Logistic Regression Using Weather Data

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

In [2]:
```
df = pd.read_csv("weather.csv")
```

In [3]:
```
df.head()
```

Out[3]:

	MinTemp	MaxTemp	Rainfall	Evaporation	Sunshine	WindGustDir	WindGustSpeed	WindDir9am	WindDir3pm
0	8.0	24.3	0.0	3.4	6.3	NW	30.0	SW	NW
1	14.0	26.9	3.6	4.4	9.7	ENE	39.0	E	W
2	13.7	23.4	3.6	5.8	3.3	NW	85.0	N	NNE
3	13.3	15.5	39.8	7.2	9.1	NW	54.0	WNW	W
4	7.6	16.1	2.8	5.6	10.6	SSE	50.0	SSE	ESE

5 rows × 22 columns

In [4]:
```
df.size
```

Out[4]:
```
8052
```

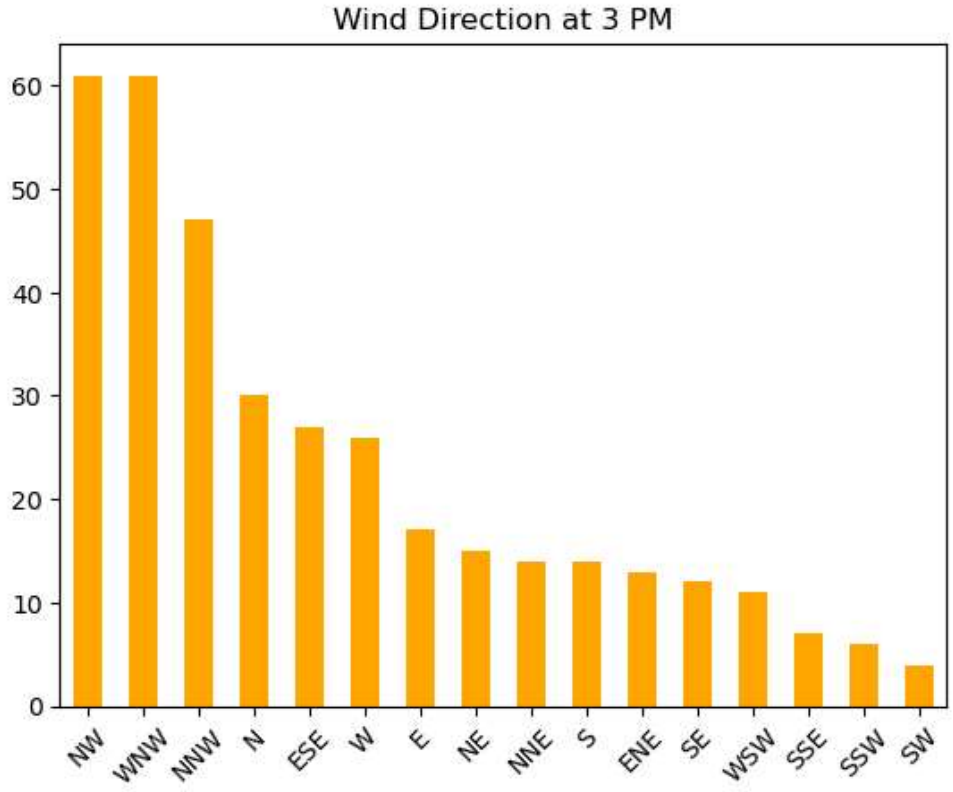
In [5]:
```
df.shape
```

Out[5]:
```
(366, 22)
```

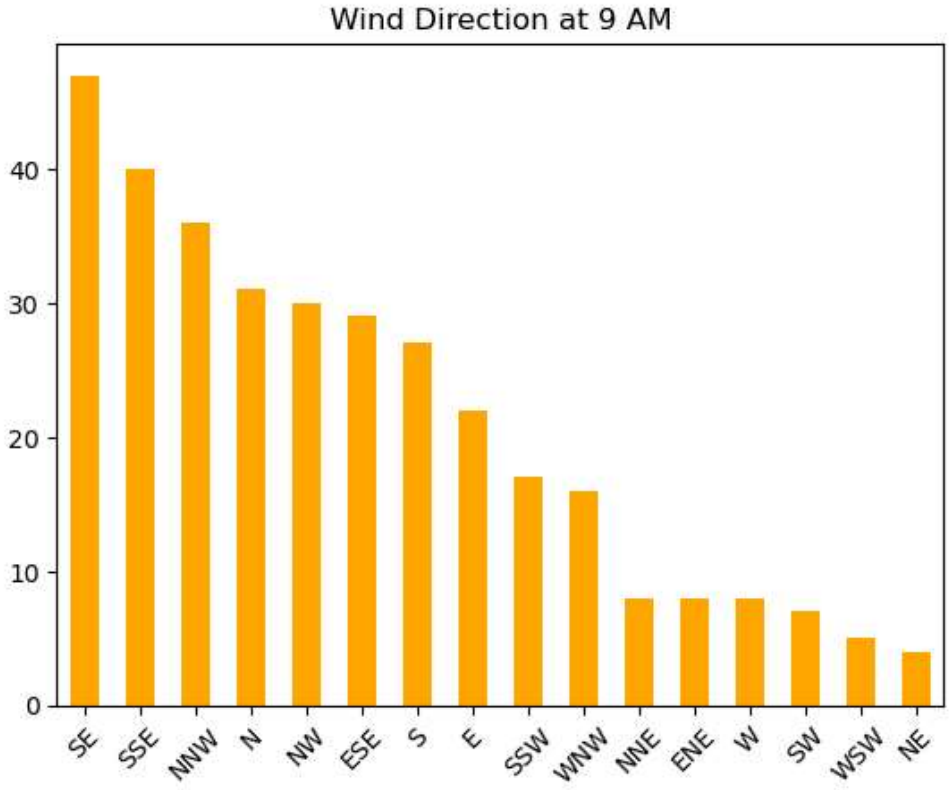
In [6]:
```
df.columns
```

Out[6]:
```
Index(['MinTemp', 'MaxTemp', 'Rainfall', 'Evaporation', 'Sunshine',
       'WindGustDir', 'WindGustSpeed', 'WindDir9am', 'WindDir3pm',
       'WindSpeed9am', 'WindSpeed3pm', 'Humidity9am', 'Humidity3pm',
       'Pressure9am', 'Pressure3pm', 'Cloud9am', 'Cloud3pm', 'Temp9am',
       'Temp3pm', 'RainToday', 'RISK_MM', 'RainTomorrow'],
      dtype='object')
```

In [7]:
```
df['WindDir3pm'].value_counts().plot(kind="bar", color='orange')
plt.title("Wind Direction at 3 PM")
plt.xticks(rotation=45)  # Rotate x-axis labels
plt.show()
```



In [8]:
```
df['WindDir9am'].value_counts().plot(kind="bar", color='orange')
plt.title("Wind Direction at 9 AM")
plt.xticks(rotation=45)  # Rotate x-axis
plt.show()
```



Transform categorical data into numerical values in a DataFrame

In [9]:
```
df['RainToday']=df['RainToday'].apply(lambda x:1 if x == "Yes" else 0)
```

In [10]:
```
df['RainTomorrow']=df['RainTomorrow'].apply(lambda x:1 if x == "Yes" else 0)
```

