DSC 2CC PROJECT

(MACHINE LEARNING)

PROJECT REVIEW REPORT

Submitted by
MAYUKH GHOSH (18BCE0417)

Prepared For

DSC 2CC

PROJECT COMPONENT

VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

DSC VIT

ABSTRACT:

A wildlife strike is a collision between an animal (most often a bird, but sometimes another species) and a man made vehicle, especially aircraft. Wildlife strikes constitute a serious hazard to aircraft safety and have caused a number of fatal accidents.
The Federal Aviation Authority counted 177,269 wildlife strike reports on civil aircraft between 1990 and 2015, growing 38% in seven years from 2009 to 2015. Birds accounted for 97%.

DATASET:

Given below is the dataset of Aircraft Wildlife Strikes in the years 1990-2015 which we used in our project.

Link: https://www.kaggle.com/faa/wildlife-strikes

DESCRIPTION OF THE DATASET:

The dataset contains a record of each reported wildlife strike of a military, commercial, or civil aircraft between 1990 and 2015. Each row contains the incident date, aircraft operator, aircraft make and model, engine make and model, airport name and location, species name and quantity, and aircraft damage.

TASK OBJECTIVE:

As described above, this dataset has 66 features related to the damage caused to airplanes and the species of bird that caused the damage
Your objective is:
Find the answer the questions below

1. What bird species has caused the most damage to airplanes?

2. Which part of the airplane is most prone to damage in wildlife strikes?

DSC 2CC PROJECT

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NAME: MAYUKH GHOSH

REG: 18BCE0417

[1]:
```
import numpy as np
import pandas as pd
import sklearn as sklearn
import matplotlib.pyplot as plt
import seaborn as sns
import sys
import re
```

[2]:
```
data = pd.read_csv("database.csv")
```

```
C:\Users\Mayukh\Anaconda3\lib\site-
packages\IPython\core\interactiveshell.py:3051: DtypeWarning: Columns
(9,12,15,17) have mixed types. Specify dtype option on import or set
low_memory=False.
  interactivity=interactivity, compiler=compiler, result=result)
```

[3]:
```
attributes=(list(data))
attributes
```

[3]:
```
['Record ID',
 'Incident Year',
 'Incident Month',
 'Incident Day',
 'Operator ID',
 'Operator',
 'Aircraft',
 'Aircraft Type',
 'Aircraft Make',
 'Aircraft Model',
 'Aircraft Mass',
 'Engine Make',
 'Engine Model',
 'Engines',
 'Engine Type',
 'Engine1 Position',
```

```
'Engine2 Position',
'Engine3 Position',
'Engine4 Position',
'Airport ID',
'Airport',
'State',
'FAA Region',
'Warning Issued',
'Flight Phase',
'Visibility',
'Precipitation',
'Height',
'Speed',
'Distance',
'Species ID',
'Species Name',
'Species Quantity',
'Flight Impact',
'Fatalities',
'Injuries',
'Aircraft Damage',
'Radome Strike',
'Radome Damage',
'Windshield Strike',
'Windshield Damage',
'Nose Strike',
'Nose Damage',
'Engine1 Strike',
'Engine1 Damage',
'Engine2 Strike',
'Engine2 Damage',
'Engine3 Strike',
'Engine3 Damage',
'Engine4 Strike',
'Engine4 Damage',
'Engine Ingested',
'Propeller Strike',
'Propeller Damage',
'Wing or Rotor Strike',
'Wing or Rotor Damage',
'Fuselage Strike',
'Fuselage Damage',
'Landing Gear Strike',
'Landing Gear Damage',
'Tail Strike',
'Tail Damage',
'Lights Strike',
```

```
 'Lights Damage',
 'Other Strike',
 'Other Damage']
```

