

Aily Case: EnergyInc

The following is a fictional case study. It will test your ability to handle data and perform statistical/machine learning analyses as well as your ability to communicate your findings and derive commercial insight from your technical work.

You may perform the analyses using any computational language you wish. Please submit your code along with your presentation and the requested results file by the date agreed with the recruitment team.

Please work through the below in your own time and compose your findings in a "PowerPoint-like" presentation. You shall present these results in the technical interview. The time allocated to the presentation is of 20 min.

Scenario:

EnergyInc, is a major utility company providing gas and electricity to corporate, SME and residential customers. In recent years, post-liberalization of the energy market in Europe, EnergyInc has had a growing problem with increasing customer defections above industry average. EnergyInc has asked you to work alongside them to identify the drivers of this problem and to devise and implement a strategy to counter it. The churn issue is most acute in the SME division and thus they want it to be the first priority.

The head of the SME division has asked whether it is possible to predict the customers which are most likely to churn so that they can trial a range of pre-emptive actions. He has a hypothesis that clients are switching to cheaper providers so the first action to be trialed will be to offer customers with high propensity of churning a 20% discount.

Your task:

We have scheduled a meeting in one week's time with the head of the SME division in which you will present our findings of the churn issue and your recommendations on how to address it.

You are in charge of building the model and of suggesting which commercial actions should be taken as a result of the model's outcome. The first stage is to establish the viability of such a model. For training your model you are provided with a dataset which includes features of SME customers in January 2016 as well as the information about whether or not they have churned by March 2016. In addition to that you have received the prices from 2015 for these customers. Of particular interest for the client is how you frame the problem for training.

Given that this is the first time the client is resorting to predictive modelling, it is beneficial to leverage descriptive statistics and visualization for extracting interesting insights from the provided data before diving into the model. Also, while it is not mandatory, you are encouraged to test multiple algorithms. If you do so, it will be helpful to describe the tested algorithms in a simple manner.

Using the trained model you shall “score” customers in the test data set (provided in the eponymous file) and put them in descending order of the propensity to churn. You should also classify these customers into two classes: those which you predict to churn are to be labelled "1" and the remaining customers should be labelled "0" in the result template. You will submit this file together with your presentation. Moreover, we ask that you include, in the presentation, the ROC curve and Brier score of your model, as they will be discussed in the interview.

Finally, the EnergyInc would like to have a view on whether the 20% discount offer to customers predicted to be churned is a good measure. Given that it is a steep discount bringing their price lower than all competitors we can assume for now that everyone who is offered will accept it. According to regulations they cannot raise the price of someone within a year if they accept the discount. Therefore, offering it excessively is going to hit revenues hard.

Table 1 describes all the data fields which are found in the data. You will notice that the contents of some fields are meaningless text strings. This is due to "hashing" of text fields for data privacy. While their commercial interpretation is lost as a result of the hashing, they may still have predictive power.

Table 1:

Field Name	Description
contract_id	contract id
company_category	category of the company's activity
campaign_code_elect	code of the electricity campaign the customer last subscribed to
channel	code of the sales channel
elect_cons_at_12m	electricity consumption of the past 12 months
gas_cons_at_12m	gas consumption of the past 12 months
elect_cons_last_month	electricity consumption of the last month
contract_activation_date	date of activation of the contract
contract_end_date	registered date of the end of the contract
contract_fist_act_date	date of first contract of the client
contract_last_mod_date	date of last modification of the product

contract_renewal_date	date of the next contract renewal
fcst_bill_baseline_elect_next_month	forecasted electricity bill baseline for next month
fcst_bill_baseline_elect_cal_year	forecasted electricity bill baseline for calendar year
fcst_bill_baseline_elect_12m	forecasted electricity bill baseline for 12 months
fcst_consumption_elect_next_month	forecasted electricity consumption for next month
fcst_consumption_elect_12m	forecasted electricity consumption for next 12 months
fcst_consumption_elect_cal_year	forecasted electricity consumption for next calendar year
fcst_current_discount	forecasted value of current discount
fcst_bill_meter_rent_12m	forecasted bill of meter rental for the next 12 months
fcst_price_period_1	forecasted energy price for 1st period
fcst_price_period_2	forecasted energy price for 2nd period
fcst_price_power_period_1	forecasted power price for 1st period
client_got_gas	indicated if client is also a gas client
current_paid_consumption	current paid consumption
gross_margin_power_elect	gross margin on power subscription
net_margin_power_elect	net margin on power subscription
number_active_products	number of active products and services
total_net_margin	total net margin
customer_antiquity_in_years	antiquity of the client (in number of years)
code_elect_campaign_first_subs	code of the electricity campaign the customer first subscribed to
subscribed_power	subscribed power
reference_date	reference date
price_energy_1st_period	price of energy for the 1st period
price_energy_2nd_period	price of energy for the 2nd period
price_energy_3rd_period	price of energy for the 3rd period
price_power_1st_period	price of power for the 1st period
price_power_2nd_period	price of power for the 2nd period
price_power_3rd_period	price of power for the 3rd period
has_churned_over_next_3m	has the client churned over the next 3 months