Social Network Ads Analysis

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Springboard Capstone #1

Abstract

Social network ads are commonly deployed due to their cost effective nature and ease of

deployment. In the observed dataset we will observe the use of specific parameters and their

predictive probability on purchases. In order to have a successful campaign the parameters need

to correlate to purchases as well as be statistically significant. It is important that the ads be

deployed more specifically to users that would be more likely to make a purchase than not. We

will be analyzing a Kaggle dataset consisting of 400 rows and 5 columns of features. The

features are User ID, Gender, Age, Estimated Salary and Purchased. Through exploratory data

analysis we will identify the optimum parameters that impact purchase outcomes. The findings

from EDA will then be used to build models to see the most optimum fit for ideal results.

Kaggle Dataset can be found at:

https://www.kaggle.com/rakeshrau/social-network-ads/data

Social Network Ads Analysis

Social network ads are commonly deployed due to their cost effective nature and ease of deployment. In the observed dataset we will observe the use of specific parameters and their predictive probability on purchases. In order to have a successful campaign the parameters need to correlate to purchases as well as be statistically significant. It is important that the ads be deployed more specifically to users that would be more likely to make a purchase than not.

Method

Data

Dataset is a Kaggle dataset that consists of 400 rows of unique customer data and 5 columns consisting of attributes: User ID, Gender, Age, Estimated Salary, Purchased. The dataset can be found at: https://www.kaggle.com/rakeshrau/social-network-ads/data. Our observations will provide that the dependent variable be Purchased as that is the value that we want to observe and optimize for the campaign.

Exploratory Data Analysis (EDA)

Our initial observations on the data to find values that correlate to the Purchased outcome with the best measure. Initial EDA observations against the variables of Gender, Age and Estimated Salary to find the best correlation to Purchased was needed to create models with the best fit for the campaign. In order to understand the data and any patterns that may be presented. Initial observations were to investigate how purchase patterns and behaviors were with the collected sample.

Figure #1 Purchases count with percentage
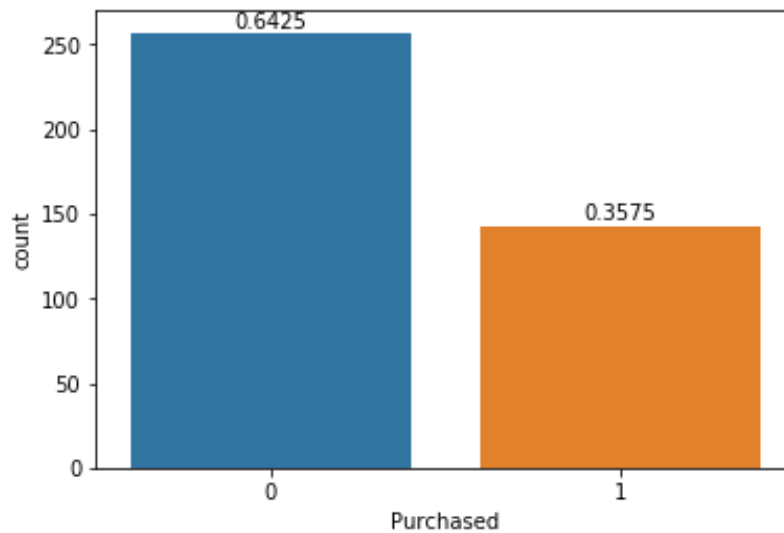
From the above figure we can see the current ratio of purchases versus non-purchases. Purchases are significantly less than non-purchases.

