**Holmusk Data Modelling**

**Approach:-**

**-----------------**

Minimal Coding and maximum Efficiency.

Robust and readable coding style.

**Platform:-**

**-------------------**

**Ubuntu** 14, **python** 3.5,

**pandas**, #for handling datasets

**numpy**, #for numerical computation

**functools** #to join data frames

**pylab** #for plotting

**Steps:-**

**--------------**

1. Read data from given .csv files and create Data Frames.
2. Join dfBill\_amount, dfBill\_id on column **'bill\_id'** and Create temp data frame **dfBill**.
3. Rename column **'id'** to **'patient\_id'** in dfCl\_data.
4. Join dfBill, dfCl\_data, dfDemo on column **'patient\_id'** and create final data frame **dfFinal.**
5. Create .csv file from data frame **hmFinal.csv.**
6. Explore data based on **hmFinal.csv.**
7. Play with data modelling and create multiple insights out of **hmFinal.csv.**

**DATA Analysis**

##### Amount Analysis######

count 16976.000000

mean 5457.613754

std 7688.241568

min 79.496707

25% 951.830530

50% 1515.676655

75% 7307.056573

max 81849.751340

Name: amount, dtype: float64

##### Weight Analysis ######

count 16976.000000

mean 78.671136

std 10.918066

min 48.000000

25% 71.200000

50% 78.800000

75% 86.200000

max 121.000000

Name: weight, dtype: float64

4593.86489965

##### Race Analysis ######

count 16976

unique 6

top Chinese

freq 8952

Name: race, dtype: object

##### Groupby Amount Analysis ######

bill\_id medical\_history\_1 medical\_history\_2 \

amount

79.496707 5175703971 0.000000 0.0

93.806451 6212707315 0.000000 0.0

108.721162 3334662827 0.000000 1.0

119.405414 3429674426 0.000000 0.0

194.357987 1234249611 0.000000 0.0

228.234099 3066000736 0.000000 0.0

235.374943 5665678138 0.000000 0.0

238.591675 7720310407 0.000000 0.0

239.014614 4668129999 0.000000 1.0

244.023357 4304004650 0.000000 1.0

246.588325 2204680903 0.000000 0.0

251.617738 1681195057 0.000000 0.0

254.166095 4046727314 0.500000 0.0

257.357186 4641992679 0.000000 0.0

261.961530 8150926819 0.500000 0.0

264.789899 1050632535 0.000000 0.0

273.065813 3688476777 0.000000 0.0

278.231612 6181136043 0.000000 0.0

278.735553 8954067797 0.000000 0.0

279.743807 1871929852 0.000000 0.0

281.288005 2185200056 0.000000 0.0

281.885544 467540460 0.000000 0.0

284.805316 227710606 0.333333 0.5

285.567616 3322495472 0.000000 0.0

291.146757 6293758201 0.000000 1.0

293.918441 5848699408 0.000000 0.0

293.947774 2349838379 0.000000 1.0

296.874484 5996887868 0.000000 1.0

296.907324 6781141024 0.000000 0.0

297.216056 1010184267 0.000000 1.0

... ... ... ...

