

# Model-Based Fiber Network Expansion Using SAS® Enterprise Miner™ and SAS® Visual Analytics

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## ABSTRACT

Charter Communications is the second largest cable service provider in the nation and has started making huge investments to expand its fiber network in order to maintain a competitive edge in the industry. Thus, it is very important that this investment is managed in the most efficient way by using a model-driven strategy to accomplish the following: identify the best go-to markets for prospects; determine the cost of expanding the fiber network to each business location; and get the maximum ROI for the company. Spectrum Enterprise used SAS® Enterprise Guide®, SAS® Enterprise Miner™, and SAS® Visual Analytics to create and deploy logistic and linear regression models to help achieve these goals. The models help create a focused segmentation strategy for marketing campaigns, resource allocation for the telesales group, and an expansion strategy for the network construction team nationwide. Our SAS® platform provided an integrated approach for delivery of model output, along with the technical help provided by SAS consultants to fine-tune models.

## INTRODUCTION

The purpose of this paper is to demonstrate the use of advanced modeling techniques using Logistic Regression, Linear Regression and Visual Analytics in creating a strategy to expand fiber network at Charter Communications. The steps needed to achieve the goal can be outlined as follows:

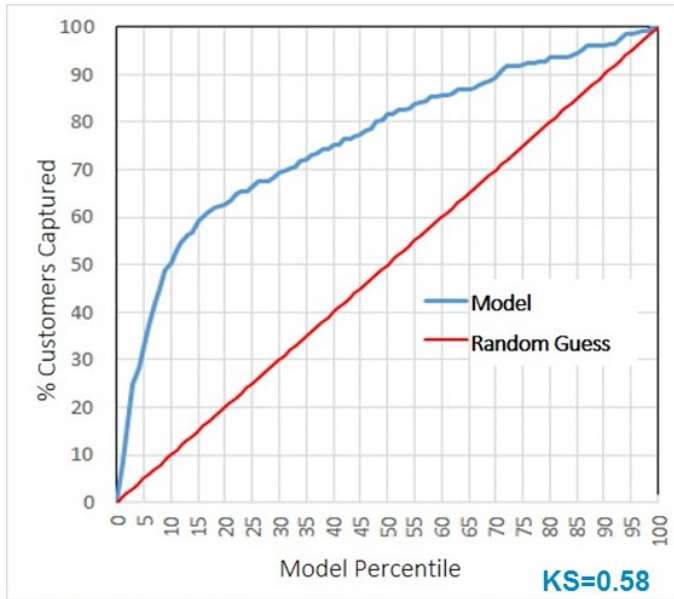
- Identify best prospects and their location using models based on Logistic Regression
- Calculate cost of expanding fiber to each building from fiber access point using model based on Linear Regression
- GIS Integration to determine obstruction identification, and building neighborhood and density using Resolution Reduction Algorithm.
- Choose the option with the best Return of Investment and routing.

## CUSTOMER ACQUISITION MODEL

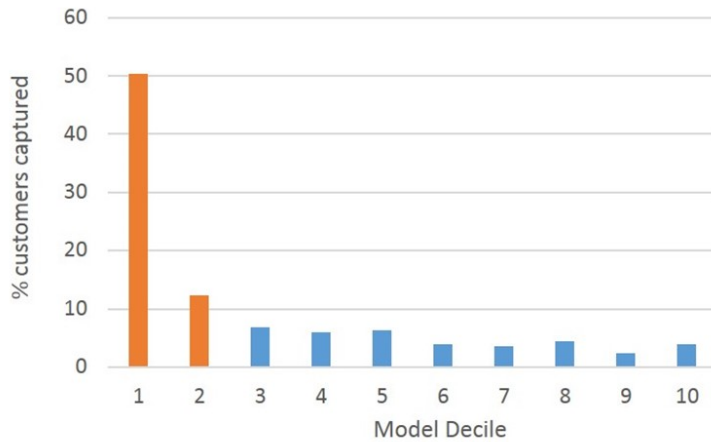
The first step in the network expansion strategy is to identify the universe that is most likely to buy the products that Spectrum Enterprise offers. This is addressed by creating a cloning model based on Logistic Regression. The model can be defined as:

Probability to Buy Products:  $f$  (Firmographic variables, demographic data, GIS based data)

- Firmographic variables: The variables that define the firm from qualitative and quantitative perspective
- Demographic variables: The variables that define the economic and geographic factors
- GIS Based Data: The additional sense that can be derived using the GIS co-ordinates of the business.