1 What bird species has caused the most damage to airplanes?

[4]:
```
species = data["Species Name"]
species_count=species.value_counts()
print(species_count)
```

```
UNKNOWN MEDIUM BIRD            38531
UNKNOWN SMALL BIRD             32981
MOURNING DOVE                   7653
GULL                            6580
UNKNOWN BIRD                    6400
                               …
HERMIT WARBLER                     1
INTERMEDIATE EGRET                 1
EASTERN SMALL-FOOTED MYOTIS        1
LITTLE OWL                         1
ALLIGATOR SNAPPING TURTLE          1
Name: Species Name, Length: 715, dtype: int64
```

[5]:
```
species_count=species_count[species_count>4000]
print(species_count)
```

```
UNKNOWN MEDIUM BIRD    38531
UNKNOWN SMALL BIRD     32981
MOURNING DOVE           7653
GULL                    6580
UNKNOWN BIRD            6400
KILLDEER                4562
AMERICAN KESTREL        4476
BARN SWALLOW            4215
Name: Species Name, dtype: int64
```

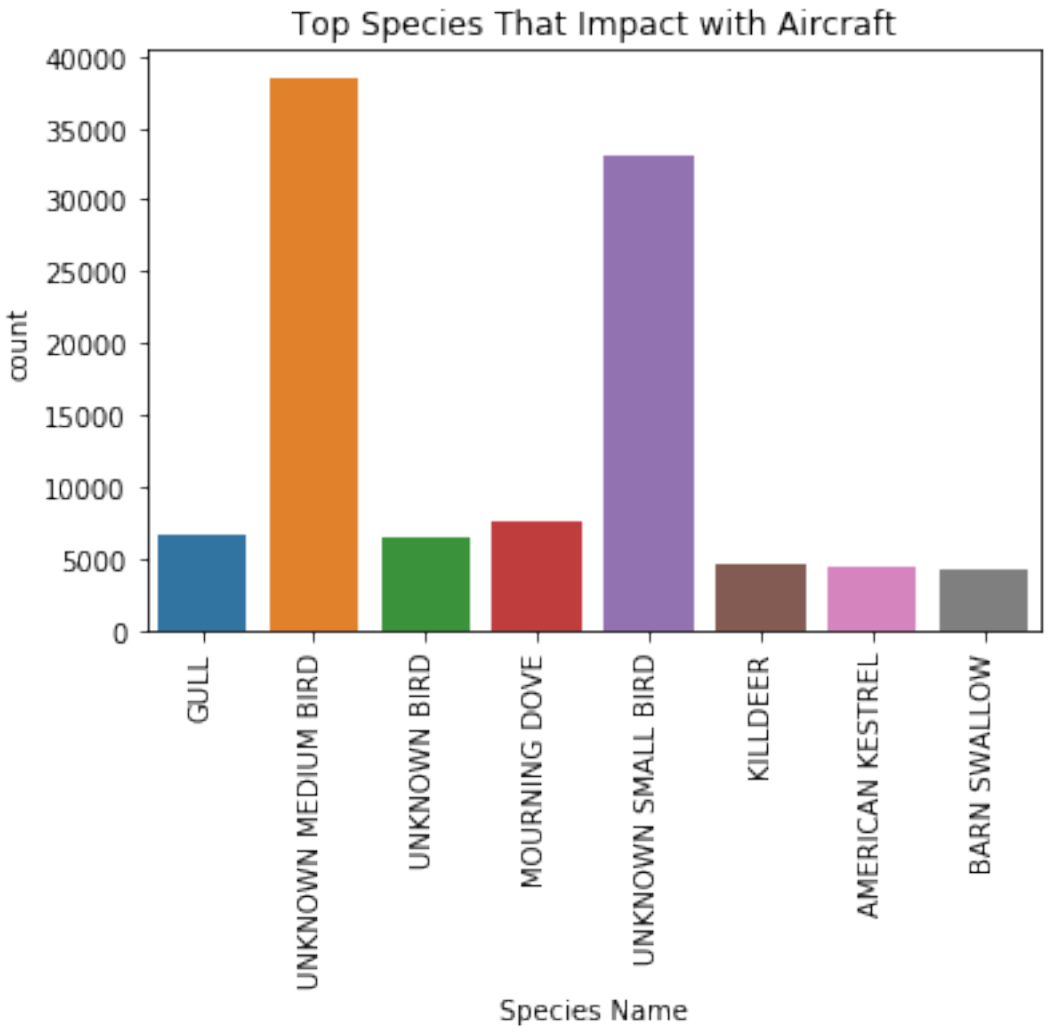
[6]:
```
top_species = ["UNKNOWN MEDIUM BIRD","UNKNOWN SMALL BIRD","MOURNING DOVE",␣
 ↪"GULL","UNKNOWN BIRD","KILLDEER", "AMERICAN KESTREL","BARN SWALLOW"]
top_species = species[species.isin(top_species)]
print(top_species.value_counts())
```

```
UNKNOWN MEDIUM BIRD    38531
UNKNOWN SMALL BIRD     32981
MOURNING DOVE           7653
GULL                    6580
UNKNOWN BIRD            6400
KILLDEER                4562
```

```
AMERICAN KESTREL        4476
BARN SWALLOW            4215
Name: Species Name, dtype: int64
```