44298.689163 9435485992 0.000000 1.0

44422.952959 3703455863 0.000000 NaN

44707.493605 642885648 0.000000 1.0

45858.679211 1495157942 0.000000 1.0

45931.544929 9212307356 0.000000 1.0

46464.354789 7111144651 0.000000 0.0

46950.806897 5409162302 0.000000 0.0

47120.256963 5516311017 0.000000 0.0

48025.248530 3820169441 0.000000 0.5

48669.112196 7817703112 0.000000 0.0

49190.872039 9719268728 0.000000 0.0

49706.656289 5984832167 0.000000 0.0

50214.534064 6701028657 0.000000 0.0

50775.379078 6751048632 1.000000 1.0

52199.769124 6617997072 0.000000 NaN

53437.866058 7167471294 1.000000 0.0

53497.475811 1157735918 0.000000 0.5

54426.287811 9170243704 1.000000 1.0

54504.848240 2261573949 1.000000 1.0

55011.360798 9476531069 0.000000 1.0

55740.739192 3184203243 1.000000 0.0

56421.085111 1253918096 0.000000 0.0

59655.976585 3413688255 0.000000 0.0

62134.143055 3601816086 0.000000 0.0

62305.026527 4460692938 1.000000 1.0

67942.776636 4231417194 0.000000 0.0

68178.585792 7487729975 0.000000 1.0

70922.127049 5013351484 1.000000 0.0

71891.334875 2650673778 0.000000 1.0

81849.751340 2626841093 0.000000 0.0

medical\_history\_4 medical\_history\_5 medical\_history\_6 \

amount

79.496707 0 0.0 0.000000

93.806451 0 0.0 0.000000

108.721162 0 1.0 0.000000

119.405414 0 0.0 0.000000

194.357987 0 0.0 0.000000

228.234099 0 NaN 0.000000

235.374943 0 1.0 1.000000

238.591675 0 0.0 0.000000

239.014614 0 0.0 0.000000

244.023357 0 0.0 0.000000

246.588325 0 1.0 1.000000

251.617738 0 0.0 1.000000

254.166095 0 0.5 0.500000

257.357186 0 0.0 0.000000

261.961530 0 0.5 0.500000

264.789899 0 0.0 0.000000

273.065813 0 1.0 1.000000

278.231612 0 0.0 1.000000

278.735553 0 0.0 1.000000

279.743807 0 0.0 0.000000

281.288005 1 0.0 0.000000

281.885544 0 0.0 0.000000

284.805316 0 0.0 0.333333

285.567616 0 0.0 0.000000

291.146757 0 0.0 0.000000

293.918441 1 0.0 1.000000

293.947774 0 0.0 0.000000

296.874484 0 0.0 1.000000

296.907324 0 0.0 0.000000

297.216056 1 0.0 0.000000

... ... ... ...

44298.689163 0 0.0 0.000000

44422.952959 0 0.0 0.000000

44707.493605 0 0.0 0.000000

45858.679211 0 0.0 0.000000

45931.544929 0 0.0 0.000000

46464.354789 0 0.0 0.000000

46950.806897 0 0.0 0.000000

47120.256963 0 1.0 0.000000

48025.248530 0 0.0 0.500000

48669.112196 0 0.0 0.000000

49190.872039 0 0.0 1.000000

49706.656289 0 NaN 0.000000

50214.534064 0 0.0 0.000000

50775.379078 0 0.0 1.000000

52199.769124 0 0.0 0.000000

53437.866058 0 0.0 1.000000

53497.475811 0 0.0 0.500000

54426.287811 1 0.0 0.000000

54504.848240 0 0.0 0.000000

55011.360798 0 0.0 1.000000

55740.739192 0 0.0 0.000000

56421.085111 1 0.0 0.000000

59655.976585 0 0.0 1.000000

62134.143055 0 0.0 1.000000

62305.026527 0 0.0 0.000000

67942.776636 0 0.0 0.000000

68178.585792 0 0.0 0.000000

70922.127049 0 1.0 0.000000

71891.334875 0 0.0 0.000000

81849.751340 0 0.0 0.000000

medical\_history\_7 preop\_medication\_1 preop\_medication\_2 \

amount

79.496707 1.0 0.000000 0.000000

93.806451 0.0 0.000000 0.000000

108.721162 0.0 0.000000 0.000000

119.405414 0.0 0.000000 0.000000

194.357987 0.0 0.000000 0.000000

228.234099 0.0 1.000000 0.000000

235.374943 1.0 1.000000 1.000000

238.591675 0.0 1.000000 0.000000

239.014614 1.0 1.000000 1.000000

244.023357 0.0 1.000000 1.000000

246.588325 0.0 0.000000 0.000000

251.617738 0.0 1.000000 1.000000

254.166095 0.0 0.000000 0.500000

257.357186 1.0 0.000000 0.000000

261.961530 0.0 0.000000 0.500000

264.789899 0.0 1.000000 1.000000

273.065813 0.0 0.000000 0.000000

278.231612 0.0 0.000000 0.000000

278.735553 1.0 0.000000 0.000000

279.743807 0.0 1.000000 1.000000

281.288005 0.0 1.000000 0.000000

281.885544 0.0 1.000000 1.000000

284.805316 0.0 0.666667 0.666667

285.567616 0.0 0.000000 0.000000

291.146757 0.0 0.000000 0.000000

293.918441 0.0 0.000000 0.000000

293.947774 1.0 1.000000 1.000000

296.874484 0.0 1.000000 1.000000

296.907324 0.0 0.000000 0.000000

297.216056 0.0 1.000000 1.000000

... ... ... ...