**Figure 1. The model's ROC curve**



**Figure 2. The lift achieved at each model decile**

## FIBER COST MODEL

The Fiber Cost model helps estimate the cost of installing fiber network at a location. This is a Linear Regression model created in SAS Enterprise Guide, E-Miner and SAS Visual Analytics

Model Variables:

1. Amount of Fiber Cable work needed, Firmographic data, Geographical data,
2. GIS Integration: Obstacle detection, Resolution reduction algorithm for density



Figure 3. The satellite photo shows the expected path for fiber network

### SAS VA SCATTER PLOTS

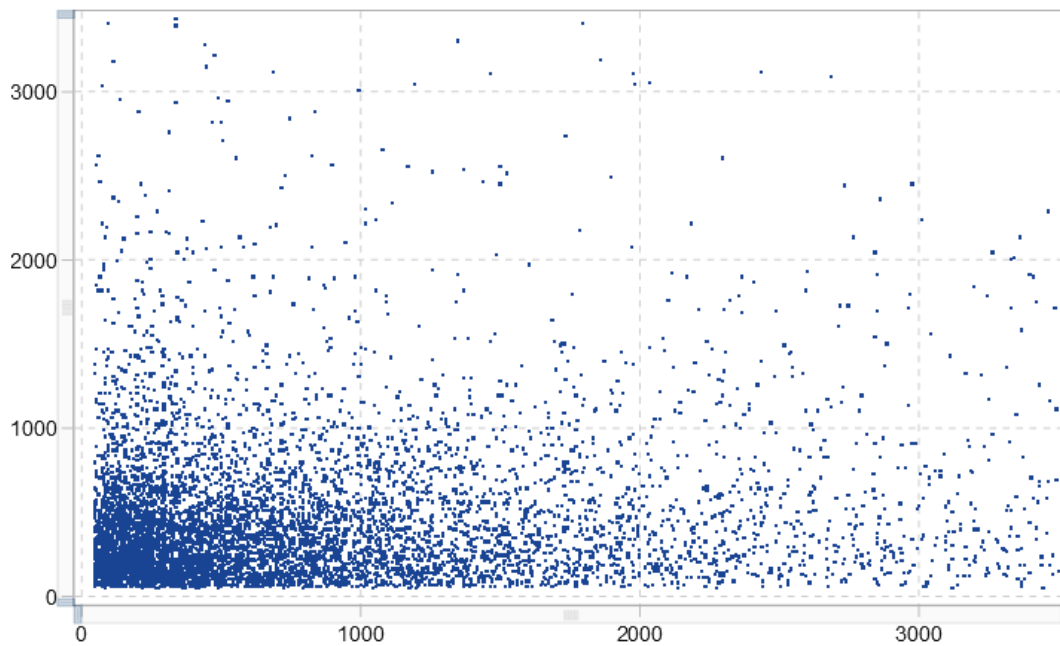
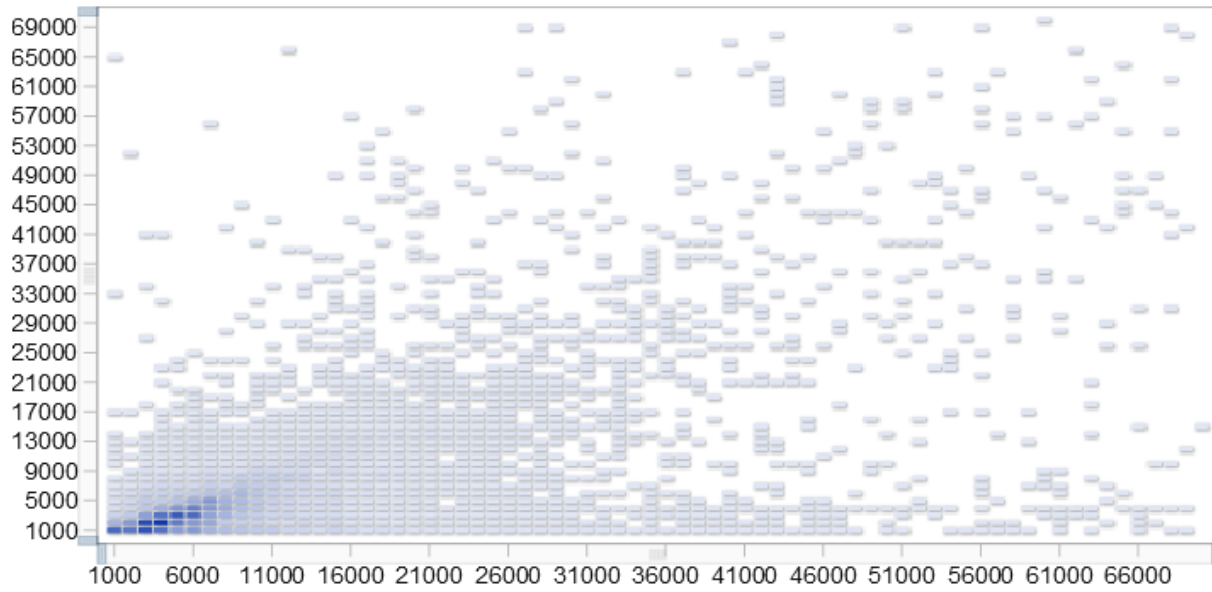


