In [ ]:
```
# CS985MLDAGroup9

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```

In [19]:
```
import numpy as np   #numpy library is imported and an alias 'np' is assigned to
import pandas as pd  # pandas library is imported and an alias 'pd' is assigned


import os                                                  # os library is imported
for dirname, _, filenames in os.walk('/kaggle/input'):  # Initialization of a lo
    for filename in filenames:                             # Iterates over each and
        print(os.path.join(dirname, filename))             # Prints the full path o
```

```
/kaggle/input/cs9856-spotify-regression-problem-2024/CS98XRegressionTest.csv
/kaggle/input/cs9856-spotify-regression-problem-2024/CS98XRegressionTrain.csv
```

In [20]:
```
spotify_tr = pd.read_csv("/kaggle/input/cs9856-spotify-regression-problem-2024/C
spotify_tr    # Displays the dataframe
```

Out[20]:

	Id	title	artist	top genre	year	bpm	nrgy	dnce	dB	live	val	dur
0	1	My Happiness	Connie Francis	adult standards	1996	107	31	45	-8	13	28	150
1	2	Unchained Melody	The Teddy Bears	NaN	2011	114	44	53	-8	13	47	139
2	3	How Deep Is Your Love	Bee Gees	adult standards	1979	105	36	63	-9	13	67	245
3	4	Woman in Love	Barbra Streisand	adult standards	1980	170	28	47	-16	13	33	232
4	5	Goodbye Yellow Brick Road - Remastered 2014	Elton John	glam rock	1973	121	47	56	-8	15	40	193
...	...	...	...	...	...	...	...	...	...	...	...	...
448	449	But Not For Me	Ella Fitzgerald	adult standards	1959	80	22	18	-17	10	16	214
449	450	Surf City	Jan & Dean	brill building pop	2010	148	81	53	-13	23	96	147
450	451	Dilemma	Nelly	dance pop	2002	168	55	73	-8	20	61	289
451	452	It's Gonna Be Me	*NSYNC	boy band	2000	165	87	64	-5	6	88	191
452	453	In The Army Now	Status Quo	album rock	2002	105	73	68	-8	14	94	281

453 rows × 15 columns

In [11]:
```
spotify_te = pd.read_csv("/kaggle/input/cs9856-spotify-regression-problem-2024/C
spotify_te.head(2) # Displays the first two rows of the dataframe
```

Out[11]:

	Id	title	artist	top genre	year	bpm	nrgy	dnce	dB	live	val	dur	acous	s
0	454	Pump It	The Black Eyed Peas	dance pop	2005	154	93	65	-3	75	74	213	1	