44298.689163 0.0 1.000000 1.000000

44422.952959 1.0 1.000000 1.000000

44707.493605 0.0 0.500000 0.500000

45858.679211 0.0 1.000000 1.000000

45931.544929 0.0 1.000000 0.000000

46464.354789 0.0 0.000000 0.000000

46950.806897 0.0 1.000000 1.000000

47120.256963 0.0 1.000000 1.000000

48025.248530 0.0 0.500000 1.000000

48669.112196 1.0 0.000000 0.000000

49190.872039 0.0 1.000000 1.000000

49706.656289 0.0 0.000000 0.000000

50214.534064 0.0 1.000000 0.000000

50775.379078 0.0 1.000000 1.000000

52199.769124 0.0 0.000000 0.000000

53437.866058 0.0 0.000000 1.000000

53497.475811 0.0 0.500000 1.000000

54426.287811 0.0 0.000000 0.000000

54504.848240 0.0 0.500000 1.000000

55011.360798 0.0 1.000000 0.000000

55740.739192 0.0 1.000000 1.000000

56421.085111 0.0 0.000000 0.000000

59655.976585 1.0 0.000000 1.000000

62134.143055 1.0 1.000000 0.000000

62305.026527 0.0 0.500000 1.000000

67942.776636 0.0 0.000000 1.000000

68178.585792 0.0 1.000000 1.000000

70922.127049 0.0 1.000000 0.000000

71891.334875 1.0 1.000000 1.000000

81849.751340 0.5 0.500000 0.500000

preop\_medication\_3 ... symptom\_1 symptom\_2 symptom\_3 \

amount ...

79.496707 0.000000 ... 0.000000 0.0 1.0

93.806451 0.000000 ... 1.000000 1.0 0.0

108.721162 0.000000 ... 0.000000 1.0 1.0

119.405414 0.000000 ... 1.000000 0.0 1.0

194.357987 0.000000 ... 1.000000 0.0 1.0

228.234099 1.000000 ... 1.000000 0.0 0.0

235.374943 1.000000 ... 1.000000 1.0 0.0

238.591675 1.000000 ... 0.000000 0.0 1.0

239.014614 1.000000 ... 1.000000 1.0 1.0

244.023357 1.000000 ... 1.000000 0.0 1.0

246.588325 0.000000 ... 0.000000 1.0 1.0

251.617738 1.000000 ... 1.000000 1.0 0.0

254.166095 0.500000 ... 0.500000 0.5 0.5

257.357186 0.000000 ... 1.000000 0.0 0.0

261.961530 0.500000 ... 0.500000 0.5 0.5

264.789899 1.000000 ... 0.000000 1.0 0.0

273.065813 0.000000 ... 0.000000 1.0 1.0

278.231612 0.000000 ... 1.000000 0.0 1.0

278.735553 0.000000 ... 0.000000 1.0 0.0

279.743807 1.000000 ... 1.000000 1.0 1.0

281.288005 0.000000 ... 1.000000 1.0 1.0

281.885544 1.000000 ... 0.000000 1.0 0.0

284.805316 0.666667 ... 0.666667 1.0 0.0

285.567616 1.000000 ... 0.000000 1.0 0.0

291.146757 1.000000 ... 1.000000 1.0 1.0

293.918441 0.000000 ... 1.000000 0.0 0.0

293.947774 1.000000 ... 1.000000 1.0 0.0

296.874484 0.000000 ... 0.000000 0.0 0.0

296.907324 1.000000 ... 1.000000 0.0 1.0

297.216056 1.000000 ... 1.000000 0.0 1.0

... ... ... ... ... ...

