In [1]:
```
import gzip
import matplotlib.pyplot as plt
import numpy
import random
import scipy
import tensorflow as tf
from collections import defaultdict
from scipy.spatial import distance
import pandas as pd
import numpy as np
import time
from sklearn import linear_model
from sklearn.datasets import make_regression
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.model_selection import train_test_split
```

In [2]:
```
def parsegz(fname):
    for l in gzip.open(fname):
        d = eval(l)
        yield d
```

In [3]:
```
def parsejson(fname):
    for l in open(fname):
        yield eval(l)
```

In [4]:
```
#steam_review = list(parsegz('steam_reviews.json.gz'))
```

In [5]:
```
steam_games = list(parsejson('steam_games.json'))
```

In [6]:
```
aus_review = list(parsejson('australian_user_reviews.json'))
```

In [126]:
```
aus_item = list(parsejson('australian_users_items.json'))
```

In [8]:
```
#bundle_data = list(parsegz('bundle_data.json.gz'))
```

In [9]:
```
# Can't match if game do not have id
removed = 0
for game in steam_games:
    if 'id' not in game.keys():
        steam_games.remove(game)
        removed += 1
print(removed)
```

```
2
```

In [11]:
```python
len(aus_item)
```
Out[11]:
```
88310
```

In [124]:
```python
aus_item[0]
```
```
',
   'playtime_forever': 32,
   'playtime_2weeks': 0},
  {'item_id': '33910',
   'item_name': 'Arma 2',
   'playtime_forever': 3,
   'playtime_2weeks': 0},
  {'item_id': '33930',
   'item_name': 'Arma 2: Operation Arrowhead',
   'playtime_forever': 3,
   'playtime_2weeks': 0},
  {'item_id': '219540',
   'item_name': 'Arma 2: Operation Arrowhead Beta (Obsolete)',
   'playtime_forever': 0,
   'playtime_2weeks': 0},
  {'item_id': '17410',
   'item_name': "Mirror's Edge",
   'playtime_forever': 0,
   'playtime_2weeks': 0},
```

In [127]:
```python
train = aus_item[:60000]
test = aus_item[60000:]
```

In [13]:
```python
### feature
```

In [128]:
```python
gameid = [game['id'] for game in steam_games]
```

In [129]:
```python
len(gameid)
```
Out[129]:
```
32133
```

In [16]:
```python
genres = []
for game in steam_games:
    if 'genres' in game.keys():
        genres.extend(game['genres'])

genres = list(set(genres))
```

In [17]:
```python
gameid_genres = defaultdict(list)
for game in steam_games:
    if 'genres' in game.keys():
        gameid_genres[game['id']] = game['genres']
```

In [18]:
```
gameid_tags = defaultdict(list)
for game in steam_games:
    if 'tags' in game.keys():
        gameid_tags[game['id']] = game['tags']
```

In [400]:
```
userid_items = defaultdict(list)
for user in aus_item:
    for i in user['items']:
        if (i['playtime_forever'] < 1000):
            userid_items[user['user_id']].append(i)
```

In [401]:
```
gameid_playTime = defaultdict(int)
gameid_userPlayed = defaultdict(int)
gameid_averagePlayTime = defaultdict(int)

#userid_genre = defaultdict(list)

for user in aus_item:
    for i in user['items']:
        if (i['playtime_forever'] < 1000):
            gameid_playTime[i['item_id']] += i['playtime_forever']
            gameid_userPlayed[i['item_id']] += 1

c = 0
for i in gameid_userPlayed:
    if (gameid_userPlayed[i] != 0):
        gameid_averagePlayTime[i] = gameid_playTime[i] / gameid_use
    c+=1
print(c)
```

```
10938
```

In [402]:
```
len(gameid_userPlayed)
```

Out[402]:
```
10938
```

In [403]:
```
list(gameid_playTime.values())[:10]
```

Out[403]:
```
[637802, 167511, 94257, 22850, 377717, 24151, 1104031, 239816, 490
785, 120978]
```