[7]:
```
sns.countplot(top_species)
plt.title("Top Species That Impact with Aircraft")
plt.xticks(rotation='vertical')
```

[7]:
```
(array([0, 1, 2, 3, 4, 5, 6, 7]), <a list of 8 Text xticklabel objects>)
```



We can see that there are some unknow medium birds which effect the aircraft the most, but our objective is to know the known species

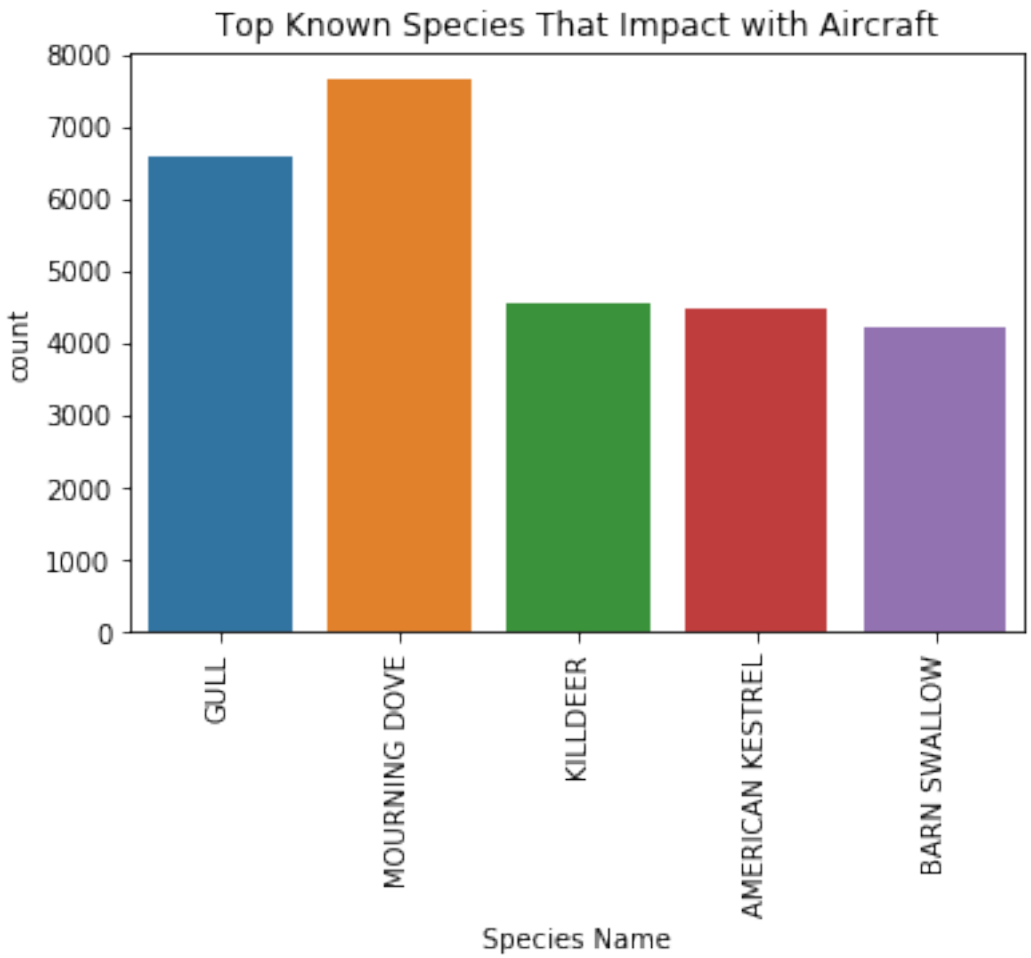
[8]:
```
top_known_species = ["MOURNING DOVE", "GULL","KILLDEER", "AMERICAN␣
↪KESTREL","BARN SWALLOW"]
```

```
top_known_species = species[species.isin(top_known_species)]
print(top_known_species.value_counts())
```

```
MOURNING DOVE       7653
GULL                6580
KILLDEER            4562
AMERICAN KESTREL    4476
BARN SWALLOW        4215
Name: Species Name, dtype: int64
```