44298.689163 1.000000 ... 1.000000 1.0 0.0

44422.952959 1.000000 ... 1.000000 1.0 1.0

44707.493605 1.000000 ... 0.500000 0.5 0.0

45858.679211 1.000000 ... 0.000000 1.0 1.0

45931.544929 0.000000 ... 0.000000 1.0 0.0

46464.354789 1.000000 ... 1.000000 1.0 1.0

46950.806897 1.000000 ... 1.000000 0.0 1.0

47120.256963 1.000000 ... 1.000000 1.0 1.0

48025.248530 0.000000 ... 1.000000 1.0 1.0

48669.112196 1.000000 ... 1.000000 0.0 1.0

49190.872039 1.000000 ... 1.000000 1.0 1.0

49706.656289 1.000000 ... 1.000000 1.0 1.0

50214.534064 1.000000 ... 1.000000 0.0 1.0

50775.379078 1.000000 ... 1.000000 0.0 0.0

52199.769124 1.000000 ... 1.000000 1.0 1.0

53437.866058 0.000000 ... 1.000000 1.0 1.0

53497.475811 0.000000 ... 1.000000 1.0 1.0

54426.287811 1.000000 ... 1.000000 1.0 1.0

54504.848240 1.000000 ... 0.500000 1.0 1.0

55011.360798 1.000000 ... 0.000000 1.0 0.0

55740.739192 1.000000 ... 1.000000 1.0 1.0

56421.085111 1.000000 ... 1.000000 0.0 1.0

59655.976585 0.000000 ... 1.000000 0.0 1.0

62134.143055 0.000000 ... 1.000000 1.0 0.0

62305.026527 1.000000 ... 0.500000 1.0 1.0

67942.776636 1.000000 ... 1.000000 1.0 1.0

68178.585792 1.000000 ... 0.000000 1.0 1.0

70922.127049 1.000000 ... 1.000000 1.0 1.0

71891.334875 1.000000 ... 0.000000 1.0 1.0

81849.751340 1.000000 ... 0.500000 0.5 1.0

symptom\_4 symptom\_5 lab\_result\_1 lab\_result\_2 lab\_result\_3 \

amount

79.496707 0.0 0.000000 13.400000 27.90 96.000000

93.806451 1.0 1.000000 10.800000 28.80 81.000000

108.721162 1.0 1.000000 14.400000 30.60 83.000000

119.405414 0.0 0.000000 17.200000 28.80 107.000000

194.357987 0.0 1.000000 15.800000 32.90 113.000000

228.234099 0.0 1.000000 13.900000 27.40 99.000000

235.374943 1.0 0.000000 14.300000 27.50 99.000000

238.591675 1.0 1.000000 15.200000 27.30 101.000000

239.014614 1.0 0.000000 14.900000 27.80 102.000000

244.023357 1.0 0.000000 14.500000 27.10 102.000000

246.588325 1.0 0.000000 14.100000 27.30 97.000000

251.617738 1.0 1.000000 14.600000 27.70 99.000000

254.166095 0.5 0.500000 13.950000 27.45 86.500000

257.357186 1.0 0.000000 15.300000 26.80 123.000000

261.961530 0.5 0.500000 13.950000 27.45 86.500000

264.789899 0.0 1.000000 14.900000 27.20 96.000000

273.065813 1.0 0.000000 14.100000 27.30 97.000000

278.231612 1.0 0.000000 13.200000 30.20 61.000000

278.735553 1.0 0.000000 12.000000 27.80 87.000000

279.743807 1.0 1.000000 14.100000 27.30 98.000000

281.288005 1.0 1.000000 14.700000 27.10 102.000000

281.885544 1.0 1.000000 13.800000 27.30 100.000000

284.805316 1.0 0.333333 14.833333 27.60 97.333333

285.567616 1.0 1.000000 14.300000 27.50 102.000000

291.146757 1.0 1.000000 14.400000 27.70 96.000000

293.918441 1.0 1.000000 15.300000 25.90 123.000000

293.947774 1.0 0.000000 14.300000 27.50 98.000000

296.874484 1.0 0.000000 14.100000 27.30 95.000000

296.907324 0.0 1.000000 14.500000 27.00 105.000000

297.216056 1.0 0.000000 14.100000 28.00 99.000000

... ... ... ... ... ...