In [404]:
```
list(gameid_userPlayed.values())[:10]
```

Out[404]:
```
[8614, 6267, 3393, 3267, 6180, 3300, 7118, 6167, 3583, 692]
```

In [405]:
```
max(gameid_averagePlayTime.values())
l = list(gameid_averagePlayTime.values())
l.sort(reverse=True)
print(np.average(list(gameid_averagePlayTime.values())))
print(l)
```

```
86.61874177694553
[910.0, 909.0, 868.0, 826.0, 756.0, 737.0, 732.0, 732.0, 719.0, 70
9.0, 706.0, 700.0, 687.0, 683.0, 676.0, 644.0, 632.0, 631.0, 631.0
, 630.0, 611.0, 606.5, 606.0, 596.0, 596.0, 585.0, 585.0, 584.0, 5
83.0, 564.0, 562.0, 562.0, 556.0, 554.6363636363636, 544.8, 540.38
38383838383, 537.0, 523.0, 522.5, 520.0, 514.5, 514.0, 511.0, 505.
5, 502.0, 500.8333333333333, 495.5, 495.0, 492.76190476190476, 492
.0, 488.0, 487.3333333333333, 482.8333333333333, 481.0, 479.765498
6522911, 477.1, 475.82142857142856, 473.0, 472.0, 469.5, 465.44, 4
64.4273504273504, 463.0, 461.0, 461.0, 460.0, 457.3333333333333, 4
48.5, 448.0, 446.98387096774195, 443.6, 443.0, 441.3333333333333,
441.0, 440.0, 437.0, 435.5, 429.0, 423.0, 423.0, 419.3426346528228
, 418.1820809248555, 417.6, 415.0, 415.0, 414.81019332161685, 410.
9211618257261З, 410.0, 410.0, 409.625, 408.8, 407.20512820512823,
406.5, 406.5, 405.78487752928646, 402.5661712668082, 402.0, 402.0,
401.0, 397.6666666666667, 397.3333333333333, 396.3070439494281, 39
2.8888888888889, 392.11538461538464, 392.11340206185565, 391.09130
816505706, 391.01846758349706, 390.72523064580827, 390.24331550802
14, 390.0, 387.8682432432432, 387.8333333333333, 387.7977150537634
5, 387.0056204720557, 386.0153318077803, 385.6132511155634, 383.702
```

In [406]:
```
len(gameid_averagePlayTime.values())
```

Out[406]:
```
10938
```

In [407]:
```
len(gameid_userPlayed)
```

Out[407]:
```
10938
```

In [408]:
```
gameid_price = defaultdict(int)
#s = set( val for val in gameid_price.values())
lis = ['Free', 'Free To Play', 'Free to Play', 'Free Demo', 'Free H
for game in steam_games:
    if 'price' not in game.keys():
        gameid_price[game['id']] = 0
    elif game['price'] in lis:
        gameid_price[game['id']] = 0
    else:
        gameid_price[game['id']] = game['price']
```

In [409]:
```
#gameid_reviews = defaultdict(int)

#for review in steam_review:
#    gameid_reviews[review['product_id']] += 1
```

In [410]:
```
def Jaccard(s1, s2):
    numer = len(s1.intersection(s2))
    denom = len(s1.union(s2))
    if denom == 0:
        return 0
    return numer / denom
```

In [411]:
```
def mostSimilar(i, N):
    similarities = []
    for i2 in gameid:
        if i2 == i: continue
        sim = Jaccard(set(gameid_tags[i]), set(gameid_tags[i2]))
        #sim = Pearson(i, i2) # Could use alternate similarity metr
        similarities.append((sim,i2))
    similarities.sort(reverse=True)

    return similarities[:N]
```

