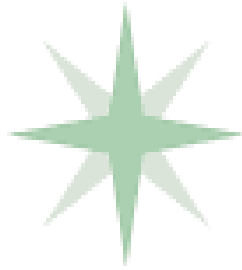




# Big Dream Ministries Inventory Analysis

Cliff Bridges and Kate Hayes



# BIG DREAM

## MINISTRIES

God has given us a dream - for every person, everywhere to grow in their biblical knowledge - to be AMAZED by God's Word.

# Major Products

## The Amazing Collection

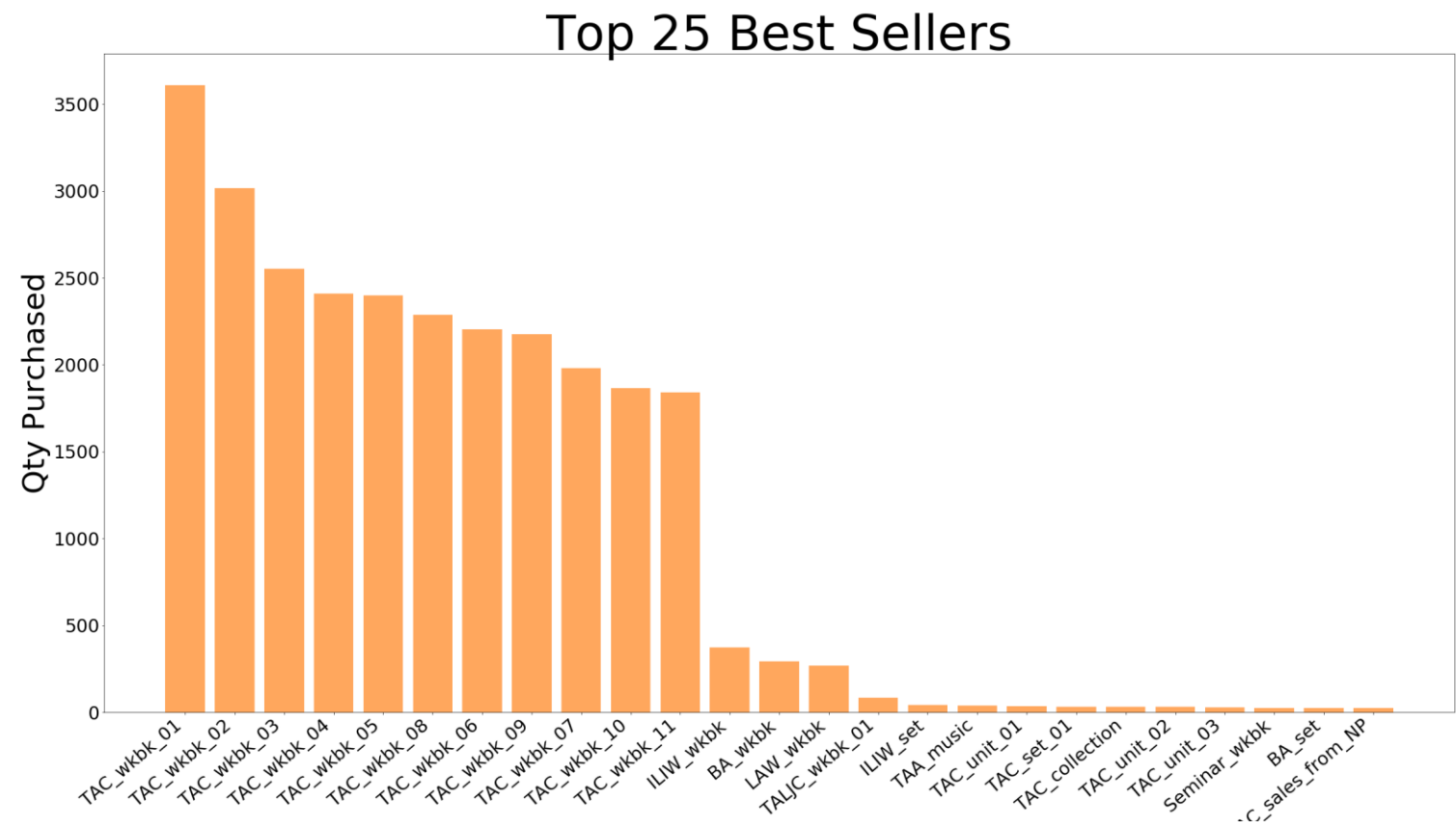
- 11 Sets
  - Set is One workbook and 5-10 DVDs
- 3 Units
  - 4 - 5 Sets
- The whole Collection
- Individual set workbooks