1	455	Circle of Life - From "The Lion King"/ Soundtra...	Elton John	glam rock	1994	161	39	30	-15	11	14	292	26	

In [21]:
```
spotify_tr = spotify_tr.dropna()  # Removes the rows with missing values and ass
```

In [22]:
```
spotify_tr.columns   # Displays the list of columns in the dataframe
```

Out[22]:
```
Index(['Id', 'title', 'artist', 'top genre', 'year', 'bpm', 'nrgy', 'dnce',
       'dB', 'live', 'val', 'dur', 'acous', 'spch', 'pop'],
      dtype='object')
```

In [23]:
```
columns = ['bpm','nrgy','dnce','dB','live','val','dur','acous','spch','pop']   #
spotify_tr = spotify_tr[columns]   # Assigns only the selected columns in the li
spotify_tr.head()   # Displays the first five rows of the dataframe
```

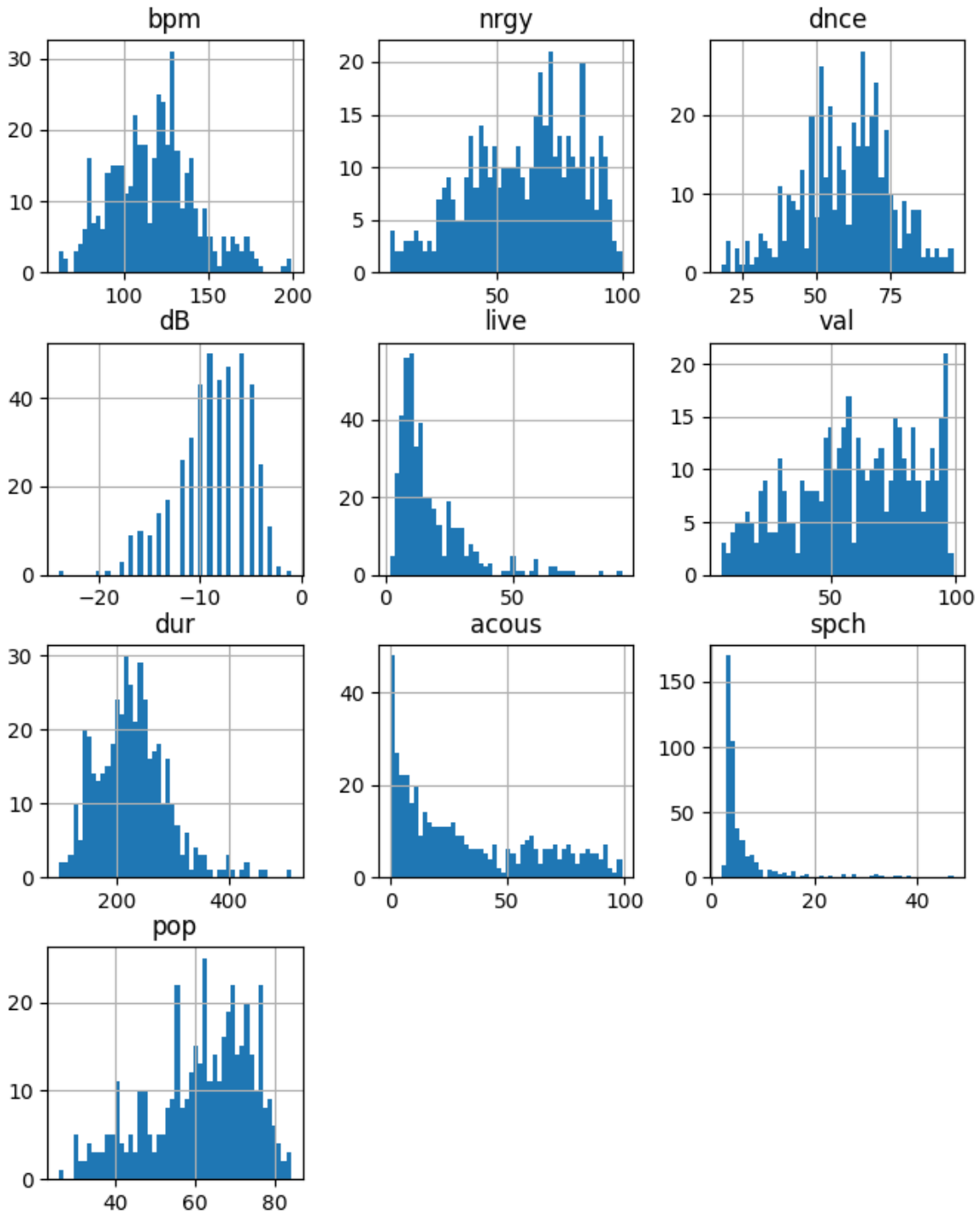
Out[23]:

	bpm	nrgy	dnce	dB	live	val	dur	acous	spch	pop
0	107	31	45	-8	13	28	150	75	3	44
2	105	36	63	-9	13	67	245	11	3	77
3	170	28	47	-16	13	33	232	25	3	67
4	121	47	56	-8	15	40	193	45	3	63
5	110	56	71	-7	12	23	223	15	6	74

In [24]:
```
spotify_tr.shape  # Returns a tuple consisting of the number of rows and columns
```

Out[24]:
```
(438, 10)
```

In [26]:
```
import matplotlib.pyplot as plt    # matplotlib.pyplot is imported and given an
%matplotlib inline
spotify_tr.hist(bins=50,figsize=(8,10)) # Generates histograms for numerical att
plt.show()   # Displays the generated histograms
```



In [27]:
```
x = spotify_tr.drop('pop',axis=1) # Creates a new dataframe ‘x’ where the column
y = spotify_tr['pop']  # Creates a new dataframe ‘y’ where the column ‘pop’ is s
x   # Displays the dataframe ‘x’
```

Out[27]:

	bpm	nrgy	dnce	dB	live	val	dur	acous	spch
0	107	31	45	-8	13	28	150	75	3
2	105	36	63	-9	13	67	245	11	3
3	170	28	47	-16	13	33	232	25	3
4	121	47	56	-8	15	40	193	45	3
5	110	56	71	-7	12	23	223	15	6
...	...	...	...	...	...	...	...	...	...
448	80	22	18	-17	10	16	214	92	4
449	148	81	53	-13	23	96	147	50	3
450	168	55	73	-8	20	61	289	23	14
451	165	87	64	-5	6	88	191	5	8
452	105	73	68	-8	14	94	281	11	2

438 rows × 9 columns

In [28]:
```
y    # Displays the dataframe 'y'
```

Out[28]:
```
0      44
2      77
3      67
4      63
5      74
       ..