Figure 4. The scatter plot created between two variables in SAS visual analytics



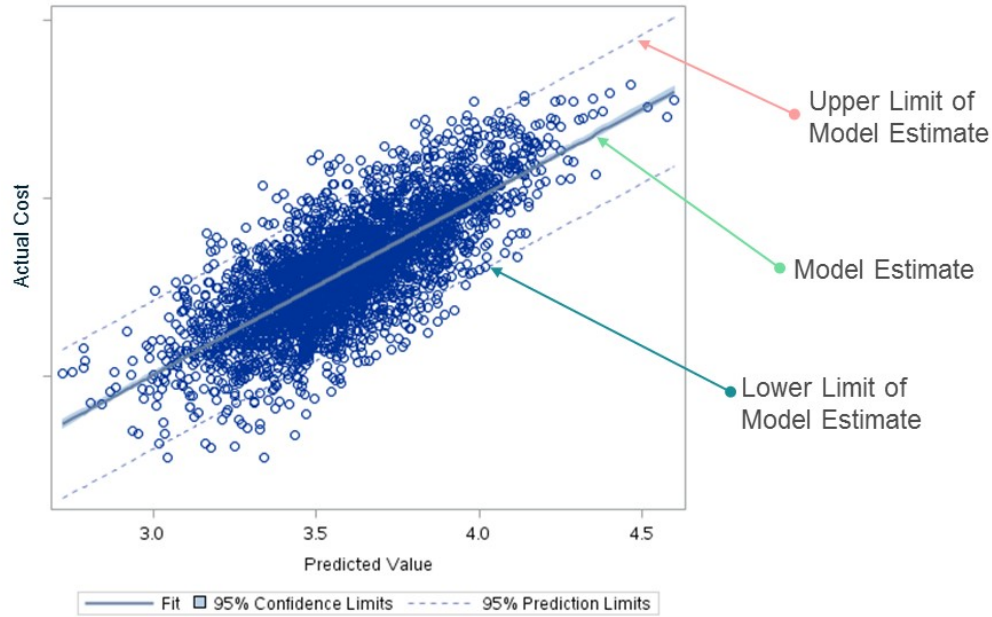
**Figure 5. The scatter plot created between two variables in SAS visual analytics**

- SAS VA provided a much faster platform for repeated creation of scatter plots, histograms, and an easy data filter application.
- This saved a lot of time and effort in creating different model versions and intense data analysis, than doing in just Enterprise Guide.

## FIBER COST MODEL FITNESS

Plot shown below was created in SAS Enterprise Guide shows the fitness of model and the confidence intervals

- Competing estimation process overestimated the actual construction cost by an **average of 56%**
- The model overestimated the actual construction cost by an **average of only 8%**, and with a lower variance



**Figure 6. Model fitness and confidence intervals**

## CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author at:

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