# Driving Questions

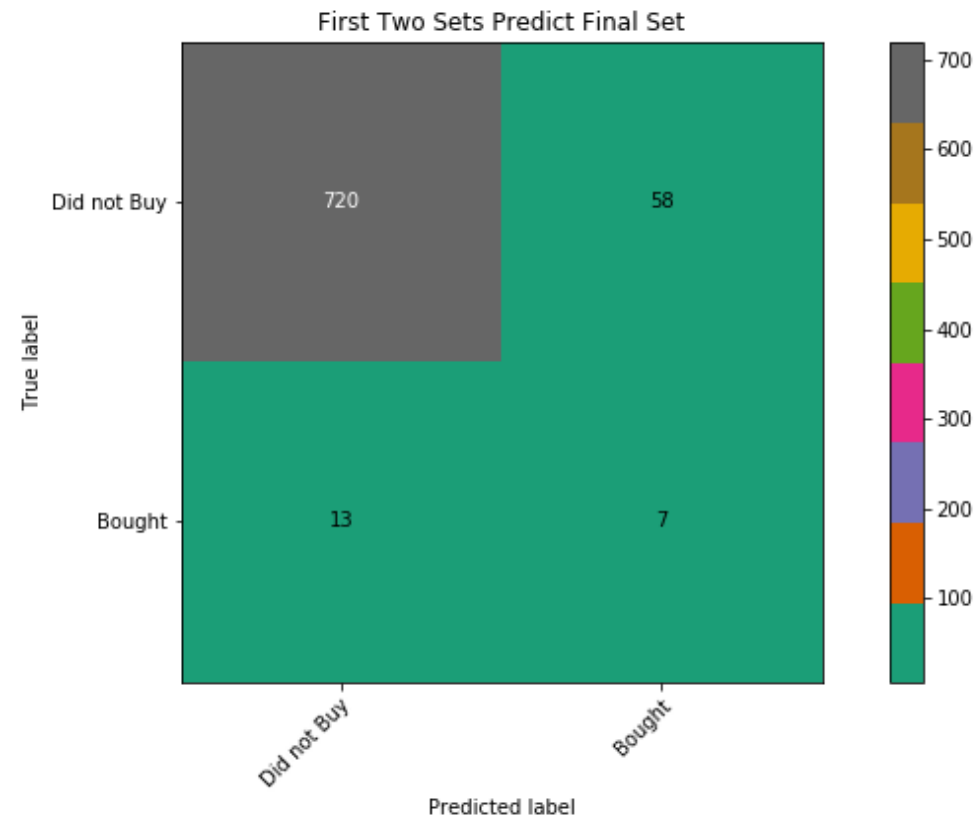
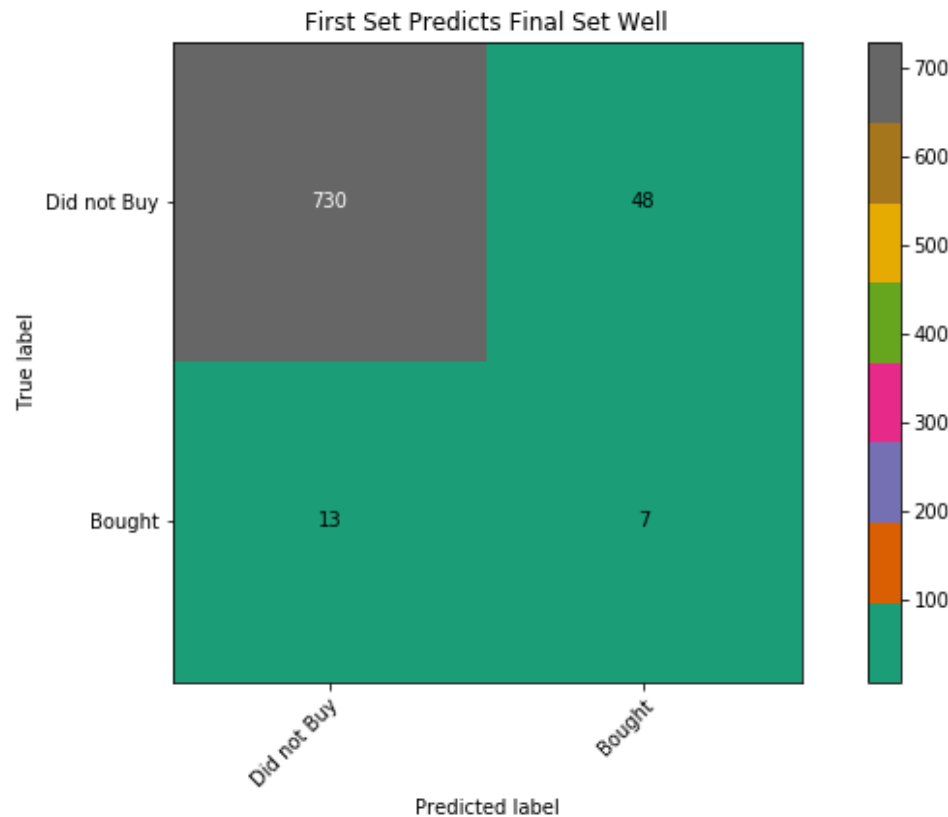
- ▶ How much inventory should BDM buy for their next season?
- ▶ Limited space to store inventory so knowing how much to buy and when is crucial
  - ▶ The company would rather order more than too little. (False Positives preferred over False Negatives)

