

Homework 13

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Question 18.1

My solution will be divided in 4 steps, Steps 2 is optional according to the classification done in Step 1.

Step 1: Determine customers' ability to pay.

Given:

- Credit score of the account holder
- Household income
- Number of people in the household
- Home price or median home price of neighborhood
- Home value or if not known median price of homes in the immediate neighborhood
- Number of months/years at current address
- Days past due

Use: Support Vector Machine model can be used to classify customers into two groups. The error margin trade off is weighted according to:

- Social impact of turning off power in general. Negative publicity, etc if a true needy families are left without power.
- *This is a tricky aspect to consider in my country (Chile). There are no regulation against cutting off power if someone cannot pay, only the negative aspect associated to bad publicity. For instance, I can give my own example with telecommunication services. Despite the fact that I live in one of the richest sector of my capital Santiago, I'm unable to get internet access. This is because I live in an old apartment, were extending a cable for just 1 person is not cost effective for any company. Furthermore, a company can claim a specific area of Santiago and claim that no other internet provider is allowed to provide internet in that zone. Thus, since extending cables is not cost effective for the company, despite the fact that I'm able to pay, and no other company is allowed to provide internet other than company X, I will not have internet unless I do it personally (asking the government for installing cables and structures, etc). This is what I had to do, and the same applies for energy services, if the SVM classifies you as not viable, there is no such things like "provide assistance" such as the professor mentioned. So sad.*

To: Classify customers into two groups:

Group 1: Customers who don't pay, and are incapable of doing so. These are automatically passed to step 4. (Or to an social assistance program, which depends on the country)

Group 2: Customers who don't pay but can. To treat these, we will follow Step 2:

Step 2: Customers who don't pay but can.

Given:

- Customers from Step 1 that were determined to be able to pay
- Customer's bill payment history such as on-time rate of past payments (if the customer frequently pays late or frequently pays on time, these both indicate the willingness to pay)
- Customer's payment of other bills

- Response to any overdue notices
- Customers access to internet
- Length of account activity

Use: Logistic Regression.

Decision point:

- Greater than 70% probability that a customer will not pay the bill: Input these customers to step 3. Less than 70% probability that a customer will not pay the bill: continue to monitor in the next months.

To: Determine the probability that a customer who has not paid yet will pay in the short term future.

Step 3: Determine Service Area where power is going to be shut down.

Given:

- Customers from Step 1 that are unable to pay.
- Customers from Step 2 that were determined to meet some threshold probability of not paying
- Number of technicians available
- Customer Addresses

Use: K-means clustering, taking into account the number of available technicians

To: Determine the cluster areas in which to turn a customer's power off

Step 4: Maximize savings from shutting off highest value set of non-paying customers.

Given:

- Clusters from Step 3
- Routing and traffic information
- Location of technicians

Use: Stochastic Optimization

Changing Factors:

- Changing number of technicians, response time taken by technicians based on their location, locations of non-paying customers.

To: Find the set of customers to shut-off power for that maximizes the profit for the power company.