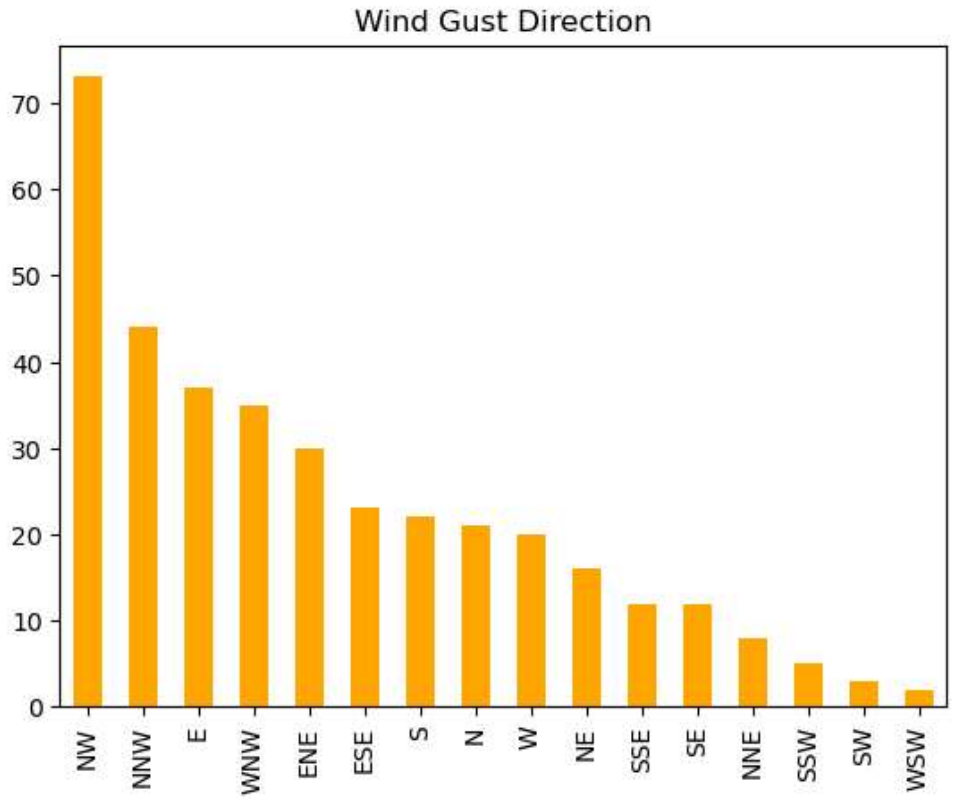
In [11]:
```
df.head()
```

Out[11]:

	MinTemp	MaxTemp	Rainfall	Evaporation	Sunshine	WindGustDir	WindGustSpeed	WindDir9am	WindDir3pm
0	8.0	24.3	0.0	3.4	6.3	NW	30.0	SW	NW
1	14.0	26.9	3.6	4.4	9.7	ENE	39.0	E	W
2	13.7	23.4	3.6	5.8	3.3	NW	85.0	N	NNE
3	13.3	15.5	39.8	7.2	9.1	NW	54.0	WNW	W
4	7.6	16.1	2.8	5.6	10.6	SSE	50.0	SSE	ESE

5 rows × 22 columns

In [12]:
```
df.WindGustDir.value_counts().plot(kind = "bar",color = 'orange')
plt.title("Wind Gust Direction")
plt.show()
```



In [13]:
```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
df=df.dropna()
```

In [14]:
```
df.shape
```

Out[14]:
```
(328, 22)
```

In [15]:
```
df.WindGustDir = le.fit_transform(df.WindGustDir)
df.WindDir3pm = le.fit_transform(df.WindDir3pm)
df.WindDir9am = le.fit_transform(df.WindDir9am)
```

In [16]:
```
df.describe()
```

Out[16]:

	MinTemp	MaxTemp	Rainfall	Evaporation	Sunshine	WindGustDir	WindGustSpeed	WindDir9am	W
count	328.000000	328.000000	328.000000	328.000000	328.000000	328.000000	328.000000	328.000000	
mean	7.742988	20.897561	1.440854	4.702439	8.014939	6.192073	40.396341	7.067073	
std	5.945199	6.707310	4.289427	2.681183	3.506646	4.337765	13.132176	3.897197	
min	-5.300000	7.600000	0.000000	0.200000	0.000000	0.000000	13.000000	0.000000	
25%	2.850000	15.500000	0.000000	2.550000	6.000000	2.000000	31.000000	3.000000	
50%	7.900000	20.400000	0.000000	4.400000	8.750000	6.500000	39.000000	7.500000	
75%	12.800000	25.800000	0.200000	6.600000	10.700000	8.000000	46.000000	10.000000	
max	20.900000	35.800000	39.800000	13.800000	13.600000	15.000000	98.000000	15.000000	

8 rows × 22 columns

In [17]:
```
#Training and Testing
from sklearn.model_selection import train_test_split
x = df.drop(['RainTomorrow'],axis=1)
y = df['RainTomorrow']
```

In [18]:
```
y
```

Out[18]:
```
0      1
1      1
2      1
3      1
4      0
      ..
361    0
362    0
363    0
364    0
365    0
Name: RainTomorrow, Length: 328, dtype: int64
```

In [19]:
```
train_x , train_y ,test_x , test_y = train_test_split(x,y ,test_size = 0.3,random_state = 2)
```

In [20]:
```
train_x.shape
```

Out[20]:
```
(229, 21)
```

In [21]:
```
test_x.shape
```

Out[21]:
```
(229,)
```

In [22]:
```
train_y.shape
```

Out[22]:
```
(99, 21)
```

In [23]:
```
from sklearn.linear_model import LogisticRegression
model = LogisticRegression(max_iter=2000)
model.fit(train_x , test_x)
```

Out[23]:
```
LogisticRegression
(https://scikit-learn.org/1.4/modules/generated/sklearn.linear_model.LogisticRegression.h

LogisticRegression(max_iter=2000)
```

In [24]:
```
predict = model.predict(train_y)
```

In [25]:
```
from sklearn.metrics import accuracy_score, classification_report
score = accuracy_score(predict, test_y)
score
```

