')
          plt.figure(figsize=(10,10))
          plt.axis('off')
          plt.imshow(d)
```

```
Out[12]: <matplotlib.image.AxesImage at 0x1ef23e23e20>
```



In [13]:

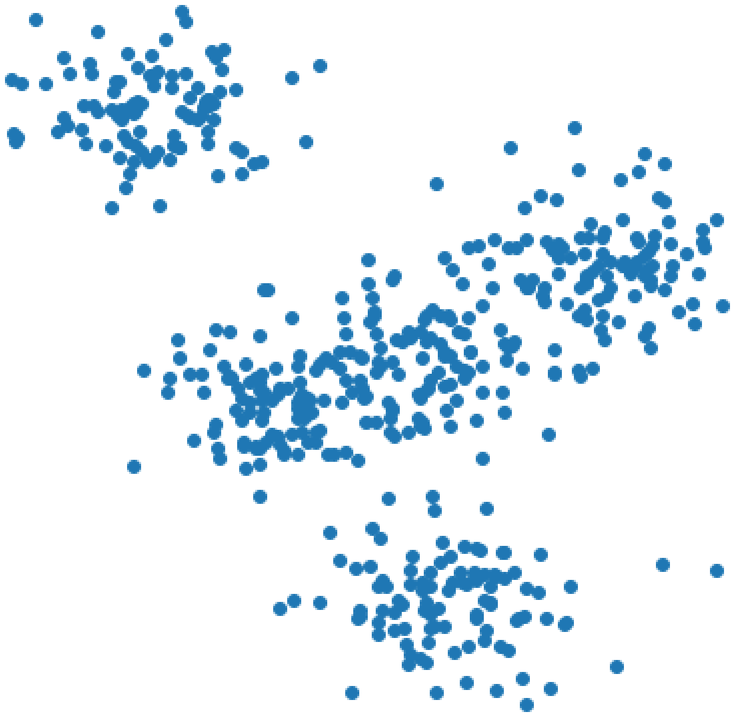
```
#创建数据集 关键参数:样本数量，中心个数
from sklearn.datasets import make_blobs
x,y=make_blobs(n_samples=500,random_state=2,centers=5)
```

In [14]:

```
X=pd.DataFrame(x)
plt.figure(figsize=(7,7))
plt.axis('off')
plt.scatter(X.iloc[:,0],X.iloc[:,1])
```

Out[14]:

```
<matplotlib.collections.PathCollection at 0x1ef1f839100>
```



In [15]:

```
from sklearn.cluster import KMeans
kmeans=KMeans(n_clusters=5)
kmeans.fit(X)
#k均值聚类
#kmeans.labels_
```

Out[15]:

```
KMeans(n_clusters=5)
```

In [16]:

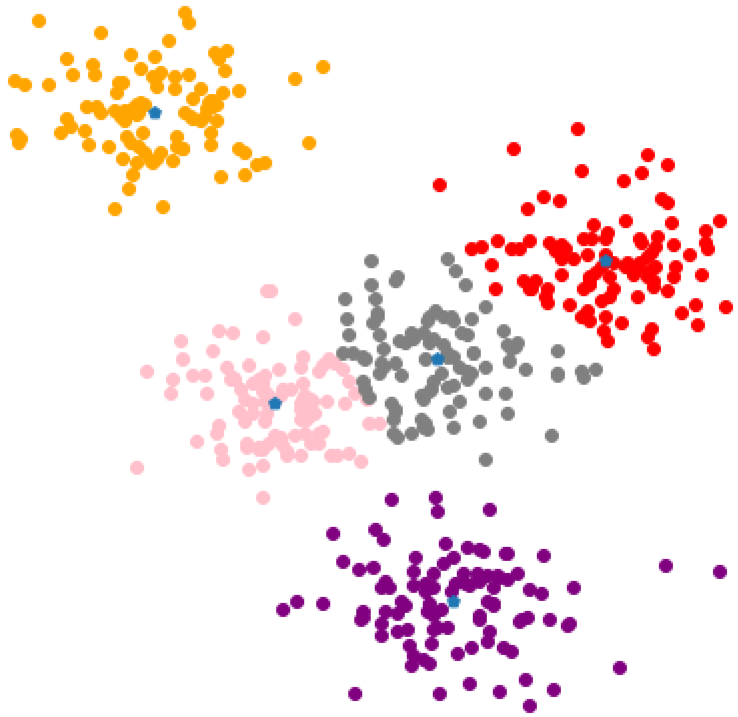
```
Y=pd.DataFrame(kmeans.labels_)
zong=pd.concat([X,Y],axis=1)
zong.columns=np.arange(0,3)
zong
```

Out[16]:

	0	1	2
0	-1.394523	-9.979650	3
1	-6.499994	2.697023	2
2	-3.616208	-4.700975	1
3	0.390109	-1.251595	0
4	-2.700083	-3.569590	4
...	...	...	...
495	-4.989807	3.661246	2
496	-5.896993	2.864224	2
497	0.513264	-2.313201	0
498	-5.068314	2.535247	2
499	-5.492924	1.362431	2

500 rows × 3 columns

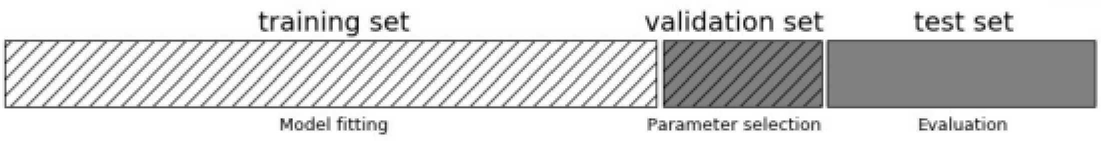
In [17]:
```
plt.figure(figsize=(7,7))
plt.axis('off')
plt.scatter(zong[zong[2]==0].iloc[:,0],zong[zong[2]==0].iloc[:,1],c='red')
plt.scatter(zong[zong[2]==1].iloc[:,0],zong[zong[2]==1].iloc[:,1],c='pink')
plt.scatter(zong[zong[2]==2].iloc[:,0],zong[zong[2]==2].iloc[:,1],c='orange')
plt.scatter(zong[zong[2]==3].iloc[:,0],zong[zong[2]==3].iloc[:,1],c='purple')
plt.scatter(zong[zong[2]==4].iloc[:,0],zong[zong[2]==4].iloc[:,1],c='grey')
plt.scatter(kmeans.cluster_centers_[:,0],kmeans.cluster_centers_[:,1],marker='p')
plt.show()
```



参数过拟合的风险与验证集

In [18]:
```
d=plt.imread('./Screenshot 2021-06-30 102706.jpg')
plt.figure(figsize=(10,10))
plt.axis('off')
plt.imshow(d)
```

Out[18]:
```
<matplotlib.image.AxesImage at 0x1ef1fb664c0>
```



In [19]:
```
from sklearn.svm import SVC
from sklearn.datasets import load_iris
iris=load_iris()
from sklearn.model_selection import train_test_split
#将数据分为训练+验证集和测试集
```