[9]:
```
sns.countplot(top_known_species)
plt.title("Top Known Species That Impact with Aircraft")
plt.xticks(rotation='vertical')
```

[9]: (array([0, 1, 2, 3, 4]), <a list of 5 Text xticklabel objects>)



1.0.1 CONCLUSION:

From the above graph it is clear that "MOURNING DOVE" species of birds effect the aircrafts the most

2 Which part of the airplane is most prone to damage in wildlife strikes?

[10]:
```
attributes=(list(data))
attributes
```

[10]:
```
['Record ID',
 'Incident Year',
 'Incident Month',
 'Incident Day',
 'Operator ID',
 'Operator',
 'Aircraft',
 'Aircraft Type',
 'Aircraft Make',
 'Aircraft Model',
 'Aircraft Mass',
 'Engine Make',
 'Engine Model',
 'Engines',
 'Engine Type',
 'Engine1 Position',
 'Engine2 Position',
 'Engine3 Position',
 'Engine4 Position',
 'Airport ID',
 'Airport',
 'State',
 'FAA Region',
 'Warning Issued',
 'Flight Phase',
 'Visibility',
 'Precipitation',
 'Height',
 'Speed',
 'Distance',
 'Species ID',
 'Species Name',
 'Species Quantity',
 'Flight Impact',
 'Fatalities',
 'Injuries',
```

```
 'Aircraft Damage',
 'Radome Strike',
 'Radome Damage',
 'Windshield Strike',
 'Windshield Damage',
 'Nose Strike',
 'Nose Damage',
 'Engine1 Strike',
 'Engine1 Damage',
 'Engine2 Strike',
 'Engine2 Damage',
 'Engine3 Strike',
 'Engine3 Damage',
 'Engine4 Strike',
 'Engine4 Damage',
 'Engine Ingested',
 'Propeller Strike',
 'Propeller Damage',
 'Wing or Rotor Strike',
 'Wing or Rotor Damage',
 'Fuselage Strike',
 'Fuselage Damage',
 'Landing Gear Strike',
 'Landing Gear Damage',
 'Tail Strike',
 'Tail Damage',
 'Lights Strike',
 'Lights Damage',
 'Other Strike',
 'Other Damage']
```

[11]:
```
damage_x=[]
strike_x=[]
dam=".*Damage$"
stri=".*Strike$"
for i in attributes:
    if (re.match(dam, i)):
        damage_x.append(i)
    elif (re.match(stri, i)):
        strike_x.append(i)
```

[12]:
```
damage_x
```

[12]:
```
['Aircraft Damage',
 'Radome Damage',
 'Windshield Damage',
```

```
 'Nose Damage',
 'Engine1 Damage',
 'Engine2 Damage',
 'Engine3 Damage',
 'Engine4 Damage',
 'Propeller Damage',
 'Wing or Rotor Damage',
 'Fuselage Damage',
 'Landing Gear Damage',
 'Tail Damage',
 'Lights Damage',
 'Other Damage']
```