In [412]:
```
def feature(user, game):
    """
    # One hot encoding of average time spent on each genre by user
    time1 = time.time()
    timeOnGenres = [0] * len(genres)
    puchaseditems = userid_items[user]
    for i in puchaseditems:
        gameGenres = gameid_genres[i['item_id']]
        for g in gameGenres:
            timeOnGenres[genres.index(g)] += i['playtime_forever']
    """

    # Average play time by user (game with non-zero time)
    userplaytime = 0
    userplaytime = np.average([i['playtime_forever'] for i in useri

    # One hot encoding of game genres
    #onehot_gameGenres = [0] * len(genres)
    #for g in gameid_genres[game]:
    #    onehot_gameGenres[genres.index(g)] = 1

    # Average game play time (user with non-zero time)
    gameplaytime = gameid_averagePlayTime[game]


    # Game price
    #price = gameid_price[game]

    # Number of reviews the item get
    #reviews = gameid_reviews[game]

    # Average play time of top 3 Most similar items
    #similarGameAverageTime = 0
    #top3 = mostSimilar(game, 3)
    #for sim, item in top3:
    #    similarGameAverageTime += (gameid_averagePlayTime[item] * 
    #time8 = time.time()


    # TODO: z-score of user’s play time in all players’s play time 

    return [1] + [userplaytime] + [gameplaytime]
    #return [timeOnGenres + [userplaytime] + onehot_gameGenres + [g
```

In [ ]:

In [413]:
```
np.average(list(gameid_averagePlayTime.values()))
```

Out[413]:
```
86.61874177694553
```

In [414]:
```
X_train = []
y_train = []
```

```python
process = 0
c = 0
for user in train:
    process+=1
    if process % 1000 == 0:
        print('Processing user ' + str(process))
    for i in user['items']:
        c+=1
        if (i['playtime_forever'] < 1000):
            X_train.append(feature(user['user_id'], i['item_id']))
            y_train.append(i['playtime_forever'])
```

```
Processing user 1000
Processing user 2000
Processing user 3000
Processing user 4000
Processing user 5000
Processing user 6000
Processing user 7000
Processing user 8000
Processing user 9000
Processing user 10000
Processing user 11000
Processing user 12000
Processing user 13000
Processing user 14000
Processing user 15000
Processing user 16000
Processing user 17000
Processing user 18000
Processing user 19000
Processing user 20000
Processing user 21000
Processing user 22000
Processing user 23000
Processing user 24000
Processing user 25000
Processing user 26000
Processing user 27000
Processing user 28000
Processing user 29000
Processing user 30000
Processing user 31000
Processing user 32000
Processing user 33000
Processing user 34000
Processing user 35000
Processing user 36000
Processing user 37000
Processing user 38000
Processing user 39000
Processing user 40000
Processing user 41000
Processing user 42000
Processing user 43000
Processing user 44000
Processing user 45000
Processing user 46000
Processing user 47000
Processing user 48000
Processing user 49000
Processing user 50000
Processing user 51000
Processing user 52000
Processing user 53000
Processing user 54000
Processing user 55000
Processing user 56000
Processing user 57000
Processing user 58000
Processing user 59000
Processing user 60000
```

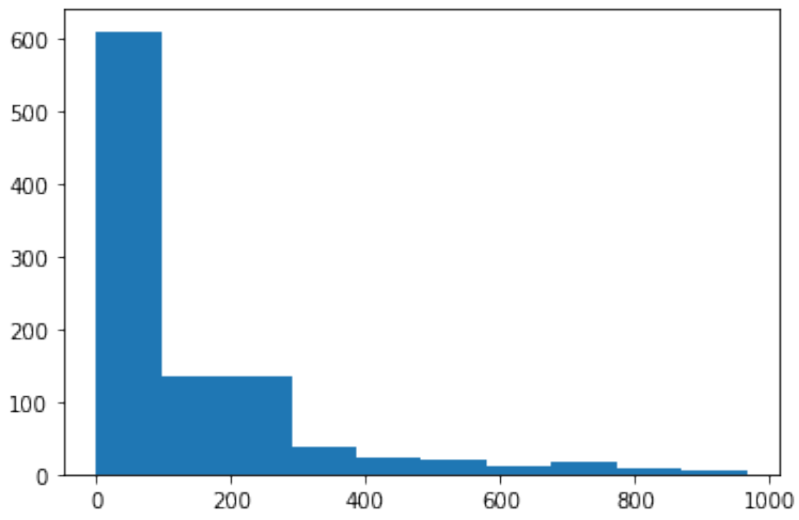
In [415]:
```
X_test = []
y_test = []
process = 0
for user in test:
    process+=1
    if process % 1000 == 0:
        print('Processing user ' + str(process))
    for i in user['items']:
        if (i['playtime_forever'] < 1000):
            X_test.append(feature(user['user_id'], i['item_id']))
            y_test.append(i['playtime_forever'])
```

```
Processing user 1000
Processing user 2000
Processing user 3000
Processing user 4000
Processing user 5000
Processing user 6000
Processing user 7000
Processing user 8000
Processing user 9000
Processing user 10000
Processing user 11000
Processing user 12000
Processing user 13000
Processing user 14000
Processing user 15000
Processing user 16000
Processing user 17000
Processing user 18000
Processing user 19000
Processing user 20000
Processing user 21000
Processing user 22000
Processing user 23000
Processing user 24000
Processing user 25000
Processing user 26000
Processing user 27000
Processing user 28000
```

