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ISYE 6501

HW13

**1. Determine delinquent customers’ ability to pay.**

**Given**:

* Account Holder’s credit score
* Reported income
* Home price or median home price of neighborhood or subdivision (based on public tax records),
* On-time rate of past payments (if the customer frequently pays late or frequently pays on time, these both indicate the ability to pay)
* Type of non-payment. A rejected auto-draft shows the willingness to pay and assumption of available funds, but perhaps not the funds at the current time vs. no manual cash/check payment

**Use**: A SVM to classify the customers. The error and margin can be weighted on numerous factors such as:

* Public perception of mistakenly turning off power for people that can’t pay. E.g. what is the cost of misclassification?
* Seasonality: being more likely to move people to “not able to pay” during extreme cold/hot seasons when shutting off power could have major impacts on the customers/family

**To**: Determine which customers have the ability to pay, and which cannot. Those who cannot pay are then eliminated from the results and put into a special assistance program

**2. Who will and won’t pay**

**Given**:

* Customers from (1) that were determined to be able to pay
* on-time rate of past payments (if the customer frequently pays late or frequently pays on time, these both indicate the willingness to pay)
* response to any overdue notices
* ownership of home vs. rental
* length of account activity

**Use**: Logistic Regression

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

**3. Cost of Not Turning Power Off**

**Given**:

* Customers from (2) that were determined to meet some threshold probability of not paying
* Customers’ historical usage, if available. If not, Can use an average of similar size homes in the immediate area as a proxy.
* Historical weather data for the upcoming month

**Use**: Exponential Smoothing with Seasonality

**To**: Forecast next month’s usage from the customer in question

**4. Determine Which Customer’s Power to Shut Off**

**Given**:

* Customers from (2) that were determined to meet some threshold probability of not paying
* Cost from (3) for the customer’s that won’t pay
* Number of technicians available to shut off power
* Physical address of the customer in question

**Use**: K-means clustering, where k = number of available technicians

**To:** Find clusters of non-paying customers within a certain geographical distance of each other where the average cost savings per shutoff is higher than the assumed cost of the technicians’ time.

**5. Minimize shutoff cost**

**Given**:

* The clusters from (4)
* Roads/Routing information
* Traffic data

**Use**: Routing simulation and optimization

**To:** Minimize the travel time between sites while selecting the customers within the cluster that maximize the cost savings given the constraint of working hours in a day for the technicians.