448    45
449    50
450    77
451    62
452    59
Name: pop, Length: 438, dtype: int64
```

In [29]:
```
from sklearn.model_selection import train_test_split    # Imports train_test_spl
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size = 0.2,random_stat
print(x_train.shape)   # Displays a tuple consisting of the number of rows and c
print(x_test.shape)    # Displays a tuple consisting of the number of rows and c
```

```
(350, 9)
(88, 9)
```

In [30]:
```
from sklearn.preprocessing import StandardScaler    # Imports StandardScaler fro
scaler = StandardScaler()   # Creates an instance of StandardScaler class
scaler.fit(x_train)   # Calculates the mean and standard deviation of each featu
x_train_scaled = scaler.transform(x_train)  # Transforms the training data 'x_tr
x_test_scaled = scaler.transform(x_test)    # Transforms the testing data 'x_tes
x_test_scaled = pd.DataFrame(x_test_scaled, columns=['bpm','nrgy','dnce','dB','l
x_test_scaled

x_train_scaled = pd.DataFrame(x_train_scaled, columns=['bpm','nrgy','dnce','dB',
x_train_scaled  # Displays the dataframe
```

Out[30]:

	bpm	nrgy	dnce	dB	live	val	dur	aco
0	0.523661	0.539952	-0.655430	0.773540	0.977251	1.175234	-1.307662	0.1819
1	-0.777325	-0.940685	0.331947	-0.870624	0.610494	-0.644087	-0.647064	0.1819
2	-1.605225	-0.895818	-0.852906	-0.322569	-0.343075	-1.925881	0.351889	1.0285
3	0.247694	1.392440	0.331947	1.321594	0.243736	1.009841	0.222992	-0.3260
4	-0.422511	1.123233	0.463597	0.773540	0.170385	0.306922	2.059777	-1.0372
...	...	...	...	...	...	...	...	
345	0.089999	-1.613702	0.595247	-1.966732	-0.783184	-1.719140	0.464674	0.5882
346	0.168847	1.571911	-1.247857	0.773540	-0.563129	-0.023864	0.835254	-1.1388
347	-0.383087	-0.940685	-0.852906	-0.322569	-0.123021	-0.354649	-1.629905	1.6380
348	0.405389	0.315613	0.858548	0.225485	0.903899	1.547368	0.222992	-0.3260
349	-0.383087	-1.030421	0.990198	-0.322569	-0.269724	1.257930	-0.630952	1.6042

350 rows × 9 columns

In [31]:
```
from sklearn.linear_model import LinearRegression  # Imports LinearRegression fr
lin_model = LinearRegression()   # Creates an instance of LinearRegression class
lin_model.fit(x_train_scaled,y_train)   # Fits the Linear Regression model to th
```

Out[31]:
```
▾ LinearRegression

LinearRegression()
```

In [32]:
```
lin_model.intercept_  # Gives the y-intercept of the regression line
```

Out[32]:
```
60.48285714285714
```

In [33]:
```
y_preds = lin_model.predict(x_test_scaled)  # The trained linear model 'lin_mode
y_preds  # Displays the predicted values of the target variable
```

Out[33]:
```
array([71.29547707, 69.7845524 , 66.8328784 , 59.50104117, 60.23981745,
       58.77475102, 64.40914852, 66.68978224, 74.1684818 , 63.20342286,
       60.01834558, 66.70411854, 63.1645799 , 72.55509398, 62.2799904 ,
       66.84494661, 55.91212988, 58.8808163 , 57.7318369 , 70.52580966,
       71.78017772, 56.49859335, 64.74742966, 67.7316139 , 59.86863871,
       67.63770349, 69.49316391, 77.15162238, 51.64551074, 64.91868346,
       69.3017442 , 63.89893284, 63.55487131, 48.67010685, 74.08130523,
       47.5055527 , 61.62277876, 61.71478734, 62.47665313, 60.35567329,
       64.40908016, 50.43599084, 59.66241431, 62.47614233, 57.98852497,
       66.00571587, 53.17404324, 64.3331116 , 69.81109551, 65.79764881,
       62.15550271, 62.53559575, 71.32662367, 61.06535861, 58.84020343,
       66.83588512, 69.25414661, 43.53977348, 57.76719143, 63.3788817 ,
       45.653209  , 56.95589291, 50.30509446, 50.71205526, 54.92694044,