We are not interested with the column of Aircraft Damage

[13]:
```
damage_x=damage_x[1:]
damage_x
```

[13]:
```
['Radome Damage',
 'Windshield Damage',
 'Nose Damage',
 'Engine1 Damage',
 'Engine2 Damage',
 'Engine3 Damage',
 'Engine4 Damage',
 'Propeller Damage',
 'Wing or Rotor Damage',
 'Fuselage Damage',
 'Landing Gear Damage',
 'Tail Damage',
 'Lights Damage',
 'Other Damage']
```

[14]:
```
strike_x
```

[14]:
```
['Radome Strike',
 'Windshield Strike',
 'Nose Strike',
 'Engine1 Strike',
 'Engine2 Strike',
 'Engine3 Strike',
 'Engine4 Strike',
 'Propeller Strike',
 'Wing or Rotor Strike',
 'Fuselage Strike',
 'Landing Gear Strike',
 'Tail Strike',
```

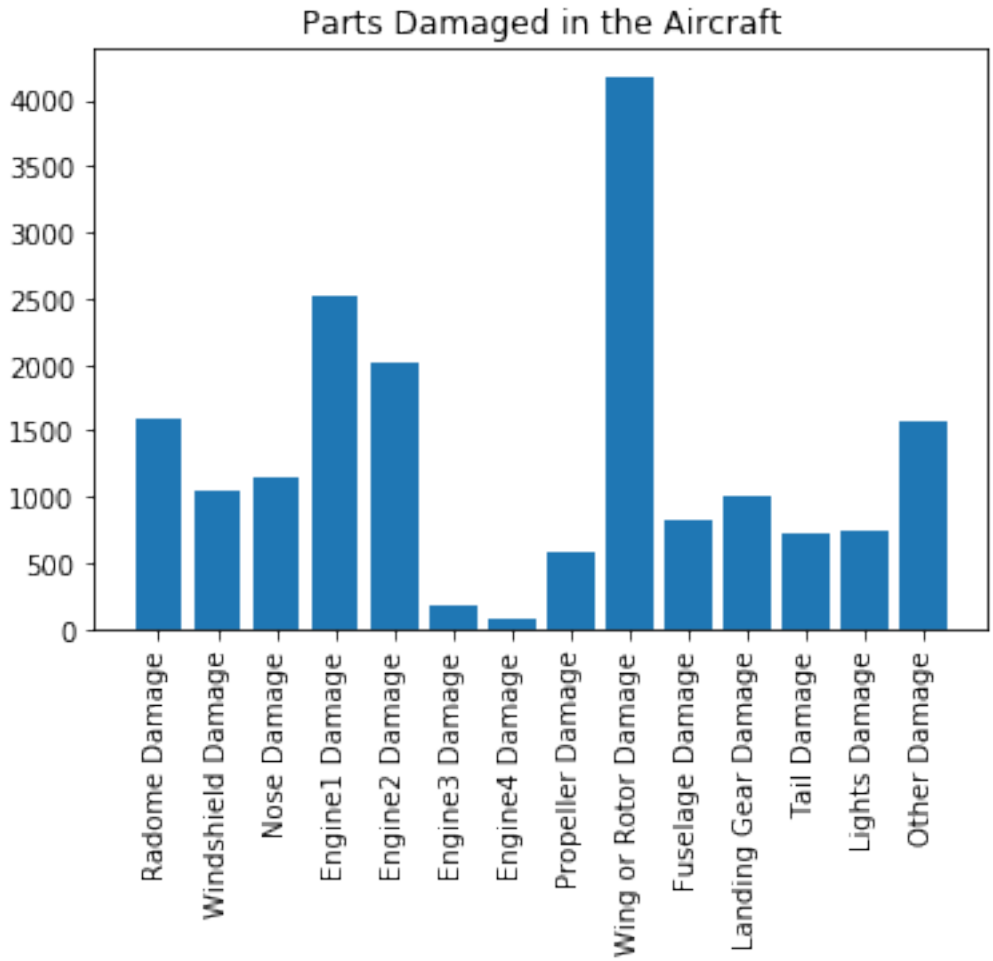
```
 'Lights Strike',
 'Other Strike']
```

