**Heart Attack Analysis & Prediction**

*# data directory*

data = '/kaggle/input/heart-attack-analysis-prediction-dataset/heart.csv'

*# load data*

df = pd.read\_csv(data)

age sex cp trtbps chol fbs restecg thalachh exng oldpeak slp caa thall output

63 1 3 145 233 1 0 150 0 2.3 0 0 1 1

37 1 2 130 250 0 1 187 0 3.5 0 0 2 1

41 0 1 130 204 0 0 172 0 1.4 2 0 2 1

56 1 1 120 236 0 1 178 0 0.8 2 0 2 1

57 0 0 120 354 0 1 163 1 0.6 2 0 2 1

57 1 0 140 192 0 1 148 0 0.4 1 0 1 1

56 0 1 140 294 0 0 153 0 1.3 1 0 2 1

44 1 1 120 263 0 1 173 0 0 2 0 3 1

52 1 2 172 199 1 1 162 0 0.5 2 0 3 1

57 1 2 150 168 0 1 174 0 1.6 2 0 2 1

54 1 0 140 239 0 1 160 0 1.2 2 0 2 1

48 0 2 130 275 0 1 139 0 0.2 2 0 2 1

49 1 1 130 266 0 1 171 0 0.6 2 0 2 1

64 1 3 110 211 0 0 144 1 1.8 1 0 2 1

58 0 3 150 283 1 0 162 0 1 2 0 2 1

50 0 2 120 219 0 1 158 0 1.6 1 0 2 1

58 0 2 120 340 0 1 172 0 0 2 0 2 1

66 0 3 150 226 0 1 114 0 2.6 0 0 2 1

43 1 0 150 247 0 1 171 0 1.5 2 0 2 1

69 0 3 140 239 0 1 151 0 1.8 2 2 2 1

59 1 0 135 234 0 1 161 0 0.5 1 0 3 1

44 1 2 130 233 0 1 179 1 0.4 2 0 2 1

42 1 0 140 226 0 1 178 0 0 2 0 2 1

61 1 2 150 243 1 1 137 1 1 1 0 2 1

40 1 3 140 199 0 1 178 1 1.4 2 0 3 1

71 0 1 160 302 0 1 162 0 0.4 2 2 2 1

59 1 2 150 212 1 1 157 0 1.6 2 0 2 1

51 1 2 110 175 0 1 123 0 0.6 2 0 2 1

65 0 2 140 417 1 0 157 0 0.8 2 1 2 1

53 1 2 130 197 1 0 152 0 1.2 0 0 2 1

41 0 1 105 198 0 1 168 0 0 2 1 2 1

65 1 0 120 177 0 1 140 0 0.4 2 0 3 1

44 1 1 130 219 0 0 188 0 0 2 0 2 1

54 1 2 125 273 0 0 152 0 0.5 0 1 2 1

51 1 3 125 213 0 0 125 1 1.4 2 1 2 1

46 0 2 142 177 0 0 160 1 1.4 0 0 2 1

54 0 2 135 304 1 1 170 0 0 2 0 2 1

54 1 2 150 232 0 0 165 0 1.6 2 0 3 1

65 0 2 155 269 0 1 148 0 0.8 2 0 2 1

65 0 2 160 360 0 0 151 0 0.8 2 0 2 1

51 0 2 140 308 0 0 142 0 1.5 2 1 2 1

48 1 1 130 245 0 0 180 0 0.2 1 0 2 1

45 1 0 104 208 0 0 148 1 3 1 0 2 1

53 0 0 130 264 0 0 143 0 0.4 1 0 2 1

39 1 2 140 321 0 0 182 0 0 2 0 2 1

52 1 1 120 325 0 1 172 0 0.2 2 0 2 1

44 1 2 140 235 0 0 180 0 0 2 0 2 1

47 1 2 138 257 0 0 156 0 0 2 0 2 1

53 0 2 128 216 0 0 115 0 0 2 0 0 1

53 0 0 138 234 0 0 160 0 0 2 0 2 1

51 0 2 130 256 0 0 149 0 0.5 2 0 2 1

66 1 0 120 302 0 0 151 0 0.4 1 0 2 1

62 1 2 130 231 0 1 146 0 1.8 1 3 3 1

44 0 2 108 141 0 1 175 0 0.6 1 0 2 1

63 0 2 135 252 0 0 172 0 0 2 0 2 1

