In [5]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

What is machine learning? Where and why you will use machine learning?

Machine learning (ML) is a type of artificial intelligence (AI) that allows software applications to become more accurate at predicting outcomes without being explicitly programmed to do so We can use machine learning applicatiuons where we cannot hard code the rules. Example, if we were tasked with segregating emails as either spam of ham, we can not hard code the algorithm since it requires a level of analysis. Also, if we have a million emails that need to be labeled, we cnat manually do it. Hence, we need an machine learning algorithm to categorize it as spam or ham.

What is normalization and why do you perform? Explain with examples. How do you perform it?

Ans. Normalization is an data preperation technique. We use it to transform the data/columns in a data set to the same scale. This ensures that we are getting the results in the same scale and that we give equal importance to all the features when performing machine learning predictions.

Example: If we take features such as height and income, since these 2 features are measuring in a different way in that the former is measured in centimeters or meters. On the other hand, income can be either measured in dollars or other currencies depending on the country of origin of the amount. Therefore, when we are dealing with machine learning, we should ensure that importance is not given to one feature while neglecting the other. We would be hence performing normalization.

Min-max normalization: We take the minimum value of a particular feature and we subtract it from all the other values in our feature. We divide this result with the difference between the maximum value and the minimum value to get the normalized results.

Standardization: There is a second way in which we can perform normalization. We take the standard deviation of each feature and we take the mean of a particular feature. We subtract each value from a feature with the mean and divide the result with the standard deviation of this feature to get normalized results.

Mean Normalization: We take the mean value of a particular feature and we subtract it from all the other values in our feature. We divide this result with the difference between the maximum value and the minimum value to get the normalized results.

What is supervised and unsupervised learning? Give some examples

Supervised learning is the learning algorithm performed on labeled dataset. Unsupervised is performned on unlabled dataset. Examples of supervised learning:

```
1) Weather to give a loan or not based on previous data. Here, we provide
labled data to the algorithm for the applications that were
    approved for loan and for those that were not. The algorithm will
predict if an applicant is eligible for the loan.
```

Unsupervised learning: Unsupervised Learning is performed on datasets that do not contain any labels or explicit instructions on what to do with it. The goal is for the learning algorithm to find structure in the input data on its own. Examples:

```
1) Clustering based on customer segmentation. We would be segmenting the
customers in applications such as e-commerce where the behavior of the
customers is segmentated and understood based on their interests. We
would classify the customers based on their user behavior with the aid of
unsupervised machine learning (clustering). After successfully
clustering, we can give offers to various customers depending on their
interests.
```

In [78]:

```
#Change the path of the file location appropriately

df = pd.read_csv("WorldRecords_1.csv",encoding = 'latin')
```

In [79]:

```
'''
Q1 print the basic information about the data set
'''
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 285 entries, 0 to 284
Data columns (total 7 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   Event        285 non-null    object 
 1   Type         285 non-null    object 
 2   Record       285 non-null    float64
 3   Athlete      285 non-null    object 
 4   Nationality  285 non-null    object 
 5   Location     285 non-null    object 
 6   Year         285 non-null    int64  
dtypes: float64(1), int64(1), object(5)
memory usage: 15.7+ KB
```

In [80]:

```
'''
Q2 How many different types of events (e.g. “Mens 100m”, “Womens shotput” etc) are repr
'''
df['Event'].value_counts() # number of people in each event
```

Out[80]:

```
Mens Polevault     55
Womens Shotput     41
Mens Shotput       39
Mens Mile          32
Womens 800m        29
Mens TripleJump    25
Mens 800m          24
Mens 100m          17
Womens Mile        13
Womens 100m        10
Name: Event, dtype: int64
```

In [90]:

```
len(df.groupby('Event')['Record'].mean().index)
```

Out[90]:

```
10
```

In [10]:

```
'''
Q3. In what year did Usain Bolt first break the world record for the Men’s 100m?
'''

df[(df['Event']=='Mens 100m') & (df['Athlete']=='Usain Bolt')]['Year'].min()
```

Out[10]:

```
2008
```

In [11]:

```
'''
Q4.Create a subset of the dataset that contains only the world record cases for men’s s
'''

df1=df[(df['Event']=='Mens Shotput') | (df['Event']=='Womens Shotput')]
```

In [12]:

```
df1
```

Out[12]:

	Event	Type	Record	Athlete	Nationality	Location	Year
205	Mens Shotput	distance	17.68	Charlie Fonville	USA	Lawrence, U.S.	1948
206	Mens Shotput	distance	17.79	Jim Fuchs	USA	Oslo, Norway	1949
207	Mens Shotput	distance	17.82	Jim Fuchs	USA	Los Angeles, U.S.	1950
208	Mens Shotput	distance	17.90	Jim Fuchs	USA	Visby, Sweden	1950
209	Mens Shotput	distance	17.95	Jim Fuchs	USA	Eskilstuna, Sweden	1950
...	...	...	...	...	...	...	...
280	Womens Shotput	distance	22.36	Ilona Slupianek	GDR	Celje, Yugoslavia	1980
281	Womens Shotput	distance	22.45	Ilona Slupianek	GDR	Potsdam, East Germany	1980
282	Womens Shotput	distance	22.53	Natalya Lisovskaya	URS	Sochi, Soviet Union	1984
283	Womens Shotput	distance	22.60	Natalya Lisovskaya	URS	Moscow, Soviet Union	1987
284	Womens Shotput	distance	22.63	Natalya Lisovskaya	URS	Moscow, Soviet Union	1987

