Relax Inc.

Relax Inc. makes productivity and project management software that's popular with both individuals and teams. Founded by several former Facebook employees, it's considered a great company to work at.

Relax would like to utilize existing customer information to predict future user adoption. Relax defines user adoption as a user who has logged in on three (or more) separate days in one (or more) seven-day periods.

Relax collects the user id and date when a user logs into the system. With that data, it was relatively easy to calculate a running total of logins for each user for the previous 7 days. With this, any user who has a count of three or higher qualifies as an adopted user.

Relax has data on 12,000 users (I found some duplicates and 3,000+ users who have no record of logins) and for those users has collected 207,917 separate user logins. Of the 12,000 users, 1,602 (13%) are considered adopted users. This is an imbalanced dataset which in this case, will make accurate positive predictions more difficult. To combat the imbalance data, I did the following:

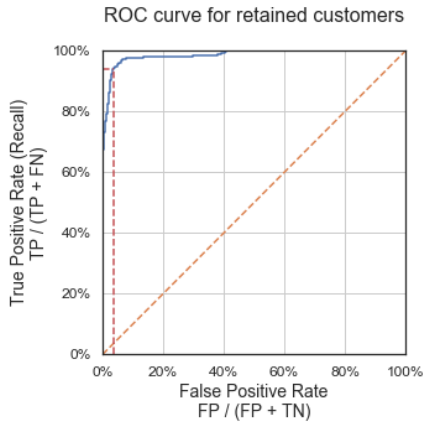
- For accessing and comparing classifier performance, I used ROC curves (Figure 1), the confusion matrix, and precision, recall and F1 metrics.
- Tried various classifiers

After being able to train an accurate model, I stopped but if needed, my plan was to generate synthetic samples (over-sampling) and to utilize penalized classifiers and metrics.

I trained the initial models on ~15 features. The LGBM Classifier scored the best and was the classifier I opted to use. I was also able to obtain some very good results with the KNN classifier.

I moved on to feature elimination by utilizing feature importance and LASSO (which both agreed) and ultimately resulted in three features as follows:

- **Creation_Time_Delta:** Creation time (date) as an integer from the first recorded date.
- **Last_Session_Creation_Time_Delta:** Last session creation time (date) as an integer from the first recorded date.
- **Org_ID:** Given Org id – The organization ID if a user belongs to an organization



My initial classifier, before making my cutoff adjustment scored a True Negative Rate (TNR) of 98.56% and a True Positive Rate (TPR) of 80.21%. Normally I wouldn't look at accuracy on an imbalanced data set, but these number were so good I decided to monitor accuracy as well. The model's accuracy score was 96.11%. I then calculated a new cutoff based on the ROC Curve (Figure 1) and which resulted in a TNR of 96.47%, a TPR of 94.10% and an accuracy score of 96.16% Finally, I retrained my model on the training and validation data and predicted on my holdout data (never seen by the model). I received a TNR of 94.52%, a TPR of 96.25% and an accuracy score of 94.75% (Figure 2).

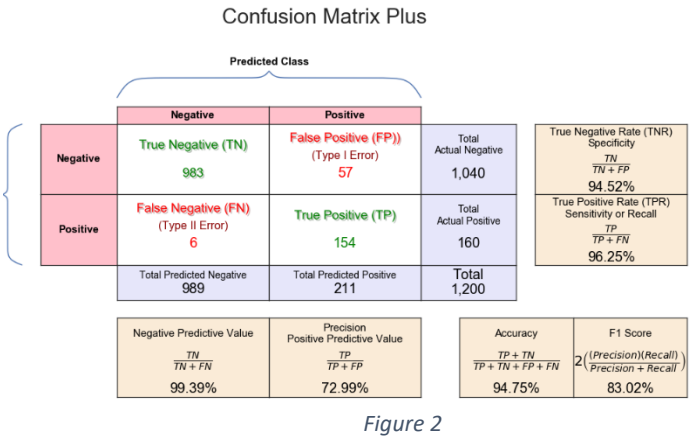


Figure 2

Since active users are always going to have a more recent last login time, this is probably what is skewing the data/model. My next steps would be to regroup with Relax's management, reevaluate my features (especially time related features) with the objective of creating the best predictive model possible for Relax, Inc.

Note: The graphs in the model will vary slightly from Figures 1 & 2 as a result of continual refinement of the model.