52 1 1 134 201 0 1 158 0 0.8 2 1 2 1

48 1 0 122 222 0 0 186 0 0 2 0 2 1

45 1 0 115 260 0 0 185 0 0 2 0 2 1

34 1 3 118 182 0 0 174 0 0 2 0 2 1

57 0 0 128 303 0 0 159 0 0 2 1 2 1

71 0 2 110 265 1 0 130 0 0 2 1 2 1

54 1 1 108 309 0 1 156 0 0 2 0 3 1

52 1 3 118 186 0 0 190 0 0 1 0 1 1

41 1 1 135 203 0 1 132 0 0 1 0 1 1

58 1 2 140 211 1 0 165 0 0 2 0 2 1

35 0 0 138 183 0 1 182 0 1.4 2 0 2 1

51 1 2 100 222 0 1 143 1 1.2 1 0 2 1

45 0 1 130 234 0 0 175 0 0.6 1 0 2 1

44 1 1 120 220 0 1 170 0 0 2 0 2 1

62 0 0 124 209 0 1 163 0 0 2 0 2 1

54 1 2 120 258 0 0 147 0 0.4 1 0 3 1

51 1 2 94 227 0 1 154 1 0 2 1 3 1

29 1 1 130 204 0 0 202 0 0 2 0 2 1

51 1 0 140 261 0 0 186 1 0 2 0 2 1

43 0 2 122 213 0 1 165 0 0.2 1 0 2 1

55 0 1 135 250 0 0 161 0 1.4 1 0 2 1

51 1 2 125 245 1 0 166 0 2.4 1 0 2 1

59 1 1 140 221 0 1 164 1 0 2 0 2 1

52 1 1 128 205 1 1 184 0 0 2 0 2 1

58 1 2 105 240 0 0 154 1 0.6 1 0 3 1

41 1 2 112 250 0 1 179 0 0 2 0 2 1

45 1 1 128 308 0 0 170 0 0 2 0 2 1

60 0 2 102 318 0 1 160 0 0 2 1 2 1

52 1 3 152 298 1 1 178 0 1.2 1 0 3 1

42 0 0 102 265 0 0 122 0 0.6 1 0 2 1

67 0 2 115 564 0 0 160 0 1.6 1 0 3 1

68 1 2 118 277 0 1 151 0 1 2 1 3 1

46 1 1 101 197 1 1 156 0 0 2 0 3 1

54 0 2 110 214 0 1 158 0 1.6 1 0 2 1

58 0 0 100 248 0 0 122 0 1 1 0 2 1

48 1 2 124 255 1 1 175 0 0 2 2 2 1

57 1 0 132 207 0 1 168 1 0 2 0 3 1

52 1 2 138 223 0 1 169 0 0 2 4 2 1

54 0 1 132 288 1 0 159 1 0 2 1 2 1

45 0 1 112 160 0 1 138 0 0 1 0 2 1

53 1 0 142 226 0 0 111 1 0 2 0 3 1

62 0 0 140 394 0 0 157 0 1.2 1 0 2 1

52 1 0 108 233 1 1 147 0 0.1 2 3 3 1

43 1 2 130 315 0 1 162 0 1.9 2 1 2 1

53 1 2 130 246 1 0 173 0 0 2 3 2 1

42 1 3 148 244 0 0 178 0 0.8 2 2 2 1

59 1 3 178 270 0 0 145 0 4.2 0 0 3 1

63 0 1 140 195 0 1 179 0 0 2 2 2 1

42 1 2 120 240 1 1 194 0 0.8 0 0 3 1

50 1 2 129 196 0 1 163 0 0 2 0 2 1

68 0 2 120 211 0 0 115 0 1.5 1 0 2 1

69 1 3 160 234 1 0 131 0 0.1 1 1 2 1

45 0 0 138 236 0 0 152 1 0.2 1 0 2 1

50 0 1 120 244 0 1 162 0 1.1 2 0 2 1

50 0 0 110 254 0 0 159 0 0 2 0 2 1

64 0 0 180 325 0 1 154 1 0 2 0 2 1

57 1 2 150 126 1 1 173 0 0.2 2 1 3 1

64 0 2 140 313 0 1 133 0 0.2 2 0 3 1

43 1 0 110 211 0 1 161 0 0 2 0 3 1

55 1 1 130 262 0 1 155 0 0 2 0 2 1

37 0 2 120 215 0 1 170 0 0 2 0 2 1

41 1 2 130 214 0 0 168 0 2 1 0 2 1