```
x_trainval, x_test, y_trainval, y_test = train_test_split(iris.data, iris.target, rando
#将数据分为训练和验证集
x_train,x_valid,y_train,y_valid= train_test_split(x_trainval, y_trainval, random_state=
best_score=0
for gamma in [0.001,0.01,0.1,1,10,100]:
    for c in [0.001,0.01,0.1,1,10,100]:
        svm=SVC(gamma=gamma,C=c)
        svm.fit(x_train,y_train)
        score=svm.score(x_valid,y_valid)
        if score>best_score:
            best_score=score
            best_parameter={'c':c,'gamma':gamma}
        else:
            pass
print(best_score)
print(best_parameter)
```

```
0.9642857142857143
{'c': 10, 'gamma': 0.001}
```

In [20]:

```
#在训练+验证集上重新构建一个模型，并在测试集上进行评估
svm=SVC(gamma=0.001,C=10)
svm.fit(x_trainval,y_trainval)
score=svm.score(x_test,y_test)
score
```

Out[20]:

```
0.9210526315789473
```

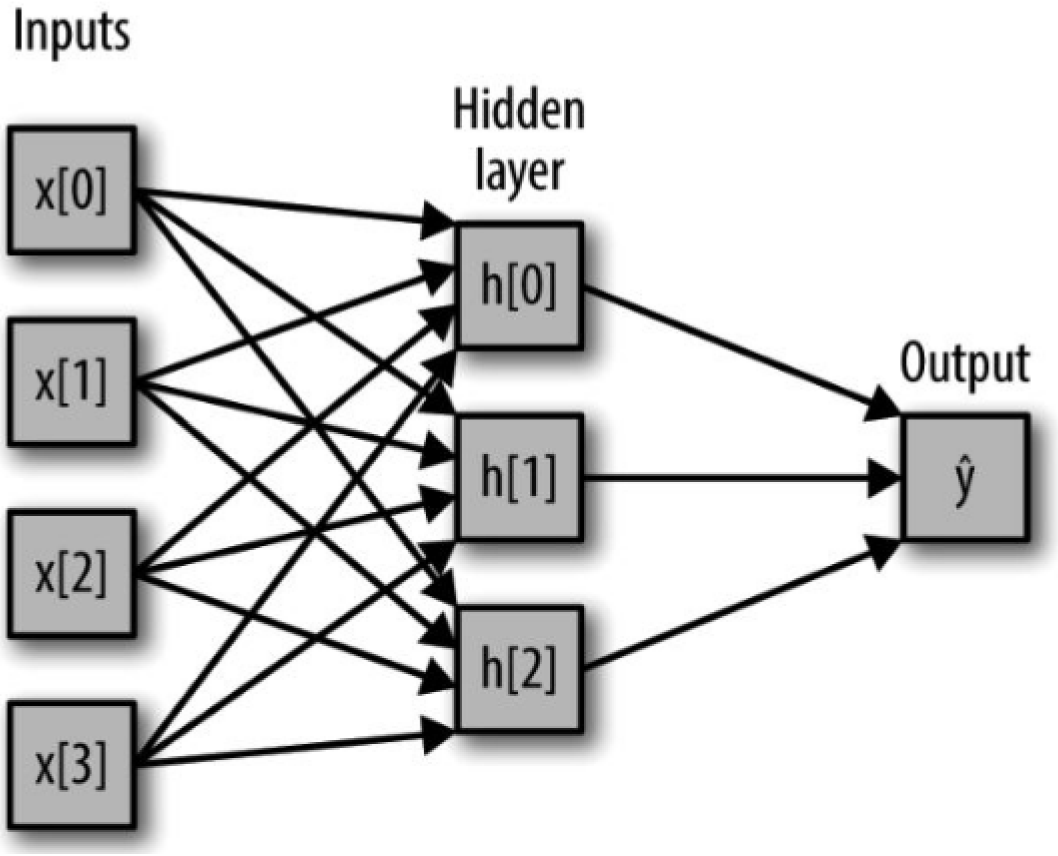
神经网络（深度学习）

In [21]:

```
d=plt.imread('./捕获.jpg')
plt.figure(figsize=(10,10))
plt.axis('off')
plt.imshow(d)
```

Out[21]:

```
<matplotlib.image.AxesImage at 0x1ef2008b0a0>
```



Source:Introduction to Machine Learning with Python Andreas C.Muller / Sarah Guido