[15]:
```
damage_y=[]
strike_y=[]
for i in strike_x:
    strike_y.append(data[i].sum())

for i in damage_x:
    damage_y.append(data[i].sum())
```

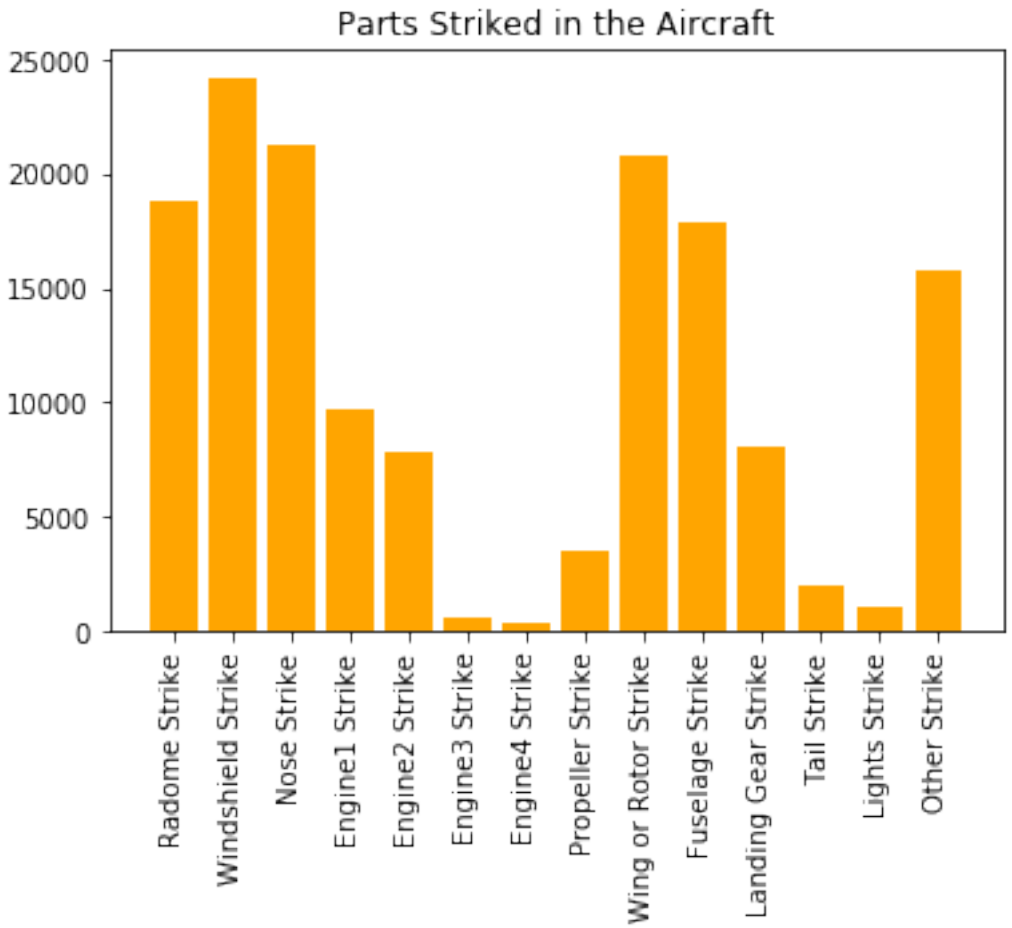
[16]:
```
plt.bar(damage_x,damage_y)
plt.title("Parts Damaged in the Aircraft")
plt.xticks(rotation='vertical')
```

[16]:
```
([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13],
 <a list of 14 Text xticklabel objects>)
```



[17]:
```
plt.bar(strike_x,strike_y,color='orange')
plt.title("Parts Striked in the Aircraft")
plt.xticks(rotation='vertical')
```