Out[25]:
```
0.9797979797979798
```

In [26]:
```
report = classification_report(predict, test_y)
print(report)
```

```
              precision    recall  f1-score   support

           0       1.00      0.98      0.99        85
           1       0.88      1.00      0.93        14

    accuracy                           0.98        99
   macro avg       0.94      0.99      0.96        99
weighted avg       0.98      0.98      0.98        99
```

Logistic Regression using Social Network Ads

In [27]:
```
from sklearn.preprocessing import OneHotEncoder
from sklearn.compose import ColumnTransformer
from sklearn.pipeline import Pipeline
```

In [28]:
```
df = pd.read_csv('Social_Network_Ads.csv')
df
```

Out[28]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0
...	...	...	...	...	...
395	15691863	Female	46	41000	1
396	15706071	Male	51	23000	1
397	15654296	Female	50	20000	1
398	15755018	Male	36	33000	0
399	15594041	Female	49	36000	1

400 rows × 5 columns

In [29]:
```
df.head()
```

Out[29]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0

In [30]:
```
df.shape
```

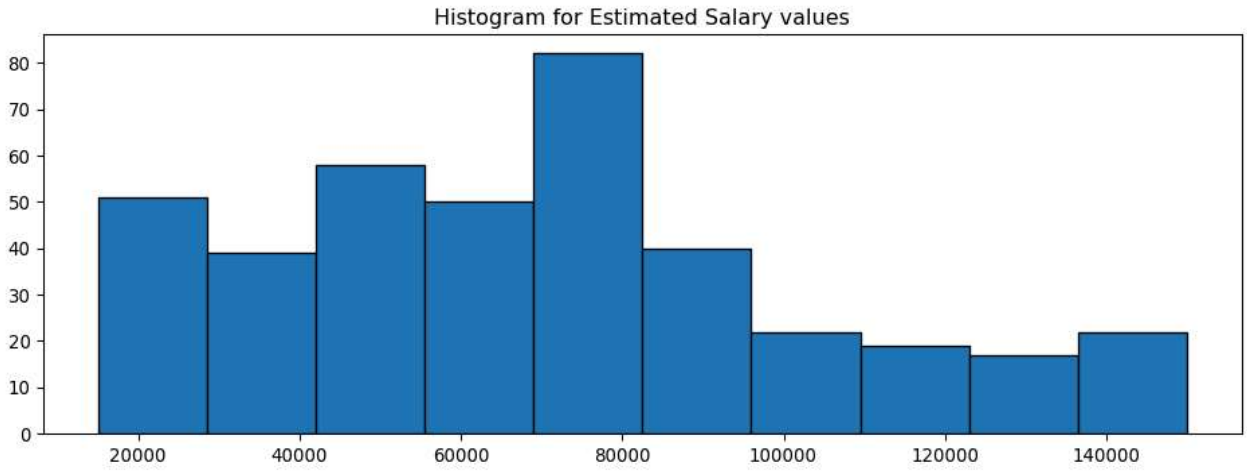
Out[30]:
```
(400, 5)
```

In [31]:
```
df.columns
```

Out[31]:
```
Index(['User ID', 'Gender', 'Age', 'EstimatedSalary', 'Purchased'], dtype='object')
```

In [32]:
```
df = df.drop(columns=['Gender'])
```

In [33]:
```
plt.figure(figsize = (12,4), dpi = 96)
plt.title("Histogram for Estimated Salary values")
plt.hist(df['EstimatedSalary'], bins = 'sturges', edgecolor = 'black')
plt. show()
```



In [34]:
```
from sklearn.model_selection import train_test_split

X = df.drop(columns = 'Purchased')
y = df['Purchased']

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.3, random_state = 42
```

In [35]:
```
lr = LogisticRegression()
lr.fit(X_train, y_train)
```

Out[35]:
```
LogisticRegression
LogisticRegression()
```
(https://scikit-learn.org/1.4/modules/generated/sklearn.linear_model.LogisticRegression.html)

In [36]:
```
print(lr.score(X_train, y_train))
y_train_pred = lr.predict(X_train)
```

```
0.8357142857142857
```

In [37]:
```
from sklearn.metrics import confusion_matrix
from sklearn.metrics import classification_report
print("\n Confusion Matrix \n")
print(confusion_matrix(y_train, y_train_pred))

print("\n Classification Report\n")
print(classification_report(y_train, y_train_pred))
```

```
 Confusion Matrix

[[170  14]
 [ 32  64]]

 Classification Report

              precision    recall  f1-score   support

           0       0.84      0.92      0.88       184
           1       0.82      0.67      0.74        96

    accuracy                           0.84       280
   macro avg       0.83      0.80      0.81       280
weighted avg       0.83      0.84      0.83       280
```

In [ ]: