

# Project Report

## GitHub URL

<https://github.com/ankitsharma86IT/UCD-Assessment.git>

## Abstract

Implementation of Python Project to analyze different data set sourced via public domain and generate valuable insight by visualizing information. Using this project I am trying to build a model to predict heart disease using machine learning.

Analysis of different data sets sourced from various domains and generate meaningful insights using different visualization methods. In this project given various clinical parameters about a patient, performing prediction whether they have heart disease or not. I have used "**Cleavland data for Machine Learning**" to train my model.

## Introduction

As part of Fidelity International Data Analytics Training, I have implemented basic concepts of Python, Data Science and Machine Learning. Public domains like Kaggle and Covid 19 India.org are the data source of this project.

## Dataset

- **Disney + Movies and TV Shows Data:**  
<https://www.kaggle.com/datasets/shivamb/disney-movies-and-tv-shows>
- **Hulu Movies and TV Shows Data:**  
<https://www.kaggle.com/datasets/shivamb/hulu-movies-and-tv-showsv>
- **Covid 19 India Data** = <https://data.covid19india.org/>
- **Tweets data** = <https://www.kaggle.com/code/jiashenliu/how-can-we-predict-the-sentiment-by-tweets>

Reason for selecting Kaggle as it consists of variety of data sets which we can use for Data Analytics, Data Science and Machine Learning. As this is my first learning experience where I used Kaggle, explored and build models and work holistically.

Covid 19 India data sets is very unique and easy to understand the real world problem like to interpret global pandemic situation across the country and it is very useful in the current situation.

Reason for using Tweets Data – Reason for using tweets data is to perform sentiment analysis and to use regular expression pattern, am extracting all hash-tags from Tweets Data which can be further visualized using visualization libraries like Matplotlib.

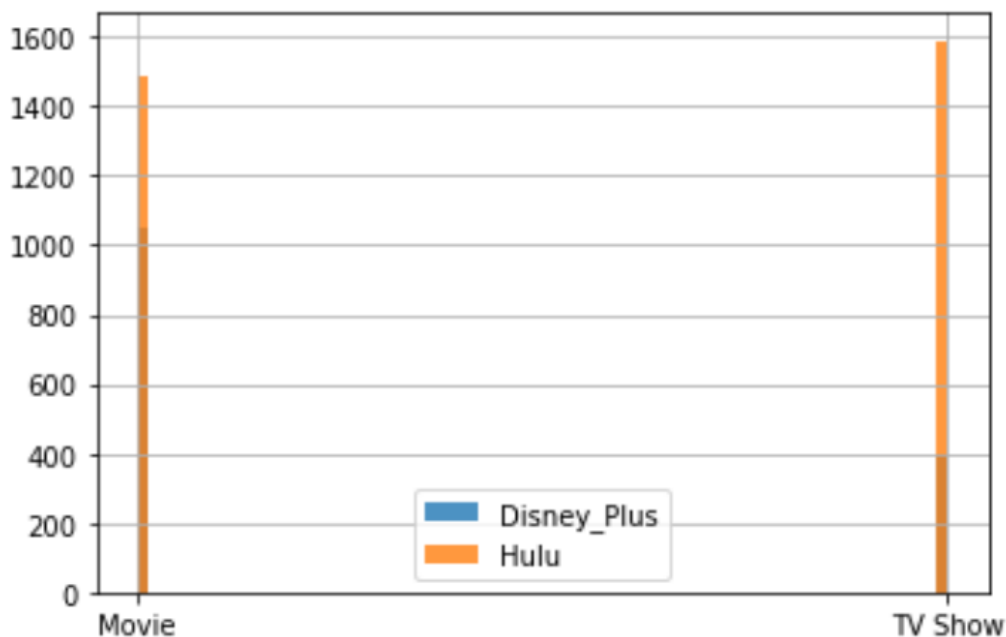
## Implementation Process

Below are the steps that I've used for implementation -

- Data Selection and Exploration – The goal here is to find out what questions we are trying to solve and data selection and exploration is the key here.
- Importing the Data – Importing the data into Python project using Pandas function
- Data Analysis and Data Cleaning – Analyzing the data and imputing missing data so that our model predicts accurately.
- Data Modelling – Split data to training and tests data sets.

## Results

- Chart 1 - Categorization of data (Movie & TV Show) between Disney+ and Hulu



- Chart 2 (Sentiment Analysis) – Graph showing different moods of users between different feature of Tweets Dataset.

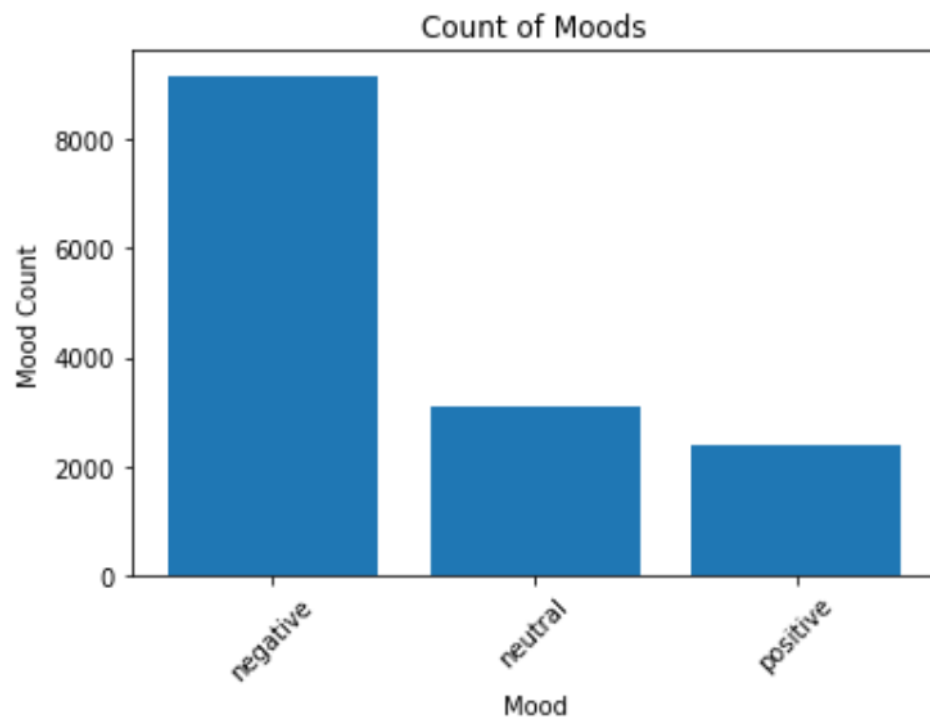


Chart 3 - Heart Disease Frequency (Age vs Sex) – Graph showing heart disease frequency according to sex.

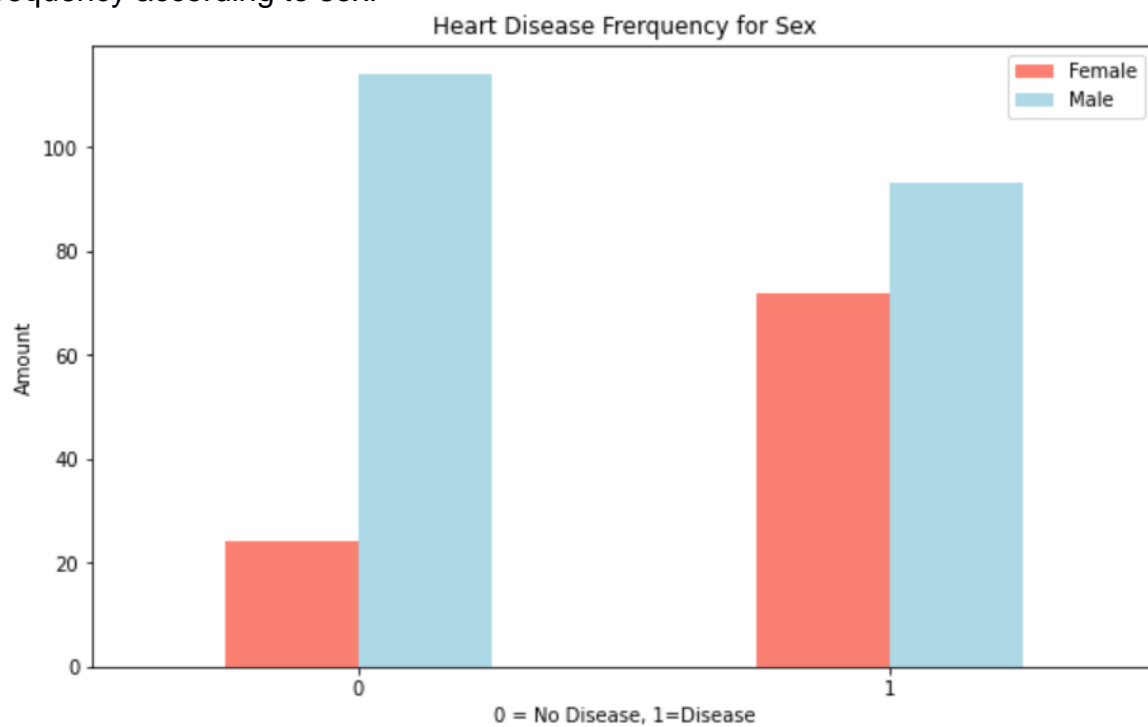
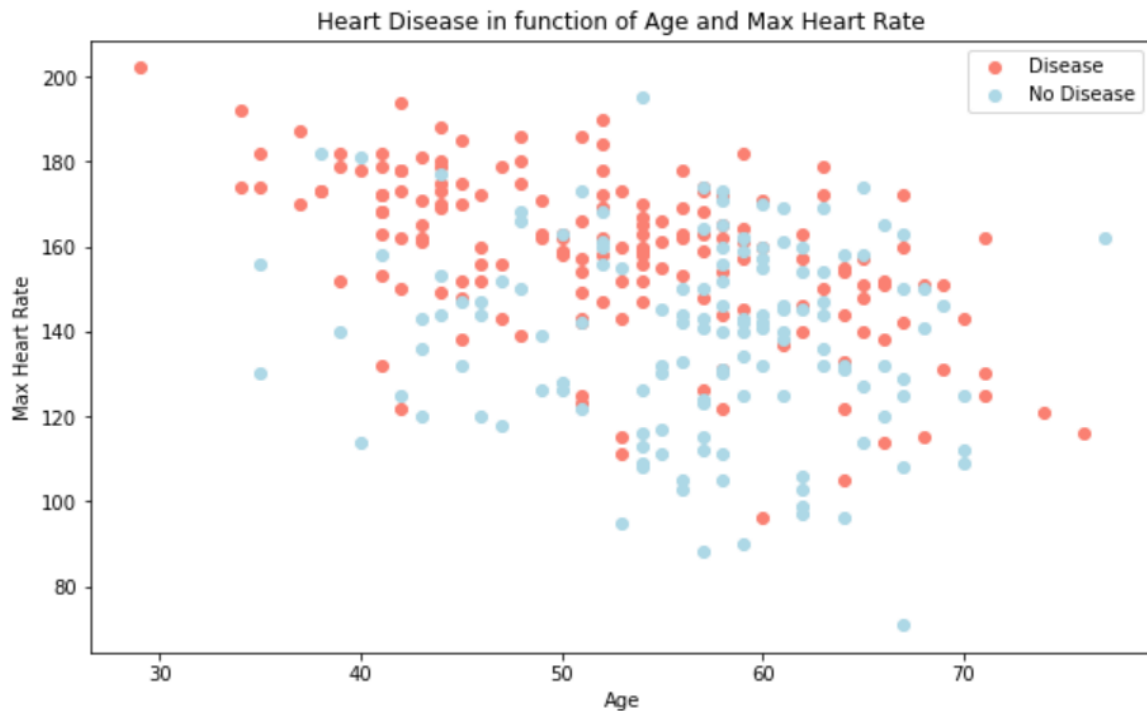


Chart 4- Age vs. Max Heart Rate for Heart Disease



## Insights

- Hulu has more content as compared to Disney Plus.
- From the above plots we can easily find out that the distribution of moods For first three airlines are always skewed toward negative moods.
- From the barchart above, the frequency of female getting heart disease is higher in this dataset compared to male.
- The chances of getting maximum heart rate is higher for heart disease patients.

## References

(Include any references if required)

### UCD Assessment Source Code

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import requests
import json
import seaborn as sns
import re
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import RandomizedSearchCV, GridSearchCV
import sklearn
%matplotlib inline
import pandas
```

```

import numpy
from sklearn.metrics import accuracy_score
pd.set_option('display.max_rows', 10)
pd.set_option('display.max_columns', 10)
def build_dataframe(file):
    """This function will create Pandas DataFrame"""
    df = pd.read_csv(file)
    return df

def draw_histogram(dataframe):
    """create histogram for dataframe passed"""
    dataframe.isna().sum().plot(kind='bar')
    plt.show()

def type_categorization(df1, df2):
    """create histogram to categorize types of two dataframes"""
    df1['type'].hist(bins=80, alpha=0.8)
    df2['type'].hist(bins=80, alpha=0.8)
    plt.legend(['Disney_Plus', 'Hulu'])
    plt.show()

def missing_values_check(dataframe):
    """This will check missing values within dataframe"""
    movie_missing = dataframe.isnull().sum()
    return movie_missing

def count_entries(file_name, chunk_size, colname):
    """ This will return a dictionary with counts of occurrences as value
    for key"""
    counts_dict = {}
    for chunk in pd.read_csv(file_name, chunksize=chunk_size):
        for entry in chunk[colname]:
            if entry in counts_dict.keys():
                counts_dict[entry] += 1
            else:
                counts_dict[entry] = 1
    return counts_dict

# loading data from csv file
df_disney_plus= build_dataframe('C:/Users/Swara/UCD
Assessment/disney_plus_titles.csv')
df_hulu = build_dataframe('C:/Users/Swara/UCD Assessment/hulu_titles.csv')
# Code to demonstrate basic operations on pandas dataframe like find
missing & duplicate

disney_missing = missing_values_check(df_disney_plus)
hulu_missing = missing_values_check(df_hulu)
print('Display Missing Values - Disney Plus: ', disney_missing)
print('Display Missing Values - Hulu : ', hulu_missing)
disney_dups = df_disney_plus.duplicated(subset=['title'], keep=False)
print(df_disney_plus[disney_dups])
hulu_dups = df_hulu.duplicated(subset=['title'], keep=False)
print(df_hulu[hulu_dups])
Display Missing Values - Disney Plus:  show_id      0
type      0
title     0
director  473
cast     190
...
release_year  0
rating        3
duration      0
listed_in     0

```

```

description          0
Length: 12, dtype: int64
Display Missing Values - Hulu :   show_id          0
type                  0
title                 0
director             3070
cast                 3073
...
release_year         0
rating               520
duration             479
listed_in            0
description           4
Length: 12, dtype: int64
Empty DataFrame
Columns: [show_id, type, title, director, cast, country, date_added,
release_year, rating, duration, listed_in, description]
Index: []

[0 rows x 12 columns]
Empty DataFrame
Columns: [show_id, type, title, director, cast, country, date_added,
release_year, rating, duration, listed_in, description]
Index: []

[0 rows x 12 columns]
# Merging dataframes and removing duplicates

df_merge = pd.concat([df_disney_plus, df_hulu])
print(df_merge.info())
duplicates_combined = df_merge.duplicated(subset=['title'], keep=False)
print(df_merge[duplicates_combined].info())
#Drop duplicates
distinct_movies =
df_merge.drop_duplicates(subset=['title','director','cast'])
print(distinct_movies.info())
<class 'pandas.core.frame.DataFrame'>
Int64Index: 4523 entries, 0 to 3072
Data columns (total 12 columns):
#   Column          Non-Null Count  Dtype
---  ---
0   show_id         4523 non-null   object
1   type            4523 non-null   object
2   title           4523 non-null   object
3   director        980 non-null    object
4   cast            1260 non-null   object
5   country         2851 non-null   object
6   date_added      4492 non-null   object
7   release_year    4523 non-null   int64
8   rating          4000 non-null   object
9   duration        4044 non-null   object
10  listed_in       4523 non-null   object
11  description      4519 non-null   object
dtypes: int64(1), object(11)
memory usage: 459.4+ KB
None
<class 'pandas.core.frame.DataFrame'>
Int64Index: 64 entries, 2 to 2755
Data columns (total 12 columns):
#   Column          Non-Null Count  Dtype
---  ---
0   show_id         64 non-null     object
1   type            64 non-null     object
2   title           64 non-null     object
3   director        13 non-null     object

```

```

4    cast          29 non-null    object
5    country       43 non-null    object
6    date_added    64 non-null    object
7    release_year  64 non-null    int64
8    rating        61 non-null    object
9    duration      55 non-null    object
10   listed_in     64 non-null    object
11   description   64 non-null    object

```

dtypes: int64(1), object(11)

memory usage: 6.5+ KB

None

<class 'pandas.core.frame.DataFrame'>

Int64Index: 4520 entries, 0 to 3072

Data columns (total 12 columns):

#	Column	Non-Null Count	Dtype
0	show_id	4520 non-null	object
1	type	4520 non-null	object
2	title	4520 non-null	object
3	director	980 non-null	object
4	cast	1260 non-null	object
5	country	2850 non-null	object
6	date_added	4489 non-null	object
7	release_year	4520 non-null	int64
8	rating	3998 non-null	object
9	duration	4043 non-null	object
10	listed_in	4520 non-null	object
11	description	4516 non-null	object

dtypes: int64(1), object(11)

memory usage: 459.1+ KB

None

# Code to demonstrate creating function, dictionary, using iterators

```
result_counts = count_entries('C:/Users/Swara/UCD
```

```
Assessment/disney_plus_titles.csv', 10, 'release_year')
```

```
print(result_counts)
```

```
{2016: 61, 1988: 6, 2011: 52, 2021: 125, 2015: 46, 2019: 99, 2008: 33,
2020: 114, 2007: 23, 2013: 32, 2018: 65, 2014: 50, 2012: 41, 2006: 32,
2010: 39, 1996: 17, 2009: 35, 2017: 69, 1993: 14, 1994: 14, 1998: 20,
1989: 7, 1997: 17, 2005: 32, 2000: 26, 2004: 28, 1987: 6, 1985: 8, 1967:
2, 1973: 2, 1991: 6, 1956: 4, 1995: 13, 1984: 4, 1974: 4, 1959: 5, 2003:
29, 1976: 4, 2001: 18, 1990: 5, 1992: 10, 1952: 8, 1955: 9, 1977: 6, 1957:
4, 1999: 22, 1948: 5, 1964: 3, 1969: 4, 1942: 6, 1950: 6, 1951: 4, 1953:
6, 1949: 5, 1940: 7, 1946: 2, 1954: 4, 1936: 6, 1944: 1, 1935: 4, 1939: 5,
1975: 4, 1978: 4, 2002: 21, 1971: 3, 1961: 5, 1962: 3, 1981: 3, 1932: 3,
1938: 5, 1941: 7, 1986: 7, 1947: 5, 1937: 6, 1966: 2, 1943: 2, 1934: 4,
1980: 4, 1960: 3, 1983: 2, 1972: 3, 1982: 2, 1979: 5, 1928: 1, 1965: 3,
1970: 1, 1963: 3, 1933: 3, 1945: 1, 1968: 1}
```

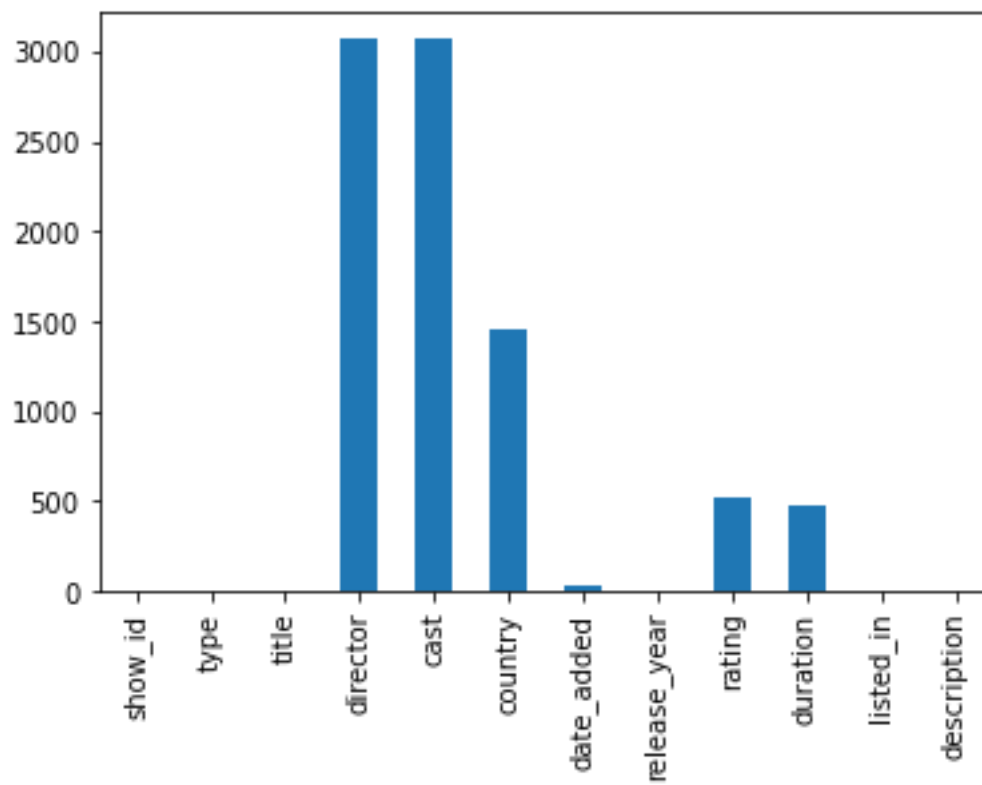
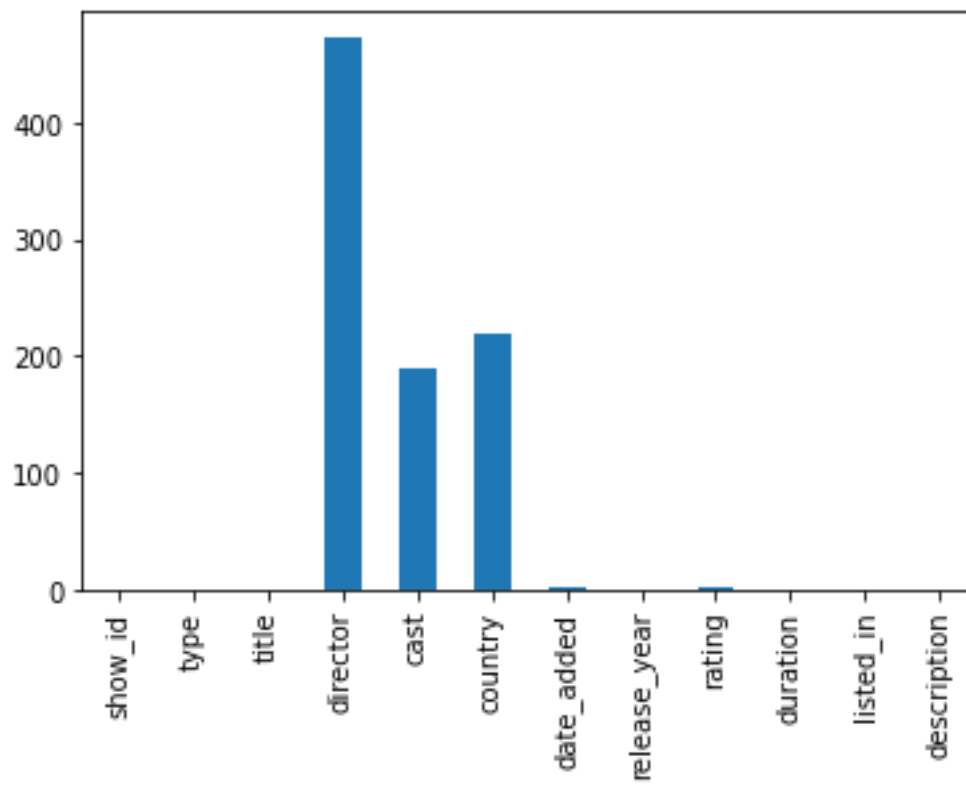
# histogram for two dataframe

```
draw_histogram(df_disney_plus)
```

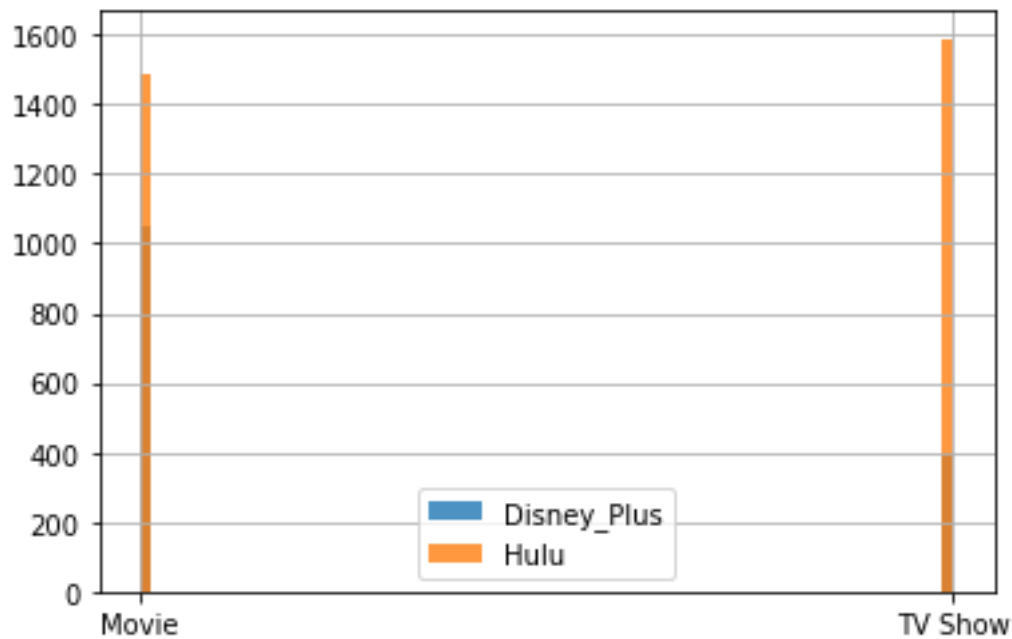
```
draw_histogram(df_hulu)
```

# Compare type of each dat set(TV,Movie Show)

```
type_categorization(df_disney_plus, df_hulu)
```







```
# Code to demonstrate loading data from API
response_API =
requests.get('https://api.covid19india.org/state_district_wise.json')
#print(response_API.status_code)
data = response_API.text
parse_json = json.loads(data)
active_case = parse_json['Andaman and Nicobar
Islands']['districtData']['South Andaman']['active']
print("Active cases in South Andaman:", active_case)
Active cases in South Andaman: 19
df_tweets = build_dataframe('C:/Users/Swara/UCD Assessment/Tweets.csv')
hash_tags = []
regex = r"#\b\w\w+\b"
for i in df_tweets['text']:
    word = re.findall(regex, i)
    if len(word) > 0:
        hash_tags.append(word)
print(hash_tags)
[['#fabulous', '#Seductive', '#stress'], ['#29DaysToGo'], ['#fail'],
 ['#VX358', '#noair', '#worstflightever', '#roasted', '#SFotoBOS'],
 ['#sendambien', '#andchexmix'], ['#MoodlitMonday',
 '#ScienceBehindTheExperience'], ['#MoodlitMonday'], ['#travelhelp'],
 ['#elevategold'], ['#tribute', '#SoundOfMusic', '#Oscars2015'],
 ['#guiltypleasures'], ['#CarrieUnderwood'], ['#CMFat35000feet'],
 ['#neverflyvirginforbusiness'], ['#inflight', '#flightattendant',
 '#dreampath'], ['#neverflyvirginforbusiness'], ['#neverflyvirgin'],
 ['#change'], ['#nomorevirgin'], ['#uncomfortable'], ['#sfo2lax'],
 ['#sneaky'], ['#customerservice', '#virginamerica', '#flying'],
 ['#sarcasm'], ['#CheapFlights', '#FareCompare'], ['#CheapFlights',
 '#FareCompare'], ['#CheapFlights', '#FareCompare'], ['#CheapFlights',
 '#FareCompare'], ['#PHL', '#pleasecomeback'], ['#VAbeatsJblue'],
 ['#Oscars2015'], ['#likingyoulessandless'], ['#Oscars', '#redcarpet',
 '#oscars', '#oscars2015'], ['#frustrated'], ['#lame'],
 ['#irmafromDallas'], ['#PrincessHalf'], ['#flight', '#dc', '#sunset',
 '#globe', '#backtowinter', '#work', '#refreshed'], ['#redwineisbetter'],
 ['#Emirates'], ['#baggageissues', '#smh'], ['#SouthwestAir'],
 ['#flights'], ['#disappointed'], ['#Elevate', '#Gold'], ['#worst',
 '#flight'], ['#AmericanAirlines'], ['#disappointed', '#expected'],
 ['#beatstheothers'], ['#seriously'], ['#soreback'], ['#diehardvirgin'],
 ['#sad'], ['#help'], ['#MeetTheFleet', '#Oscars'], ['#disruption',
 '#FCmostinnovative', '#incubator'], ['#airplanemodewason'], ['#Boston',
 '#SanFrancisco'], ['#Vodkatonics', '#sfo'], ['#OSCARS2105',
 '#AvalonHollywood'], ['#OscarsCountdown'], ['#wtf'], ['#sweet'],
 ['#MayweatherPacquiao'], ['#MayweatherPacquiao'], ['#amazing'],
```

['#DISAPPOINTED'], ['#help'], ['#JFK', '#BOS', '#DCA'],  
 ['#sorrynotsorry'], ['#Comps'], ['#freayasfund'], ['#SanFrancisco'],  
 ['#biztravel'], ['#rockstar', '#LAS2SFO', '#BestCrew', '#SheRocks'],  
 ['#rockstars', '#travel'], ['#travel', '#SAN', '#SFO'], ['#ourprincess'],  
 ['#freayasfund', '#USA', '#Bandie'], ['#SilverStatus'], ['#ourprincess'],  
 ['#USA'], ['#statusmatch', '#virginamerica'], ['#SanFrancisco'], ['#so'],  
 ['#Dallas', '#Austin'], ['#help', '#dontdothis'], ['#etailwest'],  
 ['#payments', '#visa'], ['#VXSafetyDance'], ['#150219'],  
 ['#livewelltraveled', '#sytycd'], ['#Southwest', '#jetblue'],  
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 ['#moodlighting'], ['#apostrophefail'], ['#TinderTips', '#tinderchamp'],  
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 ['#scam'], ['#pathetic', '#customerservice'], ['#scheduling'],  
 ['#Ridiculousness', '#learncustomerservice'], ['#1585'], ['#California'],  
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 ['#notcool'], ['#systemwide', '#united', '#cyberattack'],  
 ['#StatusMatchPaidOff'], ['#8477733'], ['#wastedtime'], ['#frustrating'],  
 ['#funnycaptain'], ['#goodenoughmother'], ['#friendlyskies'], ['#PH6RPS'],  
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 ['#AnyoneThere'], ['#BusinessTravel', '#goodenoughmother'],  
 ['#disgutedindenver'], ['#unfriendlyskies'], ['#UnFriendlySkies'],  
 ['#UnitedAirlines'], ['#spousal'], ['#albanyairport'],  
 ['#poorcustomerservice'], ['#frustrated'], ['#AlwaysDelayedOnUnited'],  
 ['#terrible', '#branson', '#virginatlantic', '#UnitedAirlines'],  
 ['#ContinentalAirlines', '#CommunicationFail'], ['#notfair'],  
 ['#theworst'], ['#Unacceptable'], ['#United', '#PoorService'],  
 ['#UnitedAirlines', '#AspenBaggageFail', '#Aspen'], ['#United'],  
 ['#NOANSWER'], ['#WTF', '#fb'], ['#epicfailunited'], ['#PressureCooker'],  
 ['#HeatTrap'], ['#badservice'], ['#stillnobags', '#ridiculous'],  
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 ['#whyairtravelsucks'], ['#UnitedAirlines'], ['#roadwarrior'],  
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 ['#lastflightwithyouever'], ['#inconvenience'], ['#cxp'], ['#Fail'],  
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 ['#AirlineSecurity'], ['#united'], ['#nogate', '#fail'],  
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 ['#friendlysky'], ['#frauds'], ['#gottogetbetter'], ['#DEN'],  
 ['#hotelliving'], ['#liars', '#united'], ['#FlightFail', '#Hour20Delay'],

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 ['#trappedhouston'], ['#winterstorm2015'], ['#whichisworsedenordfw'],  
 ['#LAX'], ['#sunrise'], ['#UnitedAirlines'], ['#DEN'], ['#grumpykim'],  
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 ['#lazy'], ['#alwaysLate'], ['#worstairlineever'], ['#worst'],  
 ['#customerservice'], ['#worstairline'], ['#wifi'], ['#WorstAirlineEver'],  
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 ['#unitedsucks'], ['#americanisbetter'], ['#disgruntled'],  
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 ['#UnitedAirlinesSucks'], ['#12thMan'], ['#costumerservice'], ['#legit'],  
 ['#jk'], ['#unitedlies'], ['#IAD'], ['#failed'], ['#UA57'], ['#ZRH'], ['#IAD'],  
 ['#failed'], ['#Spotify'], ['#threehoursLate'], ['#traveler'], ['#TSA'],  
 ['#plane'], ['#MakesSense'], ['#efficiency'], ['#travel'], ['#flying'],  
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 ['#UnitedAirlines'], ['#Anaphylaxis'], ['#lies'], ['#pathetic'],  
 ['#needtobehonest'], ['#UnitedAirlines'], ['#whyjeff'], ['#Dreamliner'],  
 ['#mental'], ['#breakdown'], ['#disappointed'], ['#united'],  
 ['#BadCustomerService'], ['#UnitedAirlines'], ['#stranded'],  
 ['#flyerfriendly'], ['#Belize'], ['#badservice'], ['#badservice'],  
 ['#united'], ['#badservice'], ['#Delta'], ['#lostmybusiness'],  
 ['#fakesincerity'], ['#HappyFlight'], ['#Belize'], ['#CustExp'],  
 ['#timezones'], ['#accuratetraveltimes'], ['#3rdtimethishashappened'],  
 ['#RipOffs'], ['#PriceDiscrimination'], ['#ATL'], ['#UnitedAirlines'],  
 ['#nothappy'], ['#bullying'], ['#workforce'], ['#Delays'], ['#flights'],  
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 ['#love'], ['#customerservice'], ['#BQONPA', '#1641', '#2214'],  
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 ['#shafted'], ['#disappointed'], ['#CustServ'], ['#AmericanAirlines',  
 '#unamericanairlines'], ['#Southwestairwasthere'], ['#logistics',  
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 ['#badcustomerservice'], ['#epicfail', '#Chicago'], ['#hitawall'],  
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 '#filmcrew', '#nbc', '#cnn'], ['#frustrated'], ['#Complaint',  
 '#TravelProblems'], ['#NewAmerican'], ['#AA291'], ['#AmericanAirlines'],  
 ['#AATeam'], ['#Brownsville'], ['#hardtoto'], ['#Americant'],  
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 ['#ridiculous'], ['#Atlantic'], ['#sorrynotsorry'], ['#doyourjob'],  
 ['#GoingForGreat'], ['#onhold'], ['#WakingInMemphis'],  
 ['#neverflyAAagain'], ['#AA', '#woase2015', '#winterops'],  
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 ['#thanksamericanairlines'], ['#BDSM'], ['#last', '#flight', '#ever',  
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 ['#AmericanAirlines'], ['#fakeawards', '#LUVisbetter'],  
 ['#noloveforsurfers', '#pretend'], ['#GoingForGreat'], ['#thankU'],  
 ['#nomoAA'], ['#nohotel'], ['#DallasAirport'], ['#Explain', '#whyfly'],  
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 '#Oscars2015'], ['#1080'], ['#TokyoMarathon2015'], ['#onholdfordays'],  
 ['#YoureDoingItWrong'], ['#2390', '#AmericanAirlines'], ['#2962',

```

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['#AA1457'], ['#DFW'], ['#lostluggage', '#unprofessional', '#pit',
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'#LGA'], ['#firstclass'], ['#FlyDelta'], ['#ANGRY'], ['#service'],
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['#unhappycustomer'], ['#DFW'], ['#americanairsucks', '#hiremorepeople'],
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['#shouldhavedriven'], ['#shafted'], ['#yourphonesystemsucks'],
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['#aal06', '#shortstaffed'], ['#reclameaqui', '#TripAdvisor'],
['#Yousuck'], ['#badbusiness'], ['#poorservice', '#travel'], ['#dot',
'#passengerbillofrights'], ['#CNN', '#ABCNews', '#MSNBC', '#Photography'],
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['#nevergettinghome'], ['#YeseniaHernandez'], ['#FixYourStuff'],
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['#americanforlife'], ['#13'], ['#bummed'], ['#2251'], ['#AADelay',
'#AA919'], ['#AmazingFlightCrew'], ['#neveragain'], ['#complaint'],
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['#usairways'], ['#twitterhug', '#shesaidrun'], ['#epicfail',
'#poorplanning'], ['#aa'], ['#AmericanAirlines'], ['#pleasehelp'],
['#Backwards'], ['#NoCharge', '#Ever'], ['#thankyou', '#JFK'],
['#BlackBerry10']]

```

```

# Code to demonstrate regular expression in python, Extracting all hash
tags from Tweets

```

```

Tweet= pandas.read_csv("C:/Users/Swara/UCD Assessment/Tweets.csv")

```

```

Tweet.head()

```

tweet_id	airline_senti ment	airline_senti ment_confidence	negati ve_senti ment	negati ve_senti ment_confidence	text	tweet _created	tweet _location	user_ timezone
5703061 (3367776 0513	neutral	1.0000	NaN	NaN	@Virg inAme rica . What . @dhep burn said.	2015- 02-24 11:35 :52 - 0800	NaN	Easter n Time (US & Cana da)
5703011 13088812 2368	positiv e	0.3486	NaN	0.0000	@Virg inAme rica . plus you've	2015- 02-24 11:15 :59 - 0800	NaN	Pacifi c Time (US &

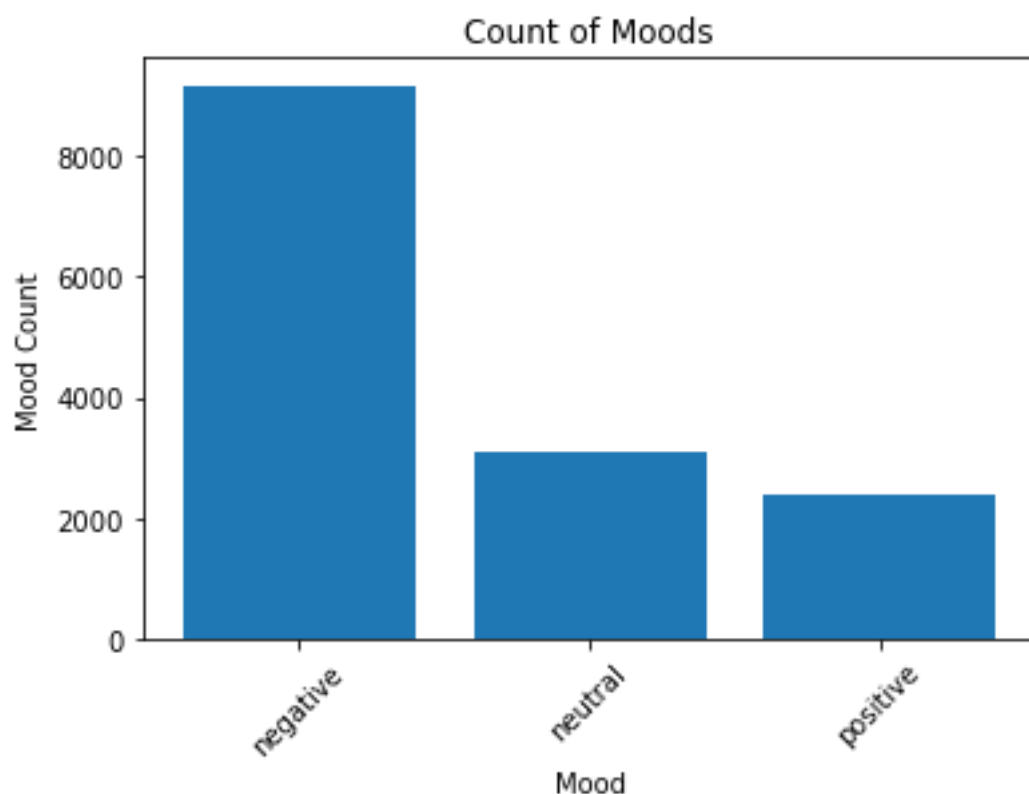


	tweet_id	airline_sentiment	airline_sentiment_confidence	negativereason	negativereason_confidence	text	tweet_coord	tweet_created	tweet_location	user_timezone
						added commercials t...				Canada)
2	5703010 8367281 3571	neutral	0.6837	NaN	NaN	@VirginAmerica I didn't today.. Must mean I n...	NaN	2015-02-24 11:15:48 - 0800	Lets Play	Central Time (US & Canada)
3	5703010 3140762 4196	negative	1.0000	Bad Flight	0.7033	@VirginAmerica it's really aggressive to blast...	NaN	2015-02-24 11:15:36 - 0800	NaN	Pacific Time (US & Canada)
4	5703008 1707446 2722	negative	1.0000	Can't Tell	1.0000	@VirginAmerica and it's a really big bad thing...	NaN	2015-02-24 11:14:45 - 0800	NaN	Pacific Time (US & Canada)

5 rows × 15 columns

```
(len(Tweet)-Tweet.count())/len(Tweet)
tweet_id          0.000000
airline_sentiment 0.000000
airline_sentiment_confidence 0.000000
negativereason    0.373087
negativereason_confidence 0.281284
...
text              0.000000
tweet_coord       0.930396
tweet_created     0.000000
tweet_location    0.323292
user_timezone     0.329235
Length: 15, dtype: float64
del Tweet['tweet_coord']
del Tweet['airline_sentiment_gold']
del Tweet['negativereason_gold']
Mood_count=Tweet['airline_sentiment'].value_counts()
Index = [1,2,3]
plt.bar(Index,Mood_count)
plt.xticks(Index,['negative','neutral','positive'],rotation=45)
plt.ylabel('Mood Count')
plt.xlabel('Mood')
```

```
plt.title('Count of Moods')
Text(0.5, 1.0, 'Count of Moods')
```



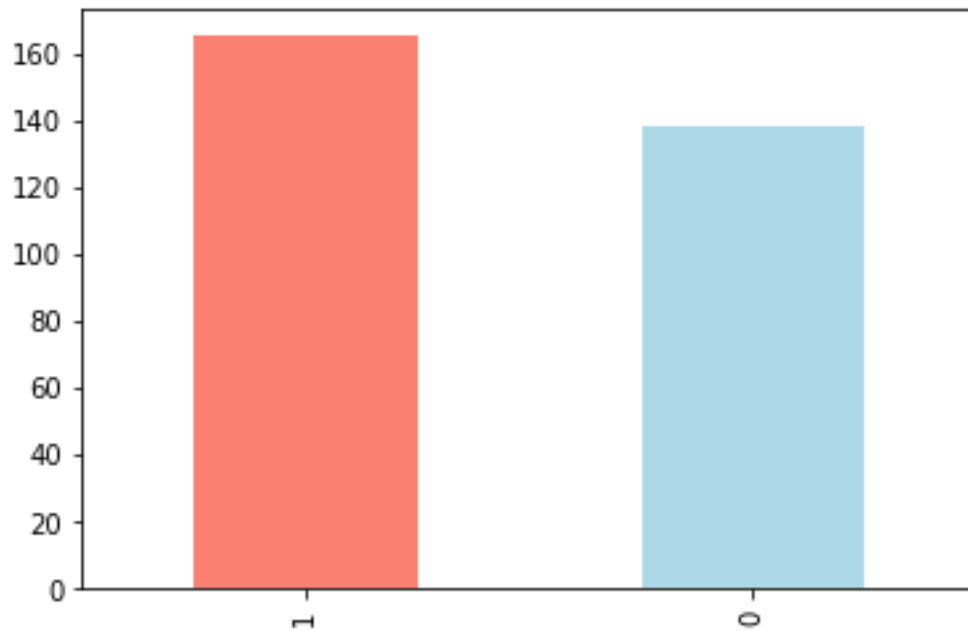
```
#Machine Learnig Code snippet
#Load Data
df = pd.read_csv("C:/Users/Swara/UCD Assessment/heart.csv")
df.shape
df.head()
```

	age	sex	cp	trestbps	chol	...	oldpeak	slope	ca	thal	target
0	63	1	3	145	233	...	2.3	0	0	1	1
1	37	1	2	130	250	...	3.5	0	0	2	1
2	41	0	1	130	204	...	1.4	2	0	2	1
3	56	1	1	120	236	...	0.8	2	0	2	1
4	57	0	0	120	354	...	0.6	2	0	2	1

5 rows × 14 columns

```
#how many class of one feature or target
df["target"].value_counts()
1    165
0    138
Name: target, dtype: int64
#bar chart
df["target"].value_counts().plot(kind='bar', color=["salmon","lightblue"])
<AxesSubplot:>
```

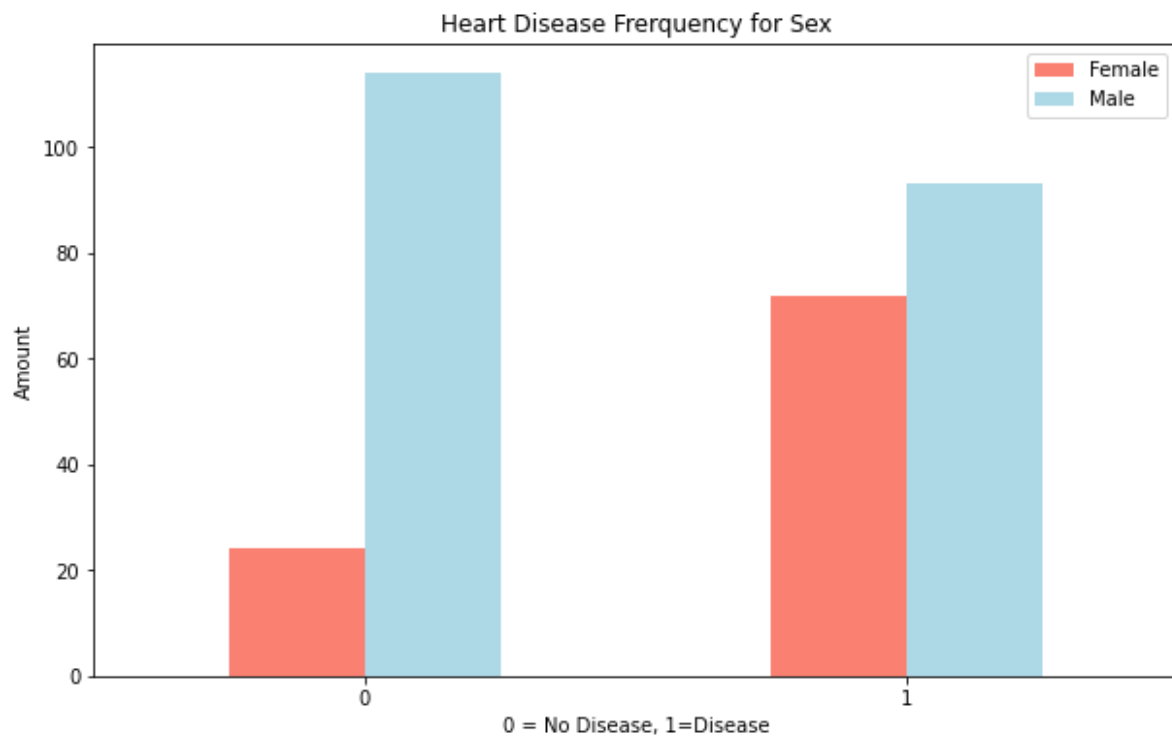




```
df.info()
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 303 entries, 0 to 302
Data columns (total 14 columns):
#   Column      Non-Null Count  Dtype
---  -
0   age         303 non-null    int64
1   sex         303 non-null    int64
2   cp          303 non-null    int64
3   trestbps    303 non-null    int64
4   chol        303 non-null    int64
5   fbs         303 non-null    int64
6   restecg     303 non-null    int64
7   thalach     303 non-null    int64
8   exang       303 non-null    int64
9   oldpeak     303 non-null    float64
10  slope       303 non-null    int64
11  ca          303 non-null    int64
12  thal        303 non-null    int64
13  target      303 non-null    int64
dtypes: float64(1), int64(13)
memory usage: 33.3 KB
#check missing values of all features
df.isna().sum()
df.describe()
#Heart Disease Frequency according to Sex
df.sex.value_counts()
#Compare target and sex column
pd.crosstab(df.target, df.sex)
```

sex	0	1
target		
0	24	114
1	72	93