In [416]:
```
print(y_train[:100])
```

```
[6, 0, 7, 0, 0, 0, 0, 0, 333, 75, 338, 0, 2, 286, 633, 0, 696, 0,
37, 0, 168, 173, 323, 692, 0, 0, 477, 115, 0, 0, 28, 0, 31, 0, 195
, 513, 186, 0, 271, 445, 0, 0, 0, 53, 199, 25, 570, 0, 940, 110, 5
, 782, 77, 437, 503, 0, 536, 139, 95, 0, 11, 46, 85, 834, 127, 71,
0, 0, 0, 0, 585, 146, 0, 32, 3, 3, 0, 0, 0, 707, 50, 206, 12, 64,
369, 76, 0, 0, 594, 43, 966, 25, 119, 6, 0, 0, 0, 537, 50, 149]
```

```
In [417]: c

Out[417]: 4623654

In [418]: len(y_train)

Out[418]: 3982332

In [419]: len(y_test)

Out[419]: 456573

In [420]: np.average(y_train[:600000000])

Out[420]: 124.2725679325581

In [421]: plt.hist(y_train[:1000])

Out[421]: (array([609., 135., 135.,  39.,  23.,  19.,  10.,  16.,   8.,   6.
          ]),
           array([  0. ,  96.6, 193.2, 289.8, 386.4, 483. , 579.6, 676.2, 77
          2.8,
                  869.4, 966. ]),
           <BarContainer object of 10 artists>)
```



```
In [422]: X_train[:100]

Out[422]: [[1, 179.31739130434784, 74.04248897144184],
           [1, 179.31739130434784, 26.72905696505505],
           [1, 179.31739130434784, 27.779840848806366],
           [1, 179.31739130434784, 6.99418426691154],
           [1, 179.31739130434784, 61.11925566343042],
           [1, 179.31739130434784, 7.318484848484848],
           [1, 179.31739130434784, 155.1041022759202],
           [1, 179.31739130434784, 38.886979082211774],
           [1, 179.31739130434784, 136.97599776723416],
           [1, 179.31739130434784, 174.82369942196533],
           [1, 179.31739130434784, 57.638971315529176],
           [1, 179.31739130434784, 7.854843799305774],
           [1, 179.31739130434784, 86.06048387096774],
           [1, 179.31739130434784, 45.04040404040404],
           [1, 179.31739130434784, 174.7219917012448],
           [1, 179.31739130434784, 4.658843007401636],
           [1, 179.31739130434784, 262.9236272107041],
           [1, 179.31739130434784, 34.5105120598478],
           [1, 179.31739130434784, 14.892362864935851],
           [1, 179.31739130434784, 4.836625854428003],
           [1, 179.31739130434784, 113.23824162311712],
           [1, 179.31739130434784, 194.33795959482904],
           [1, 179.31739130434784, 125.29737678855327],
           [1, 179.31739130434784, 31.15158371040724],
           [1, 179.31739130434784, 76.32785693515557],
           [1, 179.31739130434784, 74.38079347423063],
           [1, 179.31739130434784, 114.39532680770445],
           [1, 179.31739130434784, 178.52291365171249],
           [1, 179.31739130434784, 19.163674762407602],
           [1, 179.31739130434784, 115.2258064516129],
           [1, 179.31739130434784, 66.75990675990676],
           [1, 179.31739130434784, 55.01439884809215],
           [1, 179.31739130434784, 79.04559457794208],
           [1, 179.31739130434784, 13.517998779743746],
           [1, 179.31739130434784, 81.34541249036238],
           [1, 179.31739130434784, 212.23287086446103],
           [1, 179.31739130434784, 169.75222182723073],
           [1, 179.31739130434784, 134.75647825428095],
           [1, 179.31739130434784, 83.35915492957747],
           [1, 179.31739130434784, 103.0311327831958],
           [1, 179.31739130434784, 6.827852444952817],