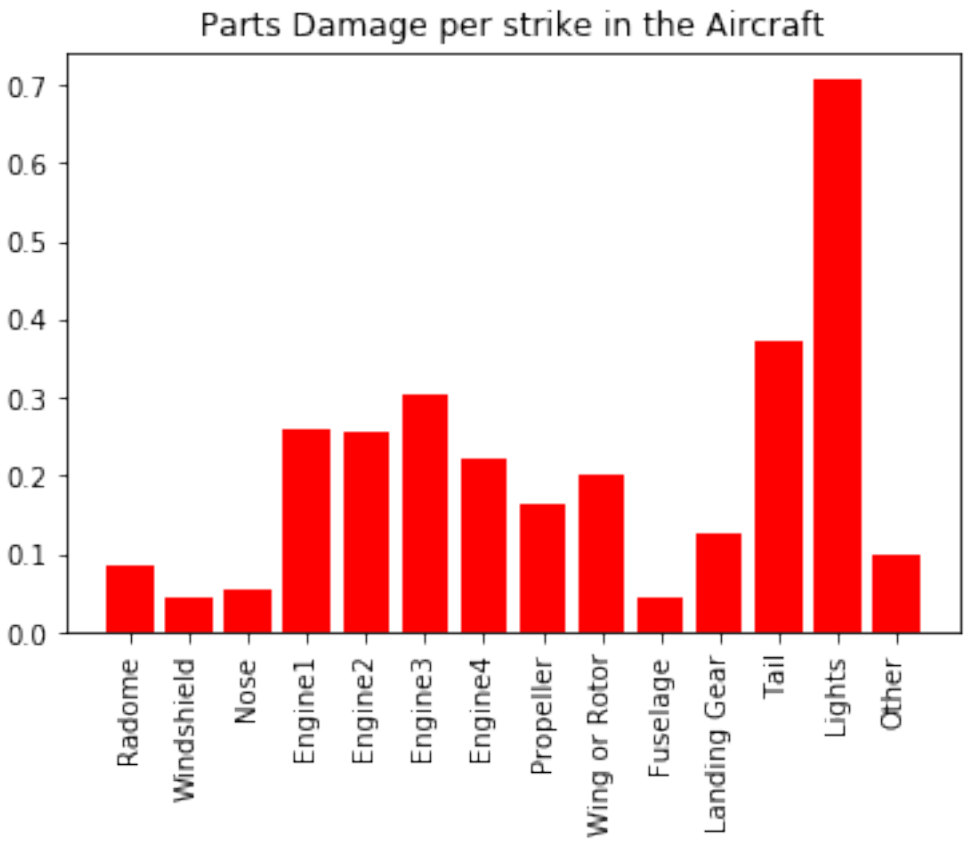
[17]:
```
([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13],
 <a list of 14 Text xticklabel objects>)
```



[18]:
```
damage_per_strike=[]
parts=[]
for i in range(0,len(strike_x)):
    damage_per_strike.append(damage_y[i]/strike_y[i])
    parts.append(strike_x[i][:-7])
```

[19]:
```
plt.bar(parts,damage_per_strike,color='red')
plt.title("Parts Damage per strike in the Aircraft")
plt.xticks(rotation='vertical')
```

[19]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13],
<a list of 14 Text xticklabel objects>)



2.0.1 CONCLUSION:

From the Graphs above we can see that the part that reports most cases of damage in a wildlife strike is 'Wings or Rotor'

Though most of the strikes are usually on the 'Windshield'

But the most prone to damage are the 'Lights', they get damaged in approximately 70% of the strikes

CONCLUSION:

1. **“MOURNING DOVE” species of birds effect the aircrafts the most.**
2. **The part that reports most cases of damage in a wildlife strike is ‘Wings or Rotor’.**
3. **Most of the strikes are usually on the ‘Windshield’.**
4. **The most prone to damage are the ‘Lights’, they get damaged in approximately 70% of the strikes.**