```
#Create plot of crosstab
pd.crosstab(df.target,
df.sex).plot(kind="bar",figsize=(10,6),color=["salmon","lightblue"])
plt.title("Heart Disease Frerquency for Sex")
plt.xlabel("0 = No Disease, 1=Disease")
plt.ylabel("Amount")
plt.legend(["Female","Male"]);
plt.xticks(rotation=0);
```

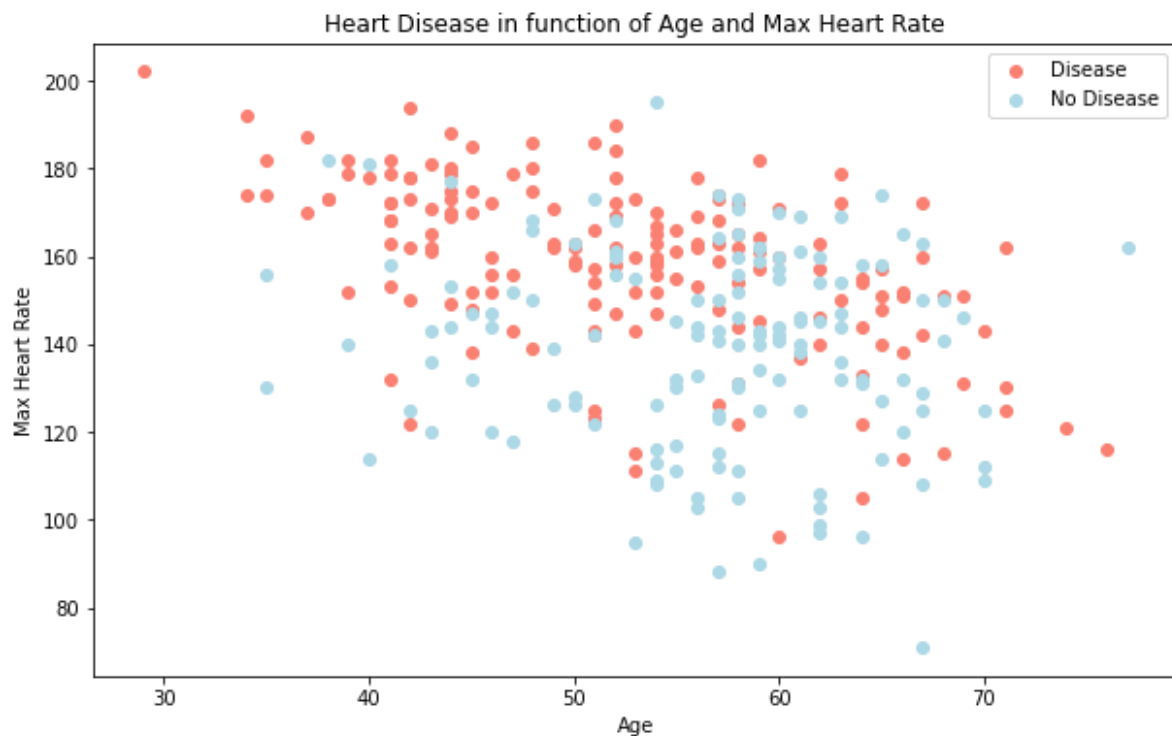


```
#Create new figure
plt.figure(figsize=(10,6))

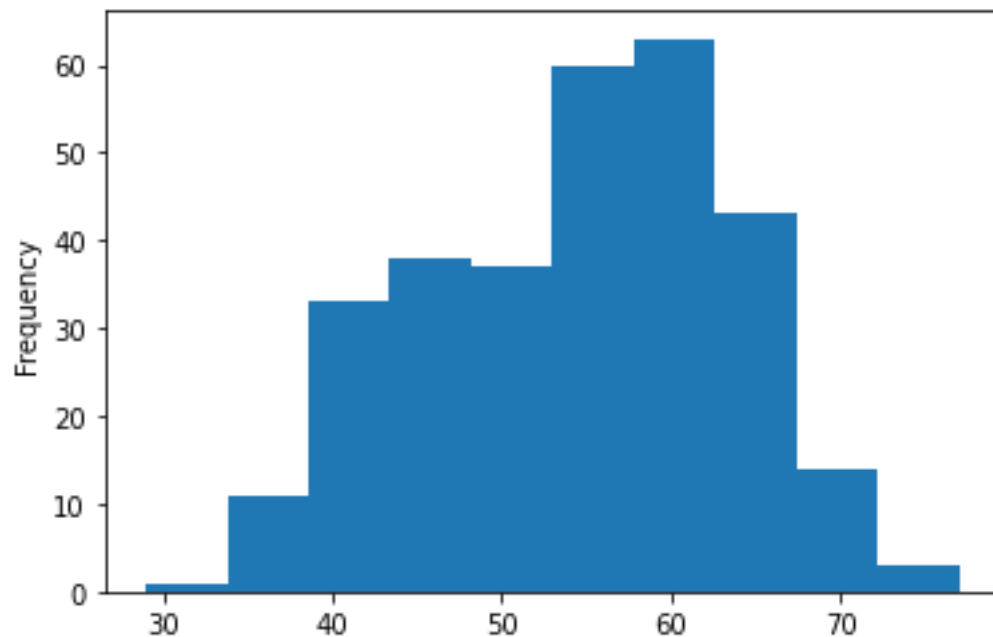
#Scatter with positive examples
plt.scatter(df.age[df.target==1],
            df.thalach[df.target==1],
            c="salmon")

#Scatter with negative examples
plt.scatter(df.age[df.target==0],
            df.thalach[df.target==0],
            c="lightblue");

#Add some helpful info
plt.title("Heart Disease in function of Age and Max Heart Rate")
plt.xlabel("Age")
plt.ylabel("Max Heart Rate")
plt.legend(["Disease", "No Disease"])
<matplotlib.legend.Legend at 0x19eeecf5b50>
```



```
#Check the distribution of the age column with a histogram
#May check for outliers of the data
df.age.plot.hist()
<AxesSubplot:ylabel='Frequency'>
```



```
#Create a hyperparameter grid for LR
log_reg_grid = {"C": np.logspace(-4,4,20),
                "solver": ["liblinear"]}

#Create a hyperparameter grid for RF
rf_grid = {"n_estimators": np.arange(10,1000,50),
           "max_depth": [None,3,5,10],
           "min_samples_split": np.arange(2,20,2),
           "min_samples_leaf": np.arange(1,20,2)}

#Split data into X and y for training features and target variable
X=df.drop("target",axis=1)
y=df["target"]

np.random.seed(42)
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.2)
```

```
# Setup random hyperparameter search for LogisticRegression
rs_log_reg = RandomizedSearchCV(LogisticRegression(),
                                param_distributions=log_reg_grid,
                                cv=5,
                                n_iter=20,
                                verbose=True)

# Fit random hyperparameter search model for LogisticRegression
rs_log_reg.fit(X_train, y_train)
print('Best Params :- ', end='')
Fitting 5 folds for each of 20 candidates, totalling 100 fits
Best Params :-
```