           [1, 179.31739130434784, 27.85489721886336],
           [1, 179.31739130434784, 13.411238825031928],
           [1, 179.31739130434784, 69.5625],
           [1, 179.31739130434784, 143.80548128342247],
           [1, 179.31739130434784, 57.06578947368421],
           [1, 179.31739130434784, 392.1134020618556 5],
           [1, 179.31739130434784, 212.14260814450958],
           [1, 179.31739130434784, 57.23481414324569],
           [1, 179.31739130434784, 61.741106719367586],
           [1, 179.31739130434784, 114.35852478839178],
           [1, 179.31739130434784, 360.3777777777778],
           [1, 179.31739130434784, 134.19224116629601],
           [1, 179.31739130434784, 171.2783417935702],
           [1, 179.31739130434784, 73.79347826086956],
           [1, 179.31739130434784, 1.5863633907828625],
           [1, 179.31739130434784, 215.04151223128244],
           [1, 179.31739130434784, 112.90881284649207],
           [1, 179.31739130434784, 128.56808510638297],
           [1, 179.31739130434784, 0.7842701621861808],
           [1, 179.31739130434784, 50.38333333333333],
           [1, 179.31739130434784, 46.357883817427386],
           [1, 179.31739130434784, 156.5483870967742],
           [1, 179.31739130434784, 141.81131898091567],
           [1, 179.31739130434784, 182.40267175572518],

           [1, 179.31739130434784, 35.29552819183409],
           [1, 179.31739130434784, 20.760855476344783],
           [1, 179.31739130434784, 19.132295719844358],
           [1, 179.31739130434784, 15.91839378238342],
           [1, 179.31739130434784, 14.420711974110032],
           [1, 179.31739130434784, 76.8984771573604],
           [1, 179.31739130434784, 13.905918481295366],
           [1, 179.31739130434784, 11.368715083798882],
           [1, 179.31739130434784, 335.99328859060404],
           [1, 179.31739130434784, 100.96172283556072],
           [1, 179.31739130434784, 161.4081652165599],
           [1, 179.31739130434784, 13.687108295707258],
           [1, 179.31739130434784, 179.00125822686798],
           [1, 179.31739130434784, 5.16240197267362],
           [1, 179.31739130434784, 213.38681948424068],
           [1, 179.31739130434784, 91.71428571428571],
           [1, 179.31739130434784, 194.11769447803306],
           [1, 179.31739130434784, 101.45925656859184],
           [1, 179.31739130434784, 224.34865900383141],
           [1, 179.31739130434784, 104.62299651567945],
           [1, 179.31739130434784, 24.74742268041237],
           [1, 179.31739130434784, 12.883565172591448],
           [1, 179.31739130434784, 14.316168898043255],
           [1, 179.31739130434784, 126.96132596685082],
           [1, 179.31739130434784, 256.48746081504703],
           [1, 179.31739130434784, 327.6522090517241],
           [1, 179.31739130434784, 89.25213675213675],
           [1, 179.31739130434784, 170.74881398252185],
           [1, 179.31739130434784, 19.483126110124335],
           [1, 179.31739130434784, 31.282101167315176],
           [1, 179.31739130434784, 39.92079207920792],
           [1, 179.31739130434784, 38.04961832061068],
           [1, 179.31739130434784, 236.09565217391304],
           [1, 179.31739130434784, 89.70251177394034],
           [1, 179.31739130434784, 124.54018547140649]]
```