56 1 3 120 193 0 0 162 0 1.9 1 0 3 1

46 0 1 105 204 0 1 172 0 0 2 0 2 1

46 0 0 138 243 0 0 152 1 0 1 0 2 1

64 0 0 130 303 0 1 122 0 2 1 2 2 1

59 1 0 138 271 0 0 182 0 0 2 0 2 1

41 0 2 112 268 0 0 172 1 0 2 0 2 1

54 0 2 108 267 0 0 167 0 0 2 0 2 1

39 0 2 94 199 0 1 179 0 0 2 0 2 1

34 0 1 118 210 0 1 192 0 0.7 2 0 2 1

47 1 0 112 204 0 1 143 0 0.1 2 0 2 1

67 0 2 152 277 0 1 172 0 0 2 1 2 1

52 0 2 136 196 0 0 169 0 0.1 1 0 2 1

74 0 1 120 269 0 0 121 1 0.2 2 1 2 1

54 0 2 160 201 0 1 163 0 0 2 1 2 1

49 0 1 134 271 0 1 162 0 0 1 0 2 1

42 1 1 120 295 0 1 162 0 0 2 0 2 1

41 1 1 110 235 0 1 153 0 0 2 0 2 1

41 0 1 126 306 0 1 163 0 0 2 0 2 1

49 0 0 130 269 0 1 163 0 0 2 0 2 1

60 0 2 120 178 1 1 96 0 0 2 0 2 1

62 1 1 128 208 1 0 140 0 0 2 0 2 1

57 1 0 110 201 0 1 126 1 1.5 1 0 1 1

64 1 0 128 263 0 1 105 1 0.2 1 1 3 1

51 0 2 120 295 0 0 157 0 0.6 2 0 2 1

43 1 0 115 303 0 1 181 0 1.2 1 0 2 1

42 0 2 120 209 0 1 173 0 0 1 0 2 1

67 0 0 106 223 0 1 142 0 0.3 2 2 2 1

76 0 2 140 197 0 2 116 0 1.1 1 0 2 1

70 1 1 156 245 0 0 143 0 0 2 0 2 1

44 0 2 118 242 0 1 149 0 0.3 1 1 2 1

60 0 3 150 240 0 1 171 0 0.9 2 0 2 1

44 1 2 120 226 0 1 169 0 0 2 0 2 1

42 1 2 130 180 0 1 150 0 0 2 0 2 1

66 1 0 160 228 0 0 138 0 2.3 2 0 1 1

71 0 0 112 149 0 1 125 0 1.6 1 0 2 1

64 1 3 170 227 0 0 155 0 0.6 1 0 3 1

66 0 2 146 278 0 0 152 0 0 1 1 2 1

39 0 2 138 220 0 1 152 0 0 1 0 2 1

58 0 0 130 197 0 1 131 0 0.6 1 0 2 1

47 1 2 130 253 0 1 179 0 0 2 0 2 1

35 1 1 122 192 0 1 174 0 0 2 0 2 1

58 1 1 125 220 0 1 144 0 0.4 1 4 3 1

56 1 1 130 221 0 0 163 0 0 2 0 3 1

56 1 1 120 240 0 1 169 0 0 0 0 2 1

55 0 1 132 342 0 1 166 0 1.2 2 0 2 1

41 1 1 120 157 0 1 182 0 0 2 0 2 1

38 1 2 138 175 0 1 173 0 0 2 4 2 1

38 1 2 138 175 0 1 173 0 0 2 4 2 1

67 1 0 160 286 0 0 108 1 1.5 1 3 2 0

67 1 0 120 229 0 0 129 1 2.6 1 2 3 0

62 0 0 140 268 0 0 160 0 3.6 0 2 2 0

63 1 0 130 254 0 0 147 0 1.4 1 1 3 0

53 1 0 140 203 1 0 155 1 3.1 0 0 3 0

56 1 2 130 256 1 0 142 1 0.6 1 1 1 0

48 1 1 110 229 0 1 168 0 1 0 0 3 0

58 1 1 120 284 0 0 160 0 1.8 1 0 2 0

58 1 2 132 224 0 0 173 0 3.2 2 2 3 0

60 1 0 130 206 0 0 132 1 2.4 1 2 3 0

40 1 0 110 167 0 0 114 1 2 1 0 3 0

60 1 0 117 230 1 1 160 1 1.4 2 2 3 0

64 1 2 140 335 0 1 158 0 0 2 0 2 0

43 1 0 120 177 0 0 120 1 2.5 1 0 3 0