       68.13016852, 47.61450136, 67.62813372, 57.49603272, 53.47084144,
       52.92545107, 62.85126273, 63.51102445, 54.27905389, 50.31451174,
       56.5500302 , 72.68174954, 72.02938023, 69.84106306, 70.75696707,
       78.80454923, 63.68379825, 57.06265708, 56.38684127, 63.83792106,
       51.47276196, 61.02267747, 49.11056173])
```

In [34]:
```
from sklearn.metrics import mean_squared_error   # Imports mean_squared_error fr
lin_rmse = mean_squared_error(y_test, y_preds, squared=False)   # Calculates RMS
lin_rmse   # Displays the RMSE Value
```

Out[34]:
```
10.905634132063183
```

In [35]:
```
len(y_preds)  # Displays the length of 'y_preds'
```

Out[35]:
```
88
```

In [36]:
```
from sklearn.ensemble import RandomForestRegressor  # Imports RandomForestRegres
rfr_model = RandomForestRegressor(random_state=1)  # Creates an instance of the
rfr_model.fit(x_train_scaled, y_train)  # Trains the Random forest regression mo
```

Out[36]:
```
▾        RandomForestRegressor

RandomForestRegressor(random_state=1)
```

In [37]:
```
rfr_pred = rfr_model.predict(x_test_scaled)  # Make predictions on the scaled te
rfr_pred
```

Out[37]:
```
array([65.42, 67.83, 70.24, 66.14, 64.23, 56.4 , 65.41, 65.32, 69.01,
       68.34, 62.42, 63.28, 66.53, 63.  , 59.01, 66.82, 53.16, 57.01,
       67.63, 65.82, 62.92, 56.58, 65.99, 61.65, 55.15, 62.62, 69.58,
       66.33, 51.28, 68.4 , 69.23, 60.55, 59.13, 54.79, 67.78, 46.89,
       64.13, 64.84, 67.31, 65.97, 64.09, 49.42, 65.68, 59.34, 67.48,
       67.22, 59.86, 63.82, 70.34, 63.78, 69.41, 67.39, 66.9 , 68.13,
       67.31, 68.74, 71.21, 40.4 , 62.25, 61.24, 46.96, 50.18, 44.97,
       53.89, 52.96, 68.9 , 50.19, 66.11, 61.62, 46.86, 57.56, 65.58,
       66.63, 62.15, 49.09, 50.26, 69.52, 69.42, 64.57, 68.97, 61.48,
       61.49, 57.99, 62.18, 69.02, 49.6 , 57.65, 44.02])
```

In [38]:
```
rfr_mse = mean_squared_error(y_test,rfr_pred)  # Calculates the mean squared err
rfr_rmse = np.sqrt(rfr_mse)  # RMSE = √MSE
rfr_rmse  # Displays the RMSE value
```

Out[38]:
```
10.814271032045824
```

In [40]:
```
spotify_test_scaled = scaler.transform(spotify_te[['bpm','nrgy','dnce','dB','liv
spotify_test_scaled = pd.DataFrame(spotify_test_scaled, columns=['bpm','nrgy','d
spotify_test_scaled
y_preds_csv = rfr_model.predict(spotify_test_scaled)    # The trained Random For
```

In [41]:
```
y_preds_csv  # Displays the predicted values
```

Out[41]:
```
array([67.02, 61.08, 52.37, 60.46, 50.17, 64.81, 54.52, 42.31, 62.69,
       59.93, 62.44, 65.91, 58.68, 60.3 , 61.64, 64.11, 62.06, 64.4 ,
       67.31, 65.22, 51.79, 59.94, 60.69, 45.48, 53.54, 68.23, 59.57,
       57.09, 48.72, 66.93, 68.53, 53.63, 66.81, 68.03, 64.56, 68.46,
       63.94, 50.76, 65.41, 65.96, 64.34, 63.34, 63.58, 44.11, 64.08,
       60.82, 65.99, 60.03, 58.16, 63.04, 48.34, 66.09, 61.4 , 50.7 ,
       62.21, 64.23, 63.31, 51.1 , 69.2 , 42.1 , 64.55, 66.19, 68.12,
       66.49, 68.71, 65.65, 65.83, 55.16, 62.55, 60.33, 65.24, 54.34,
       56.79, 61.98, 59.39, 67.04, 68.7 , 67.67, 56.07, 52.76, 67.99,
       62.41, 47.19, 68.24, 49.11, 61.66, 64.04, 67.18, 43.32, 71.32,
       40.98, 61.87, 68.3 , 68.67, 67.05, 68.76, 60.73, 58.23, 65.77,
       48.86, 56.26, 60.95, 68.97, 55.15, 47.2 , 66.2 , 66.61, 64.6 ,
       56.42, 66.54, 60.85, 60.76, 63.35, 62.69])
```

In [42]:
```
submission = pd.DataFrame({'Id': spotify_te.iloc[:,0], 'pop': y_preds_csv })  #
submission.to_csv('submission.csv', index=False)  # Saves the 'submission' dataf
```