Figure #3 Purchase Frequency for Gender
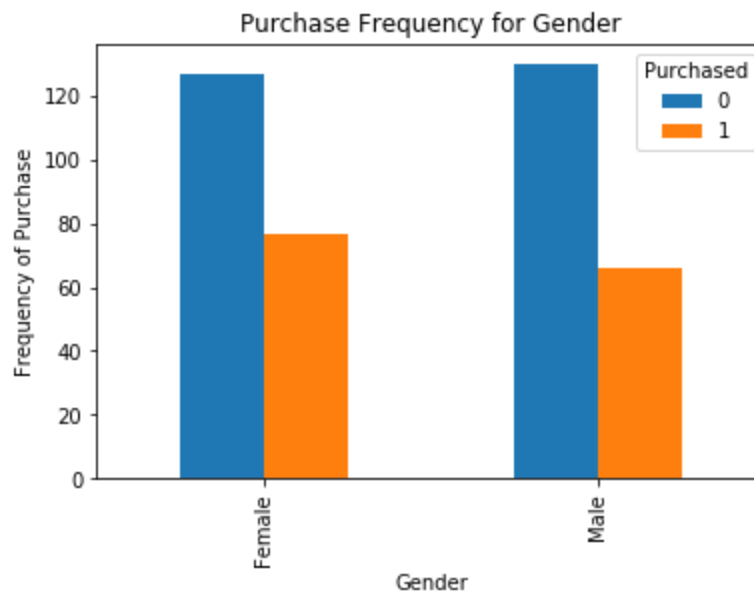
We can see that Gender does not significantly impact Purchased for our observations and can be excluded from our models.

Figure #3 Correlations of all variables to Purchase
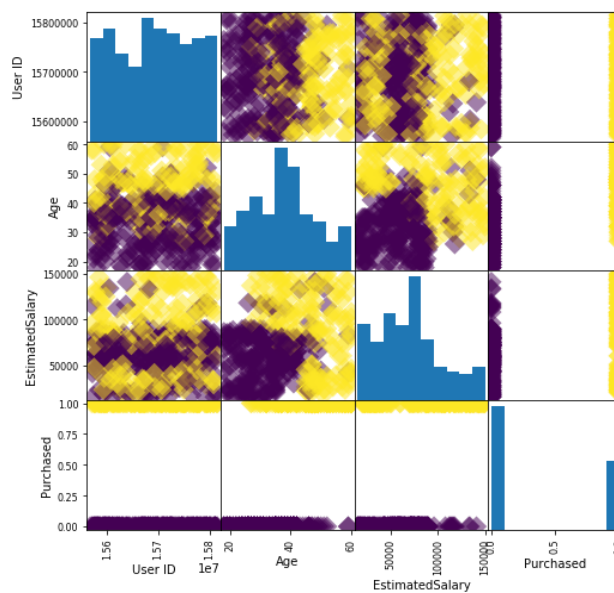
From this figure we can see the correlations of the variables against Purchased. We can also identify the categorical variables bi-sectional groupings. We also see strong correlations for Age and Estimated Salary.

Model Selection

After extracting the necessary data and processing the attributes necessary for our models we create a training set and testing set to make our observations with our models. We will be using Logistic Regression, Elastic Net, K-Nearest Neighbors and Support Vector Classifier as methods for our models. Observations and findings will be reported in results. We will be observing the scores on the testing sets for our observations. Metrics that will be observed are the classification reports as well as the AUC scores of the ROC curves. The ROC curves provide a good visual performance metric as to the performance of the model and it's predictive capabilities. The AUC provides the value for the ROC and range between 0.867 and 0.952 which

relates that our models have fairly good predictive measures overall. The deterministic feature

would be the goals of the client and how they would like to use the predictive metrics provided.

Results

The findings of the models are as follows:

Classifiers	Precision	Recall	F1-score	Accuracy score	AUC
Logistic Regression	0.09	0.30	0.14	0.30	0.8973
Logistic Regression with GridSearchCV	0.09	0.30	0.14	0.70	0.8973
Logreg with GSCV and params	0.09	0.30	0.14	0.84	0.952
Elastic Net	0.09	0.30	0.14	0.84	0.952
K-Nearest Neighbors (n=5)	0.86	0.86	0.86	0.86	0.905
K-Nearest Neighbors (n=8)	0.84	0.84	0.83	0.84	0.906
KNN with Standard Scaler	0.62	0.62	0.62	0.94	0.943
Support Vector Classifier	0.71	0.72	0.66	0.73	0.867
SVC with Standard Scaler	0.90	0.90	0.90	0.90	0.867
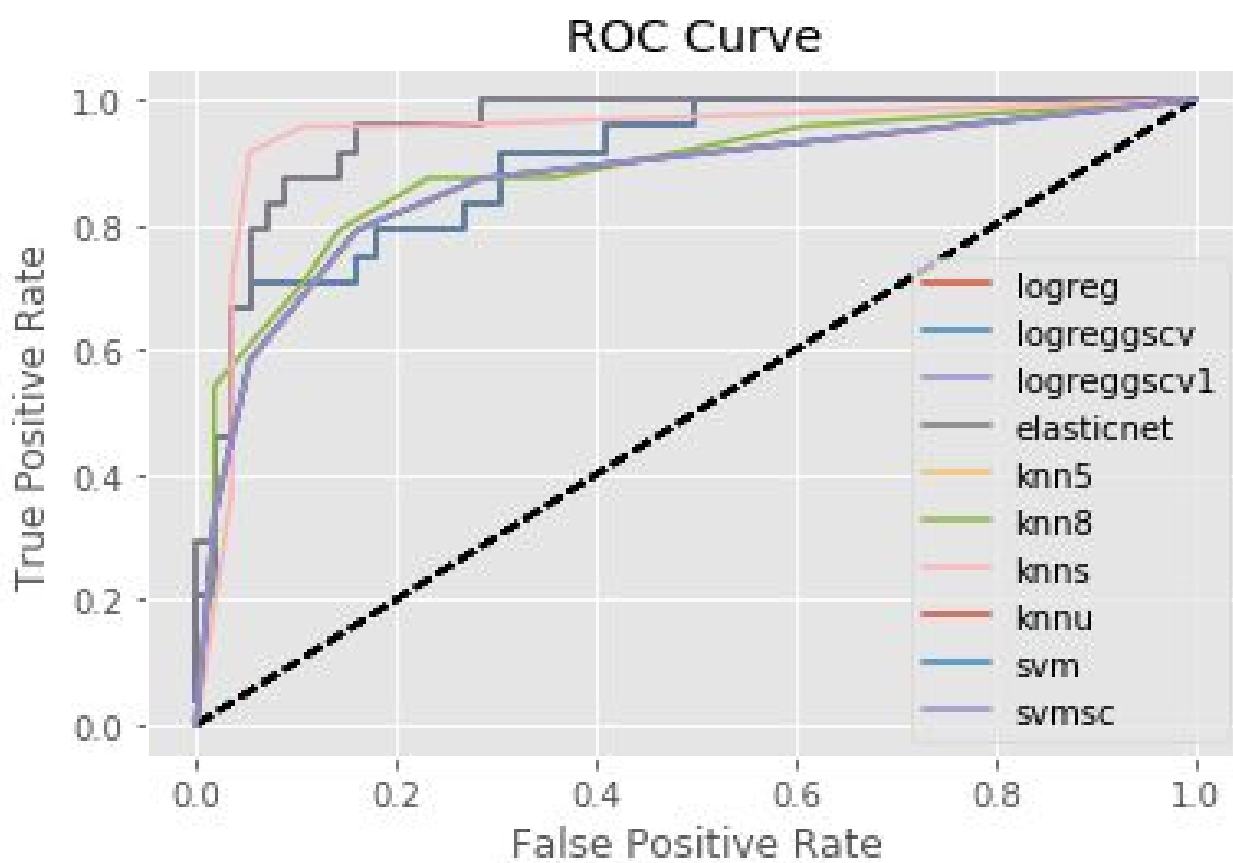
Conclusion

Evaluations of the models primarily used the classification report scores and ROC in conjunction with AUC score. The classification report provides insights to performance of model for ability to correctly identify labels. ROC in conjunction with AUC is used to determine the performance of the models and how random or consistent the predictions are. Our results determined that logistic regression with gridsearchCV using parameters or Elastic Net produced the most ideal results for predictive analysis on social network ad deployment success. Logistic regression is the best model as long as it is tuned with either gridsearchCV and extended parameters or ElasticNet as they both yielded the same result. The logistic regression has the better AUC score relating that the true positive rate in this model is higher that the other models relating that the predictive significance to the dataset is better pronounced in this model with less errors. The ROC Curves figure shows the performance of each model and the visual representation of the AUC score. This relates that on a random consumer the outcome prediction being a true positive result is within 95% accuracy. Relating to the scenario this means that for a random user that the ad is deployed to the certainty that they will produce a true positive result, in this instance a purchase, is within 95% likelihood.

References

Raushan, Rakesh. *Social Network Ads | Kaggle*, 6 Aug. 2017,

       www.kaggle.com/rakeshrau/social-network-ads/data.