57 1 0 150 276 0 0 112 1 0.6 1 1 1 0

55 1 0 132 353 0 1 132 1 1.2 1 1 3 0

65 0 0 150 225 0 0 114 0 1 1 3 3 0

61 0 0 130 330 0 0 169 0 0 2 0 2 0

58 1 2 112 230 0 0 165 0 2.5 1 1 3 0

50 1 0 150 243 0 0 128 0 2.6 1 0 3 0

44 1 0 112 290 0 0 153 0 0 2 1 2 0

60 1 0 130 253 0 1 144 1 1.4 2 1 3 0

54 1 0 124 266 0 0 109 1 2.2 1 1 3 0

50 1 2 140 233 0 1 163 0 0.6 1 1 3 0

41 1 0 110 172 0 0 158 0 0 2 0 3 0

51 0 0 130 305 0 1 142 1 1.2 1 0 3 0

58 1 0 128 216 0 0 131 1 2.2 1 3 3 0

54 1 0 120 188 0 1 113 0 1.4 1 1 3 0

60 1 0 145 282 0 0 142 1 2.8 1 2 3 0

60 1 2 140 185 0 0 155 0 3 1 0 2 0

59 1 0 170 326 0 0 140 1 3.4 0 0 3 0

46 1 2 150 231 0 1 147 0 3.6 1 0 2 0

67 1 0 125 254 1 1 163 0 0.2 1 2 3 0

62 1 0 120 267 0 1 99 1 1.8 1 2 3 0

65 1 0 110 248 0 0 158 0 0.6 2 2 1 0

44 1 0 110 197 0 0 177 0 0 2 1 2 0

60 1 0 125 258 0 0 141 1 2.8 1 1 3 0

58 1 0 150 270 0 0 111 1 0.8 2 0 3 0

68 1 2 180 274 1 0 150 1 1.6 1 0 3 0

62 0 0 160 164 0 0 145 0 6.2 0 3 3 0

52 1 0 128 255 0 1 161 1 0 2 1 3 0

59 1 0 110 239 0 0 142 1 1.2 1 1 3 0

60 0 0 150 258 0 0 157 0 2.6 1 2 3 0

49 1 2 120 188 0 1 139 0 2 1 3 3 0

59 1 0 140 177 0 1 162 1 0 2 1 3 0

57 1 2 128 229 0 0 150 0 0.4 1 1 3 0

61 1 0 120 260 0 1 140 1 3.6 1 1 3 0

39 1 0 118 219 0 1 140 0 1.2 1 0 3 0

61 0 0 145 307 0 0 146 1 1 1 0 3 0

56 1 0 125 249 1 0 144 1 1.2 1 1 2 0

43 0 0 132 341 1 0 136 1 3 1 0 3 0

62 0 2 130 263 0 1 97 0 1.2 1 1 3 0

63 1 0 130 330 1 0 132 1 1.8 2 3 3 0

65 1 0 135 254 0 0 127 0 2.8 1 1 3 0

48 1 0 130 256 1 0 150 1 0 2 2 3 0

63 0 0 150 407 0 0 154 0 4 1 3 3 0

55 1 0 140 217 0 1 111 1 5.6 0 0 3 0

65 1 3 138 282 1 0 174 0 1.4 1 1 2 0

56 0 0 200 288 1 0 133 1 4 0 2 3 0

54 1 0 110 239 0 1 126 1 2.8 1 1 3 0

70 1 0 145 174 0 1 125 1 2.6 0 0 3 0

62 1 1 120 281 0 0 103 0 1.4 1 1 3 0

35 1 0 120 198 0 1 130 1 1.6 1 0 3 0

59 1 3 170 288 0 0 159 0 0.2 1 0 3 0

64 1 2 125 309 0 1 131 1 1.8 1 0 3 0

47 1 2 108 243 0 1 152 0 0 2 0 2 0

57 1 0 165 289 1 0 124 0 1 1 3 3 0

55 1 0 160 289 0 0 145 1 0.8 1 1 3 0

64 1 0 120 246 0 0 96 1 2.2 0 1 2 0

70 1 0 130 322 0 0 109 0 2.4 1 3 2 0

51 1 0 140 299 0 1 173 1 1.6 2 0 3 0

58 1 0 125 300 0 0 171 0 0 2 2 3 0

60 1 0 140 293 0 0 170 0 1.2 1 2 3 0

77 1 0 125 304 0 0 162 1 0 2 3 2 0

35 1 0 126 282 0 0 156 1 0 2 0 3 0

70 1 2 160 269 0 1 112 1 2.9 1 1 3 0