In [423]:
```
reg = GradientBoostingRegressor(random_state=0)

reg.fit(X_train, y_train)
predict = reg.predict(X_test)

reg.score(X_test, y_test)
```

Out[423]:
```
0.28723894249570014
```

In [424]:
```
MSEtest = sum((y_test - predict)**2)/len(y_test)
MSEtest
```

Out[424]:
```
32247.895885977367
```

In [425]:
```
X_train[:20]
```

Out[425]:
```
[[1, 179.31739130434784, 74.04248897144184],
 [1, 179.31739130434784, 26.72905696505505],
 [1, 179.31739130434784, 27.779840848806366],
 [1, 179.31739130434784, 6.99418426691154],
 [1, 179.31739130434784, 61.11925566343042],
 [1, 179.31739130434784, 7.318484848484848],
 [1, 179.31739130434784, 155.1041022759202],
 [1, 179.31739130434784, 38.886979082211774],
 [1, 179.31739130434784, 136.97599776723416],
 [1, 179.31739130434784, 174.82369942196533],
 [1, 179.31739130434784, 57.638971315529176],
 [1, 179.31739130434784, 7.854843799305774],
 [1, 179.31739130434784, 86.06048387096774],
 [1, 179.31739130434784, 45.04040404040404],
 [1, 179.31739130434784, 174.7219917012448],
 [1, 179.31739130434784, 4.658843007401636],
 [1, 179.31739130434784, 262.9236272107041],
 [1, 179.31739130434784, 34.5105120598478],
 [1, 179.31739130434784, 14.892362864935851],
 [1, 179.31739130434784, 4.836625854428003]]
```

In [426]:
```
y_train[:20]
```

Out[426]:
```
[6, 0, 7, 0, 0, 0, 0, 0, 333, 75, 338, 0, 2, 286, 633, 0, 696, 0,
37, 0]
```

In [427]:
```
aus_item[:10]
```

Out[427]:
```
[{'user_id': '76561197970982479',
  'items_count': 277,
  'steam_id': '76561197970982479',
  'user_url': 'http://steamcommunity.com/profiles/7656119797098247
9',
  'items': [{'item_id': '10',
    'item_name': 'Counter-Strike',
    'playtime_forever': 6,
    'playtime_2weeks': 0},
   {'item_id': '20',
    'item_name': 'Team Fortress Classic',
    'playtime_forever': 0,
    'playtime_2weeks': 0},
   {'item_id': '30',
    'item_name': 'Day of Defeat',
    'playtime_forever': 7,
    'playtime_2weeks': 0},
   {'item_id': '40',
    'item_name': 'Deathmatch Classic',
```