# Best Sellers



# Logistic Regression

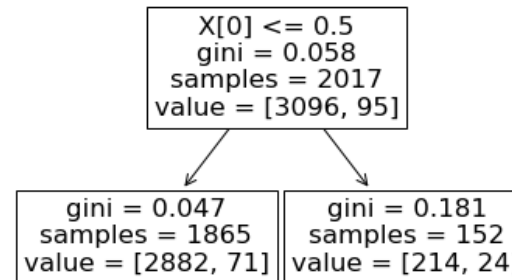
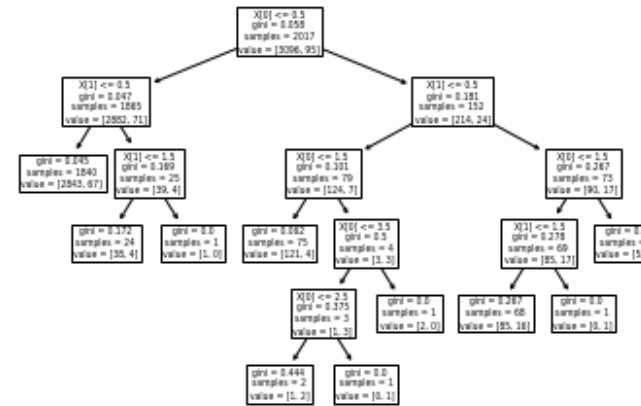
- ▶ SMOTE vs Down Sampling
- ▶ Duration of Account is Misleading
- ▶ False Positives are Better than False Negatives (F1:92% vs 91%)



# Random Forest

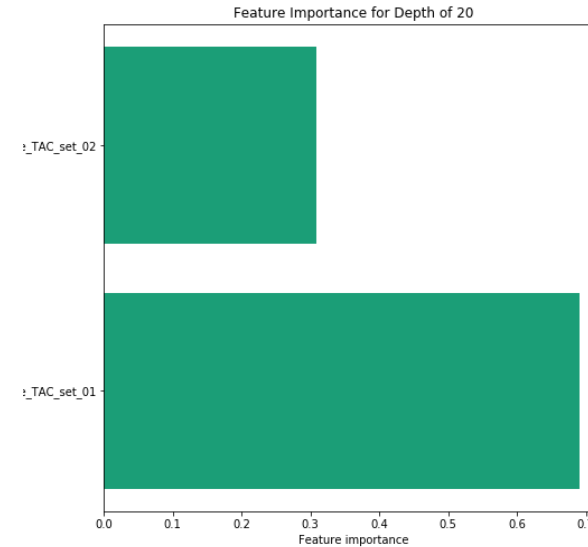
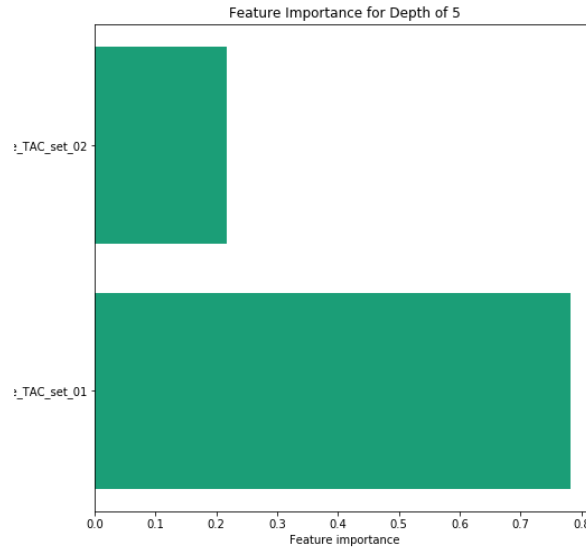
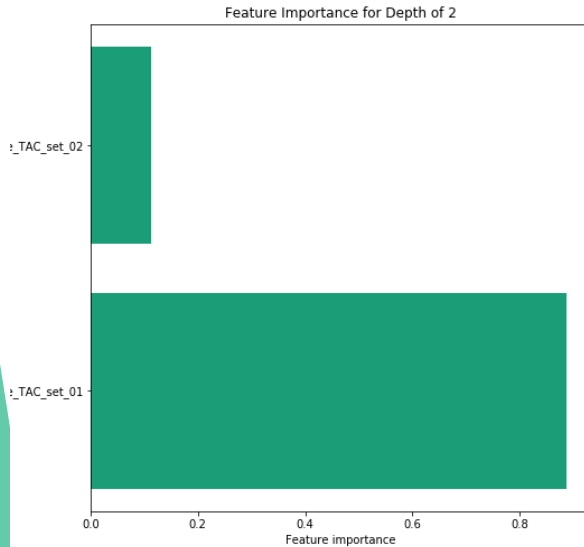
$n\_estimators = 100$ ,  $max\_depth = 20$