59 0 0 174 249 0 1 143 1 0 1 0 2 0

64 1 0 145 212 0 0 132 0 2 1 2 1 0

57 1 0 152 274 0 1 88 1 1.2 1 1 3 0

56 1 0 132 184 0 0 105 1 2.1 1 1 1 0

48 1 0 124 274 0 0 166 0 0.5 1 0 3 0

56 0 0 134 409 0 0 150 1 1.9 1 2 3 0

66 1 1 160 246 0 1 120 1 0 1 3 1 0

54 1 1 192 283 0 0 195 0 0 2 1 3 0

69 1 2 140 254 0 0 146 0 2 1 3 3 0

51 1 0 140 298 0 1 122 1 4.2 1 3 3 0

43 1 0 132 247 1 0 143 1 0.1 1 4 3 0

62 0 0 138 294 1 1 106 0 1.9 1 3 2 0

67 1 0 100 299 0 0 125 1 0.9 1 2 2 0

59 1 3 160 273 0 0 125 0 0 2 0 2 0

45 1 0 142 309 0 0 147 1 0 1 3 3 0

58 1 0 128 259 0 0 130 1 3 1 2 3 0

50 1 0 144 200 0 0 126 1 0.9 1 0 3 0

62 0 0 150 244 0 1 154 1 1.4 1 0 2 0

38 1 3 120 231 0 1 182 1 3.8 1 0 3 0

66 0 0 178 228 1 1 165 1 1 1 2 3 0

52 1 0 112 230 0 1 160 0 0 2 1 2 0

53 1 0 123 282 0 1 95 1 2 1 2 3 0

63 0 0 108 269 0 1 169 1 1.8 1 2 2 0

54 1 0 110 206 0 0 108 1 0 1 1 2 0

66 1 0 112 212 0 0 132 1 0.1 2 1 2 0

55 0 0 180 327 0 2 117 1 3.4 1 0 2 0

49 1 2 118 149 0 0 126 0 0.8 2 3 2 0

54 1 0 122 286 0 0 116 1 3.2 1 2 2 0

56 1 0 130 283 1 0 103 1 1.6 0 0 3 0

46 1 0 120 249 0 0 144 0 0.8 2 0 3 0

61 1 3 134 234 0 1 145 0 2.6 1 2 2 0

67 1 0 120 237 0 1 71 0 1 1 0 2 0

58 1 0 100 234 0 1 156 0 0.1 2 1 3 0

47 1 0 110 275 0 0 118 1 1 1 1 2 0

52 1 0 125 212 0 1 168 0 1 2 2 3 0

58 1 0 146 218 0 1 105 0 2 1 1 3 0

57 1 1 124 261 0 1 141 0 0.3 2 0 3 0

58 0 1 136 319 1 0 152 0 0 2 2 2 0

61 1 0 138 166 0 0 125 1 3.6 1 1 2 0

42 1 0 136 315 0 1 125 1 1.8 1 0 1 0

52 1 0 128 204 1 1 156 1 1 1 0 0 0

59 1 2 126 218 1 1 134 0 2.2 1 1 1 0

40 1 0 152 223 0 1 181 0 0 2 0 3 0

61 1 0 140 207 0 0 138 1 1.9 2 1 3 0

46 1 0 140 311 0 1 120 1 1.8 1 2 3 0

59 1 3 134 204 0 1 162 0 0.8 2 2 2 0

57 1 1 154 232 0 0 164 0 0 2 1 2 0

57 1 0 110 335 0 1 143 1 3 1 1 3 0

55 0 0 128 205 0 2 130 1 2 1 1 3 0

61 1 0 148 203 0 1 161 0 0 2 1 3 0

58 1 0 114 318 0 2 140 0 4.4 0 3 1 0

58 0 0 170 225 1 0 146 1 2.8 1 2 1 0

67 1 2 152 212 0 0 150 0 0.8 1 0 3 0

44 1 0 120 169 0 1 144 1 2.8 0 0 1 0

63 1 0 140 187 0 0 144 1 4 2 2 3 0

63 0 0 124 197 0 1 136 1 0 1 0 2 0

59 1 0 164 176 1 0 90 0 1 1 2 1 0

57 0 0 140 241 0 1 123 1 0.2 1 0 3 0

45 1 3 110 264 0 1 132 0 1.2 1 0 3 0

68 1 0 144 193 1 1 141 0 3.4 1 2 3 0

57 1 0 130 131 0 1 115 1 1.2 1 1 3 0

57 0 1 130 236 0 0 174 0 0 1 1 2 0