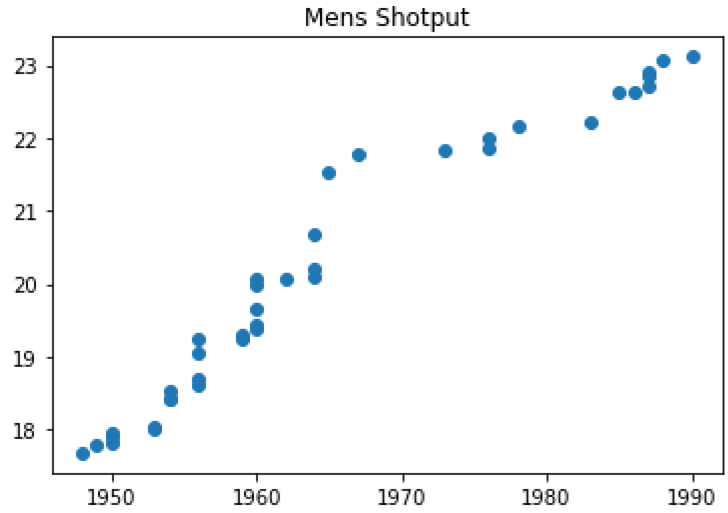
80 rows × 7 columns

In [13]:

```
'''
Q5 Create a scatter plot of the year and record shotput distance one for men and one fo
'''
df1=df[(df['Event']=='Mens Shotput')]
plt.scatter(x=df1['Year'], y=df1['Record'])
plt.title('Mens Shotput')
```

Out[13]:

```
Text(0.5, 1.0, 'Mens Shotput')
```

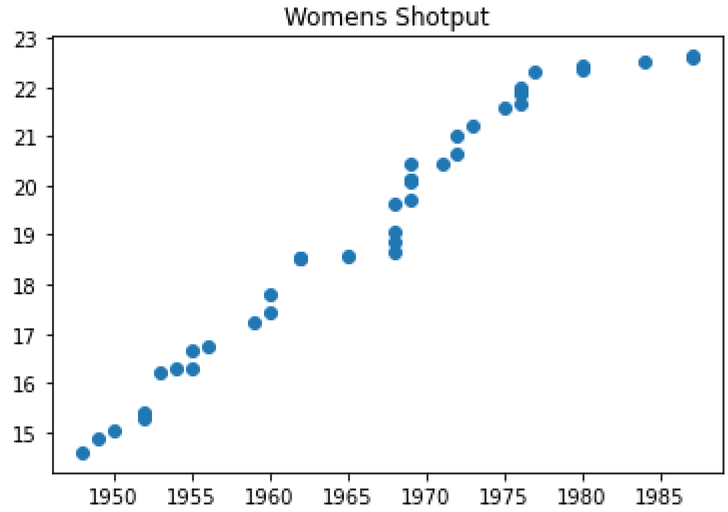


In [14]:

```
df2=df[(df['Event']=='Womens Shotput')]
plt.scatter(x=df2['Year'], y=df2['Record'])
plt.title('Womens Shotput')
```

Out[14]:

```
Text(0.5, 1.0, 'Womens Shotput')
```



In [43]:

```
'''
Q6 Find the average/mean  time for each event. How many athletes have time more than av

'''
df.groupby(['Event'])['Record'].mean() #the mean time for each event
```

Out[43]:

```
Event
Mens 100m             9.848824
Mens 800m           105.345833
Mens Mile           237.493750
Mens Polevault        5.608909
Mens Shotput         20.194872
Mens TripleJump      16.671200
Womens 100m          10.880000
Womens 800m         127.851724
Womens Mile         263.653846
Womens Shotput       19.139756
Name: Record, dtype: float64
```

In [67]:

```
df_event_grouped = df.groupby(['Event'])['Record'].mean().to_frame()
df_merged = df.merge(df_event_grouped, how = 'left', on = 'Event')
df_merged[df_merged['Record_x'] > df_merged['Record_y']].groupby(by = 'Event')['Record_
#the number of people that are above mean for each event
```

Out[67]:

```
Event
Mens 100m            9
Mens 800m           10
Mens Mile           15
Mens Polevault      31
Mens Shotput        16
Mens TripleJump     12
Womens 100m          6
Womens 800m         13
Womens Mile          5
Womens Shotput      21
Name: Record_x, dtype: int64
```

In [11]:

```
'''
Q7 Select the athlete who took most time in men’s 100m  and women’s event.
'''
print(df[(df['Event']=='Mens 100m')][['Athlete','Record']].max()) #hghest in men 100m
print(df[(df['Event']=='Womens 100m')][['Athlete','Record']].max()) #highest in womens
```

```
Athlete     Usain Bolt
Record           10.06
dtype: object
Athlete     Wyomia Tyus
Record            11.07
dtype: object
```

In [66]:

```
'''
Q8 Which country won maximum times of men’s 100m event?
'''
df[df['Event'] == 'Mens 100m']['Nationality'].value_counts().index[0]
```

Out[66]:

```
'United States'
```

In [13]:

```
'''
Q9 How many athletes are there in each event?

'''
df.groupby(['Event'])['Athlete'].count()
```

Out[13]:

```
Event
Mens 100m           17
Mens 800m           24
Mens Mile           32
Mens Polevault      55
Mens Shotput        39
Mens TripleJump     25
Womens 100m         10
Womens 800m         29
Womens Mile         13
Womens Shotput      41
Name: Athlete, dtype: int64
```