- ▶ Best Accuracy without Smote: 0.972
- ▶ Best Accuracy with Smote: 0.0946
- ▶ Single Binary Decision Tree performed better than a Random Forest of Any Size
  - ▶ Accuracy of Single Tree: 0.974



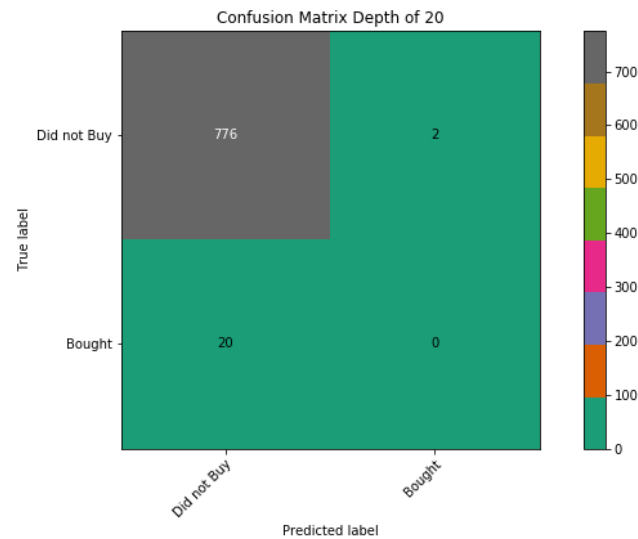
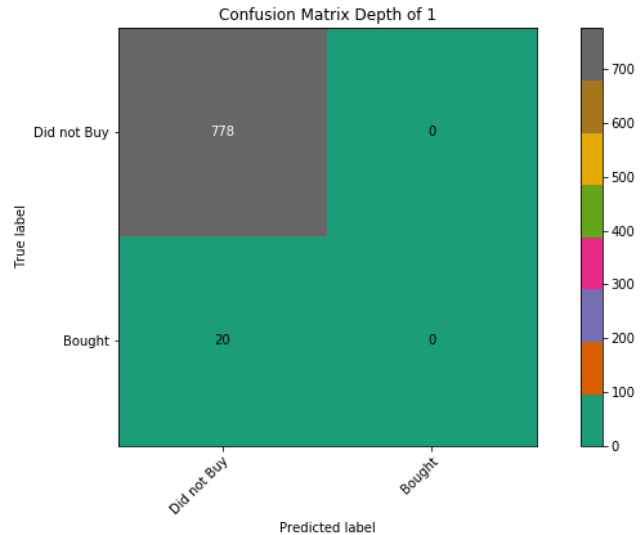
# Random Forest Feature Importance

- ▶ The deeper you go in tree depth the more important the second set of the Amazing collection is in predicting weather you buy the eleventh set
- ▶ For a depth of one there is no significance to the second set





# Random Forest Confusion Matrix



- ▶ Higher false positive is desirable
- ▶ The False Negative rate is higher than desirable and all tree depths gave similar results
- ▶ We underestimated by 18-20 customers who would buy set 11

# Conclusion & Future Work

## ► Conclusions

- Logistic Regression is a more useful model even though Random Forests is more accurate technically

## ► Future Work

- Run 'Buy 'Til You Die' model (import lifetimes)
- Predict which books are bought seasonally.
- Average time span from first purchase to last of the amazing collection. i.e. how long do customers take to finish the amazing collection?
- Quantity/Percentage of sales with and without church affiliation



# Questions?