In [51]:
```
#importing libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import tensorflow as tf
from tensorflow import keras
from sklearn.model_selection import train_test_split
```

In [52]:
```
#importing dataset
training_df = pd.read_csv('training.csv')
```

In [53]:
```
training_df.head(5)
```

Out[53]:

	Unnamed: 0	ID	Nationality	Age	DaysSinceCreation	AverageLeadTime	LodgingRevenue	C
0	82590	82591	SGP	47.0	11	0	0.00	
1	82591	82592	SGP	16.0	11	130	483.48	
2	82592	82593	SGP	15.0	11	0	0.00	
3	82593	82594	SGP	12.0	11	0	0.00	
4	82594	82595	PRT	NaN	11	0	0.00	

5 rows × 30 columns

In [54]:
```
training_df.shape
```

Out[54]:
```
(1000, 30)
```

In [55]:
```
training_df.describe()
```

Out[55]:

	Unnamed: 0	ID	Age	DaysSinceCreation	AverageLeadTime	LodgingRe
count	1000.000000	1000.000000	967.000000	1000.000000	1000.000000	1000.0
mean	83089.500000	83090.500000	39.720786	4.100000	36.840000	163.5
std	288.819436	288.819436	19.161205	3.124702	66.375508	302.3
min	82590.000000	82591.000000	0.000000	0.000000	0.000000	0.0
25%	82839.750000	82840.750000	25.000000	2.000000	0.000000	0.0
50%	83089.500000	83090.500000	42.000000	3.000000	0.000000	0.0
75%	83339.250000	83340.250000	53.000000	6.000000	41.250000	252.0
max	83589.000000	83590.000000	90.000000	11.000000	340.000000	3104.0

8 rows × 27 columns

In [56]:

```
#creating labels and features
labels = training_df['BookingsCheckedIn']
features = training_df.drop(columns=['BookingsCheckedIn'])
```

In [57]:

```
print(labels[0:5:1])
```

```
0    0
1    1
2    0
3    0
4    0
Name: BookingsCheckedIn, dtype: int64
```

In [58]:

```
#data preprocessing
labels.replace(0,0,inplace=True)
labels.replace(not 0,1,inplace=True)
```

In [59]:

```
labels[0:5:1]
```

Out[59]:

```
0    0
1    1
2    0
3    0
4    0
Name: BookingsCheckedIn, dtype: int64
```

In [60]:

```
features[0:5:1]
```

Out[60]:

	Unnamed: 0	ID	Nationality	Age	DaysSinceCreation	AverageLeadTime	LodgingRevenue
0	82590	82591	SGP	47.0	11	0	0.00
1	82591	82592	SGP	16.0	11	130	483.48
2	82592	82593	SGP	15.0	11	0	0.00
3	82593	82594	SGP	12.0	11	0	0.00
4	82594	82595	PRT	NaN	11	0	0.00

5 rows × 29 columns

In [61]:

```
#data preprocessing, here we replace textual data with random numeric dat
features = pd.get_dummies(features)
features[0:5]
```

Out[61]:

	Unnamed: 0	ID	Age	DaysSinceCreation	AverageLeadTime	LodgingRevenue	OtherRevenu
0	82590	82591	47.0	11	0	0.00	0.
1	82591	82592	16.0	11	130	483.48	155.
2	82592	82593	15.0	11	0	0.00	0.

	Unnamed: 0	ID	Age	DaysSinceCreation	AverageLeadTime	LodgingRevenue	OtherRevenu
3	82593	82594	12.0	11	0	0.00	0.(

In [62]:

```python
features = features.values.astype('float32')
labels = labels.values.astype('float32')
print(features[0:2])
print(labels[0:2])
print(len(features[0]))
```

```
[[ 8.2590e+04  8.2591e+04  4.7000e+01  1.1000e+01  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00 -1.0000e+00
  -1.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  1.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   1.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  1.0000e+00
   0.0000e+00]
 [ 8.2591e+04  8.2592e+04  1.6000e+01  1.1000e+01  1.3000e+02  4.8348e+02
   1.5510e+02  0.0000e+00  0.0000e+00  1.5000e+01  5.0000e+00  1.6000e+01
   1.6000e+01  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  1.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00
   1.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  0.0000e+00  1.0000e+00
   0.0000e+00]]
[0. 1.]
85
```

