Given a dataset, what would do based on it?

Labelled data (label: gender: 1 or 2)

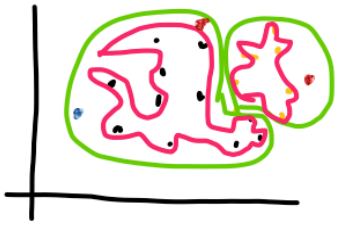
1. Look at the size of the sample data
   Note: the sample is too small
2. Look at the data to pre-process it
   a. Missing value
      Methods: delete those rows/columns; impute (mean, median, majority)
3. Once finished the pre-processing (e.g., missing value), we are going to look at the sample data problem
   a. The entire dataset is small (our case here) ⇔ df.shape
   b. Or in the entire dataset, one class / label has very small sample
      i. 100 points: 99 points for gender 2; 1 point for gender 1 ⇔ imbalanced problem
      df['gender'].value_counts(…)
      if the percentage is around 30% v.s. 70%, it's good ⇔ no imbalanced problem
      if the percentage is around 5% v.s. 95%, imbalanced ⇔
      total 27 points, 1 point is for gender 1; 26 points are for gender 2

      1. Cut off the large data points (cut off the 95% datapoints to the same 5%)
         a. We will only remain 1 point for gender 1; 1 point for gender 2.
      (assum we have total 100,000: 5,000 for gender 1; 95,000 for gender 2)

      2. Duplicate the small data points
         a. We will have 26 points for gender 1; 26 points for gender 2
         b. We duplicate 25 points for gender 1

if the accuracy for the train and validation data has huge gaps⇔ overfitting problem exits.

4. start training
   1. consider: when we chose an algorithm, would there be over-fitting problems?
      a. How can we examine if the over-fitting problem exist or not?
      b. If the over-fitting problem exist, how would we resolve it?



a. we will split the data into data_train, data_validation
if we have 100 points, 70 points are used to train; 30 points are used to validate
1. use the 70 points to train a model, decision tree
2. use the model from 1 to predict the labels of the train data
Accuracy based on the training data
(expect the high accuracy for this one)
3. use the model in 1 to predict the labels for the validation data
Accuracy based on the validation data
Model

age	salary	gender	Predicted label
20	100	1	1
30	200	1	1
40	300	2	2
25	150	2	1
23	120	1	1
45	110	2	1
40	300	2	2
25	150	2	1
40	300	2	1
25	150	2	2

Train

Valid

b. If the over-fitting problem exist, how would we resolve it?

k-folder method

100 points:

k = 5, 5 folder method

1.we will split the data and put into 5 equal-sized subgroups.

2.We will use the 4 subgroups data to train, use the left 1 to validate

3. we will repeat 1 and 2 for 5 times and each time, it randomly selects the 4 folders