In [428]:
```
list(gameid_averagePlayTime.values())[:100]
```

Out[428]:
```
[74.04248897144184,
 26.72905696505505,

 27.779840848806366,
 6.99418426691154,
 61.11925566343042,
 7.318484848484848,
 155.1041022759202,
 38.886979082211774,
 136.97599776723416,
 174.82369942196533,
 57.638971315529176,
 7.854843799305774,
 86.06048387096774,
 45.04040404040404,
 174.7219917012448,
 4.658843007401636,
 262.9236272107041,
 34.5105120598478,
 14.892362864935851,
 4.836625854428003,
 113.23824162311712,
 194.33795959482904,
 125.29737678855327,
 31.15158371040724,
 76.32785693515557,
 74.38079347423063,
 114.39532680770445,
 178.52291365171249,
 19.163674762407602,
 115.2258064516129,
 66.75990675990676,
 55.01439884809215,
 79.04559457794208,
 13.517998779743746,
 81.34541249036238,
 212.23287086446103,
 169.75222182723073,
 134.75647825428095,
 83.35915492957747,
 103.0311327831958,
 6.827852444952817,
 27.85489721886336,
 13.411238825031928,
 69.5625,
 143.80548128342247,
 57.06578947368421,
 392.11340206185565,
 212.14260814450958,
 57.23481414324569,
 61.741106719367586,
 114.35852478839178,
 360.3777777777778,
 134.19224116629601,
 171.2783417935702,
 73.79347826086956,
 1.5863633907828625,
 215.04151223128244,
 112.90881284649207,
 128.56808510638297,
 0.7842701621861808,
 50.38333333333333,
 46.357883817427386,
 156.5483870967742,
 141.81131898091567,
 182.40267175572518,
 35.29552819183409,
 20.760855476344783,
 19.132295719844358,
 15.91839378238342,
 14.420711974110032,
 76.8984771573604,
 13.905918481295366,
 11.368715083798882,
 335.99328859060404,
 100.96172283556072,
 161.4081652165599,
 13.687108295707258,
 179.00125822686798,
 5.16240197267362,
 213.38681948424068,
 91.71428571428571,
 194.11769447803306,
 101.45925656859184,
 224.34865900383141,
 104.62299651567945,
 24.74742268041237,
 12.883565172591448,
 14.316168898043255,
 126.96132596685082,
 256.48746081504703,
 327.6522090517241,
 89.25213675213675,
 170.74881398252185,
 19.483126110124335,
 31.282101167315176,
 39.92079207920792,
 38.04961832061068,
 236.09565217391304,
 89.70251177394034,
 124.54018547140649]
```

In [429]:
```
np.average(predict)
```

Out[429]:
```
128.60551409582678
```

```
In [430]: np.average(list(gameid_averagePlayTime.values()))

Out[430]: 86.61874177694553

In [431]: np.average(y_test[:3000])

Out[431]: 123.96133333333333

In [432]: np.average(y_train[:30000000])

Out[432]: 124.2725679325581

In [433]: y_pred = reg.predict(X_train)
          MSEtrain = sum((y_train - y_pred)**2)/len(y_train)
          MSEtrain

Out[433]: 33690.881968366055

In [434]: model = linear_model.LinearRegression(fit_intercept=False)
          model.fit(X_train, y_train)
          theta = model.coef_

In [435]: y_testpred = model.predict(X_test)
          MSEtest = sum((y_test - y_testpred)**2)/len(y_test)
          MSEtest

Out[435]: 33144.94323624719

In [436]: # Regularized regression
          clf = linear_model.Ridge(1.0, fit_intercept=False) # MSE + 1.0 l2
          clf.fit(X_train, y_train)
          theta = clf.coef_
          predictions = clf.predict(X_train)

In [442]: predict[:10]

Out[442]: array([408.95394028, 334.47276135, 489.09162732, 428.41015324,
                  19.67488075, 345.62303747, 366.66180671, 369.90038888,
                 354.71820666, 253.8643856 ])

In [438]: y_test[:10]

Out[438]: [549, 0, 565, 790, 0, 166, 552, 686, 853, 79]
```

In [439]:
```
X_train[:10]
```

Out[439]:
```
[[1, 179.31739130434784, 74.04248897144184],
 [1, 179.31739130434784, 26.72905696505505],
 [1, 179.31739130434784, 27.779840848806366],
 [1, 179.31739130434784, 6.99418426691154],
 [1, 179.31739130434784, 61.11925566343042],
 [1, 179.31739130434784, 7.318484848484848],
 [1, 179.31739130434784, 155.1041022759202],
 [1, 179.31739130434784, 38.886979082211774],
 [1, 179.31739130434784, 136.97599776723416],
 [1, 179.31739130434784, 174.82369942196533]]
```

In [440]:
```
y_train[:10]
```

Out[440]:
```
[6, 0, 7, 0, 0, 0, 0, 0, 333, 75]
```

In [441]:
```
len(X_train)
```

Out[441]:
```
3982332
```

In [ ]:
```
theta
```

In [ ]:
```
result=pd.DataFrame(y_pred, y_train)
result
```

In [ ]:
```
sum(y_pred < 0)
```

In [ ]:
```

```