In [83]:

```python
#splitting training and testing and validation data
features_train, features_test, labels_train, labels_test=train_test_split(
features_train, features_validation, labels_train, labels_validation = tra
```

In [142]:

```python
#creating a sequential model
import tensorflow as tf
from tensorflow import keras
classifier = keras.Sequential([keras.layers.Dense(32, input_shape=(85,)),
                               keras.layers.Dense(20, activation=tf.nn.relu),
                              keras.layers.Dense(3,activation='softmax')])
```

In [143]:

```
#compiling the model
classifier.compile(optimizer='adam',
             loss='sparse_categorical_crossentropy',
             metrics=['acc'])
```

In [144]:

```
#training the model
history = classifier.fit(features_train, labels_train, epochs=20, validati
Epoch 1/20
25/25 [==============================] - 1s 30ms/step - loss: nan - acc: 0.47
87 - val_loss: nan - val_acc: 0.4950
Epoch 2/20
25/25 [==============================] - 0s 1ms/step - loss: nan - acc: 0.527
5 - val_loss: nan - val_acc: 0.4950
Epoch 3/20
25/25 [==============================] - 0s 1ms/step - loss: nan - acc: 0.527
5 - val_loss: nan - val_acc: 0.4950
Epoch 4/20
25/25 [==============================] - 0s 1ms/step - loss: nan - acc: 0.527
5 - val_loss: nan - val_acc: 0.4950
Epoch 5/20
```

In [145]:

```
#evaluating the model
prediction_features = classifier.predict(features_test)
performance = classifier.evaluate(features_test, labels_test)
print(performance)
```

```
7/7 [==============================] - 0s 0s/step - loss: nan - acc: 0.5300
[nan, 0.5299999713897705]
```

In [68]:

```
#testing the test data
```

In [69]:

```
test_df = pd.read_csv('test.csv')
```

In [70]:

```
test_df.head(5)
```

Out[70]:

	Unnamed: 0	ID	Nationality	Age	DaysSinceCreation	AverageLeadTime	LodgingRevenue	Othe
0	0	1	PRT	51.0	150	45	371.0	
1	1	2	PRT	NaN	1095	61	280.0	
2	2	3	DEU	31.0	1095	0	0.0	
3	3	4	FRA	60.0	1095	93	240.0	
4	4	5	FRA	51.0	1095	0	0.0	

5 rows × 30 columns

In [71]:

```
test_df.shape
```

Out[71]:

```
(82580, 30)
```

In [72]:

```
test_df.describe()
```

Out[72]:

	Unnamed: 0	ID	Age	DaysSinceCreation	AverageLeadTime	Lodging
count	82580.000000	82580.000000	78834.000000	82580.000000	82580.000000	8258
mean	41289.500000	41290.500000	45.468554	459.138157	66.557205	30
std	23838.936952	23838.936952	16.526276	311.309295	87.928995	37

	Unnamed: 0	ID	Age	DaysSinceCreation	AverageLeadTime	Lodging
min	0.000000	1.000000	-11.000000	12.000000	-1.000000	
25%	20644.750000	20645.750000	34.000000	183.000000	0.000000	6
50%	41289.500000	41290.500000	46.000000	406.000000	30.000000	23
75%	61934.250000	61935.250000	57.000000	728.000000	104.000000	40
max	82579.000000	82580.000000	122.000000	1095.000000	588.000000	2178

In [73]:

```
labelsTest = test_df['BookingsCheckedIn']
featuresTest = test_df.drop(columns=['BookingsCheckedIn'])
```

In [74]:

```
print(labelsTest[0:5:1])
```

```
0    3
1    1
2    0
3    1
4    0
Name: BookingsCheckedIn, dtype: int64
```

In [75]:

```
labelsTest.replace(0,0,inplace=True)
labelsTest.replace(not 0,1,inplace=True)
```

In [76]:

```
labelsTest[0:5:1]
```

Out[76]:

```
0    3
1    1
2    0
3    1
4    0
Name: BookingsCheckedIn, dtype: int64
```

In [77]:

```
featuresTest[0:5:1]
```

Out[77]:

	Unnamed: 0	ID	Nationality	Age	DaysSinceCreation	AverageLeadTime	LodgingRevenue	Othe
0	0	1	PRT	51.0	150	45	371.0	
1	1	2	PRT	NaN	1095	61	280.0	
2	2	3	DEU	31.0	1095	0	0.0	
3	3	4	FRA	60.0	1095	93	240.0	
4	4	5	FRA	51.0	1095	0	0.0	