44298.689163 0.0 1.000000 13.000000 30.90 84.000000

44422.952959 0.0 1.000000 14.600000 26.30 87.000000

44707.493605 0.5 1.000000 15.650000 30.90 87.000000

45858.679211 1.0 1.000000 15.600000 27.00 110.000000

45931.544929 1.0 1.000000 14.200000 28.10 96.000000

46464.354789 0.0 1.000000 12.000000 28.60 125.000000

46950.806897 1.0 1.000000 16.000000 28.30 119.000000

47120.256963 1.0 1.000000 15.300000 27.40 110.000000

48025.248530 0.5 1.000000 14.150000 27.80 106.500000

48669.112196 1.0 1.000000 16.200000 27.20 102.000000

49190.872039 1.0 1.000000 14.400000 28.90 86.000000

49706.656289 1.0 1.000000 13.600000 23.90 103.000000

50214.534064 1.0 1.000000 15.700000 29.40 119.000000

50775.379078 1.0 1.000000 13.000000 25.30 84.000000

52199.769124 0.0 1.000000 12.900000 26.60 99.000000

53437.866058 0.0 1.000000 13.800000 23.90 117.000000

53497.475811 0.5 1.000000 14.150000 27.80 106.500000

54426.287811 1.0 1.000000 14.100000 30.20 81.000000

54504.848240 0.0 1.000000 14.550000 27.75 85.500000

55011.360798 1.0 1.000000 14.200000 27.20 89.000000

55740.739192 1.0 1.000000 16.700000 33.60 88.000000

56421.085111 1.0 1.000000 13.700000 26.50 90.000000

59655.976585 0.0 1.000000 14.400000 25.80 90.000000

62134.143055 1.0 1.000000 18.300000 26.00 92.000000

62305.026527 0.0 1.000000 14.550000 27.75 85.500000

67942.776636 0.0 1.000000 15.300000 26.40 86.000000

68178.585792 1.0 1.000000 14.700000 27.10 87.000000

70922.127049 1.0 1.000000 14.800000 30.40 98.000000

71891.334875 1.0 1.000000 11.000000 27.40 103.000000

81849.751340 1.0 0.500000 11.800000 28.70 131.500000

weight height

amount

79.496707 66.9 155

93.806451 72.2 163

108.721162 73.4 162

119.405414 90.5 161

194.357987 103.3 171

228.234099 77.0 172

235.374943 55.1 165

238.591675 66.6 166

239.014614 70.2 160

244.023357 74.1 160

246.588325 49.3 164

251.617738 76.4 161

254.166095 59.0 163

257.357186 69.3 151

261.961530 59.0 163

264.789899 81.6 160

273.065813 49.3 164

278.231612 62.0 172

278.735553 55.6 160

279.743807 91.6 166

281.288005 66.4 176

281.885544 77.9 161

284.805316 59.4 168

285.567616 86.8 173

291.146757 78.6 166

293.918441 71.3 168

293.947774 82.4 156

296.874484 71.7 169

296.907324 61.8 153

297.216056 93.8 162

... ... ...

44298.689163 76.8 171

44422.952959 78.2 168

44707.493605 88.4 162

45858.679211 87.8 170

45931.544929 80.3 157

46464.354789 79.5 157

46950.806897 79.6 158

47120.256963 86.5 157

48025.248530 87.9 161

48669.112196 91.8 168

49190.872039 96.3 172

49706.656289 75.8 166

50214.534064 78.6 169

50775.379078 61.0 158

52199.769124 95.5 165

53437.866058 75.4 162

53497.475811 87.9 161

54426.287811 89.6 162

54504.848240 75.8 159

55011.360798 74.7 173

55740.739192 67.7 173

56421.085111 69.8 175

59655.976585 82.0 160

62134.143055 86.0 154

62305.026527 75.8 159

67942.776636 75.8 160

68178.585792 77.5 168

70922.127049 82.5 165

71891.334875 98.9 174

81849.751340 102.8 175