5 rows × 29 columns

In [78]:

```
featuresTest = pd.get_dummies(featuresTest)
featuresTest[0:5]
```

Out[78]:

	Unnamed: 0	ID	Age	DaysSinceCreation	AverageLeadTime	LodgingRevenue	OtherRevenue	E
0	0	1	51.0	150	45	371.0	105.3	
1	1	2	NaN	1095	61	280.0	53.0	
2	2	3	31.0	1095	0	0.0	0.0	
3	3	4	60.0	1095	93	240.0	60.0	
4	4	5	51.0	1095	0	0.0	0.0	

In [79]:

```
featuresTest = featuresTest.values.astype('float32')
labelsTest = labelsTest.values.astype('float32')
print(featuresTest[0:2])
print(labelsTest[0:2])
print(len(featuresTest[0]))
```

```
[[0.000e+00 1.000e+00 5.100e+01 1.500e+02 4.500e+01 3.710e+02 1.053e+02
  1.000e+00 0.000e+00 8.000e+00 5.000e+00 1.510e+02 1.074e+03 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
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  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
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  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 1.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
  0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00 0.000e+00
```

In [87]:

```
features_train1, features_test1, labels_train1, labels_test1=train_test_sp
features_train1, features_validation1, labels_train1, labels_validation1 =
```

In [115]:

```
import tensorflow as tf
from tensorflow import keras
classifier = keras.Sequential([keras.layers.Dense(32, input_shape=(225,)),
                          keras.layers.Dense(20, activation=tf.nn.relu),
                         keras.layers.Dense(100,activation='softmax')])
```

In [116]:

```
classifier.compile(optimizer='adam',
             loss='sparse_categorical_crossentropy',
             metrics=['acc'])
```

In [ ]:

```
#no need to train the model again, we can directly evaluate it
```

In [117]:

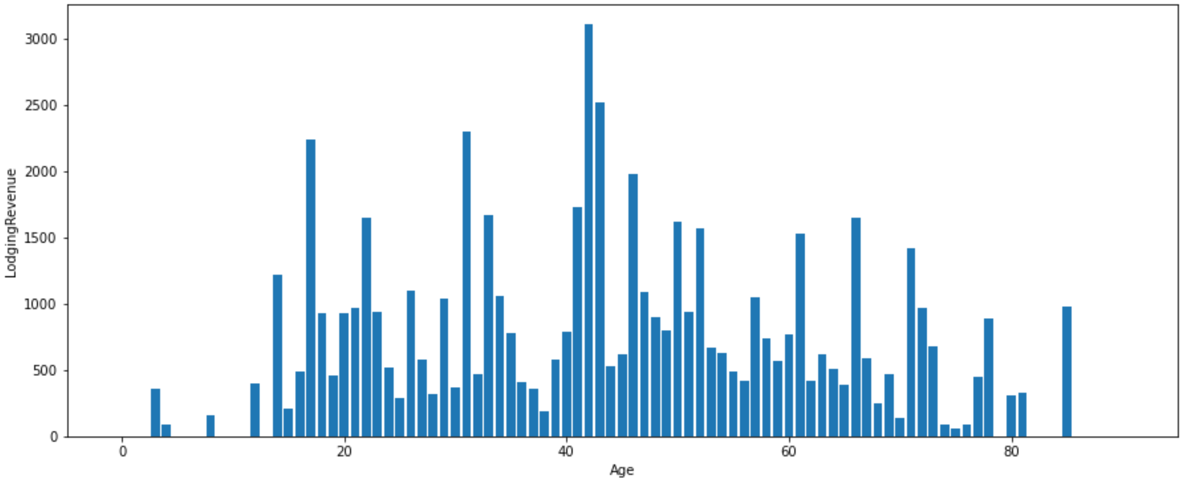
```
prediction_features = classifier.predict(features_test1)
performance1 = classifier.evaluate(features_test1, labels_test1)
print(performance1)
```

```
2323/2323 [==============================] - 4s 2ms/step - loss: nan - acc:
0.0099
[nan, 0.00991631019860506]
```

In [128]:

```
x=training_df['Age']
```

```
y=training_df['LodgingRevenue']
plt.figure(1 , figsize = (15 ,6))
plt.bar(x,y)
plt.xlabel('Age') , plt.ylabel('LodgingRevenue')
plt.show()
```

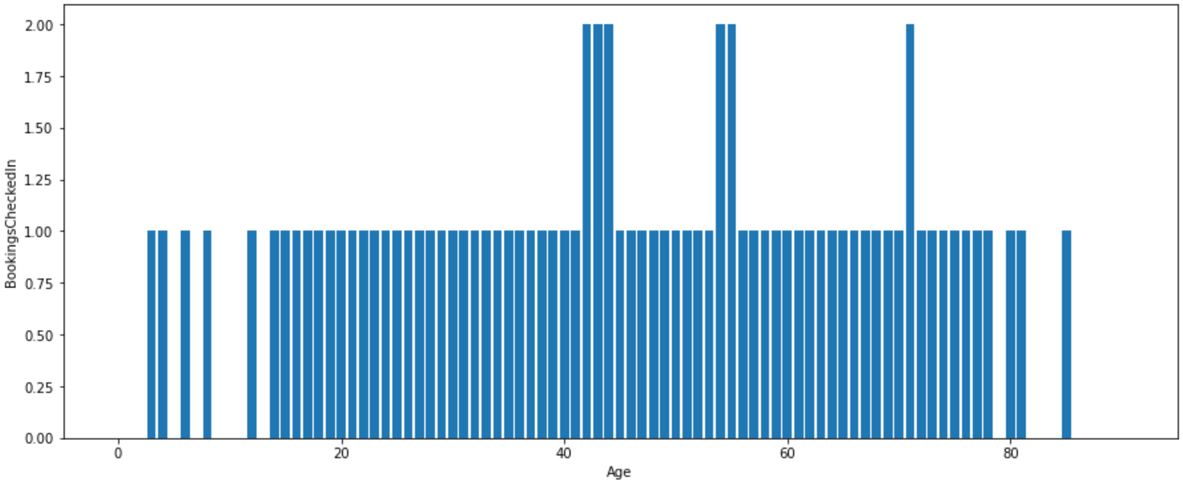


In [ ]:

```
#graph shows the relationship between age groups and lodging revenue
#incase of surplus, we need to prioritize the middle aged people in 40s
#as they spend more on the booking for amenties
```

In [132]:

```
x=training_df['Age']
y=training_df['BookingsCheckedIn']
plt.figure(1 , figsize = (15 ,6))
plt.bar(x,y)
plt.xlabel('Age') , plt.ylabel('BookingsCheckedIn')
plt.show()
```

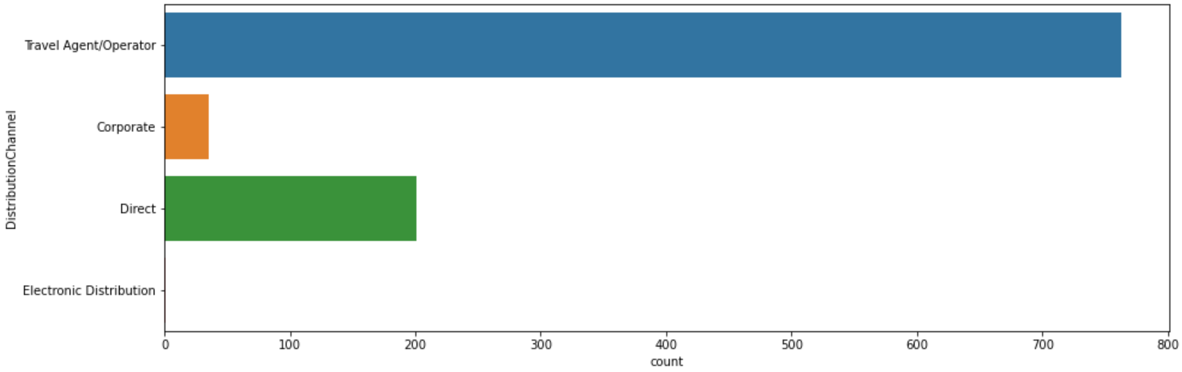


In [ ]:

```
#graph shows that people in 20s and 30s are prone to not checking in after
```

In [147]:

```
import seaborn
def graph3():
    plt.figure(1 , figsize = (15 , 5))
    seaborn.countplot(y = 'DistributionChannel' , data = pd.read_csv('trai
    plt.show()
print(graph3())
```



```
None
```

In [148]:

```
#above graph shows that a lot of people come through travel agents
#so we should focus on advertising ourselves through travel agents
```