Music Box Project

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The Lifelong Learning Platform of Silicon Valley

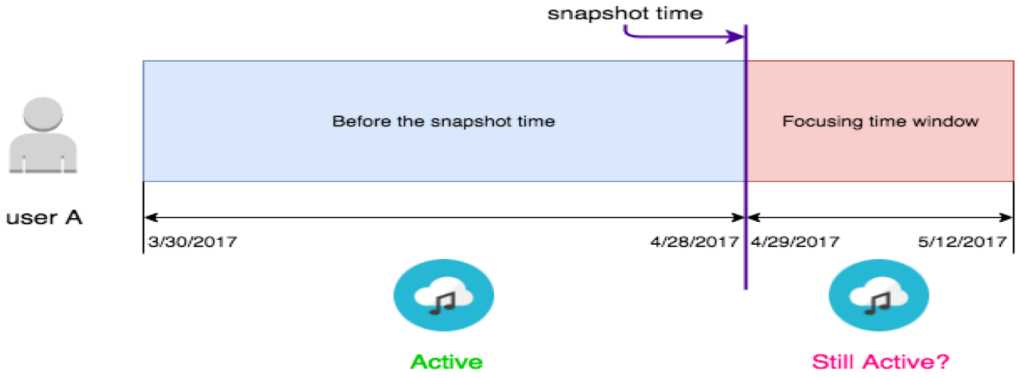
Outline

- Churn Prediction Overall Description
- Data Preprocessing
- Feature Engineering
- Modeling Design
- Performance Evaluation
- Expected Commercial Value

Churn Prediction

Target: Build an churn prediction model based on user's behavior from using our music box product

We want to know whether user A is still active during our focused time period who once has activities before the snapshot time?



Data Preprocessing

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- Raw Data Description
  - Only play log data included in my project
  - Data size: 14.1 G
  - Attributes: uid, device, song id, play time, song length, song name, singers

- Data Exploration
  - 871702 Users, 164,667,143 play records
  - Time series: 2018-03-01 to 2018-03-09; 2018-03-29 to 2018-05-12

- Platform: Local Computer (Macbook pro with 16G RAM)
  - Programming Language: python
  - Package: Spark(python based), pandas, scikit-learn, keras

Feature Engineering

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- Useful attributes: uid, date, song id, play time, song length

- Data Cleaning
  - Remove records satisfying any of the following:
    - Any attributes Including null values
    - Uid, song id, play time, song length including characters
    - Play time is larger than song length

- Feature Design
  - A total of 11 features from 3 categories
    - frequency on play log(last 1,3,7,14,30 days)
    - Recency
    - Play time percentage per song(last 1,3,7,14,30 days)

Modeling Design - (I)

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- Design the target(label)
  - Snapshot date: 2017-04-29
  - All time window: 2017-03-29 to 2017-05-12
  - Focusing time window: 2017-04-29 to 2017-05-12
  - potential churners: the users who have play activities before the snapshot date but no activity during the focusing time window(otherwise, it could be seen as the potential loyaltees)

- Balance the data
  - Original data
    - loyaltees : churners = ~200k: ~330k (38%: 62%) [churn rate: 39%]
  - Balanced data
    - loyaltees : churners = ~200k: ~200k (50%: 50%)

Modeling Design - (II)

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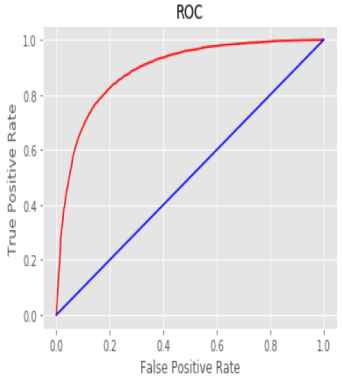
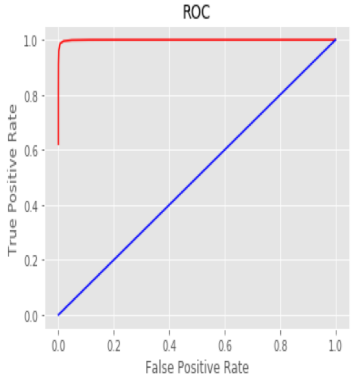
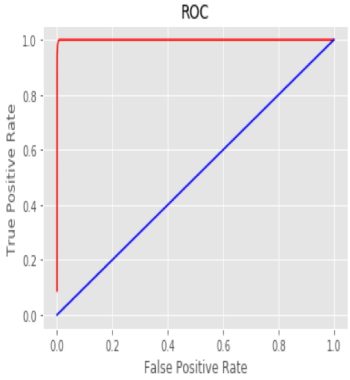
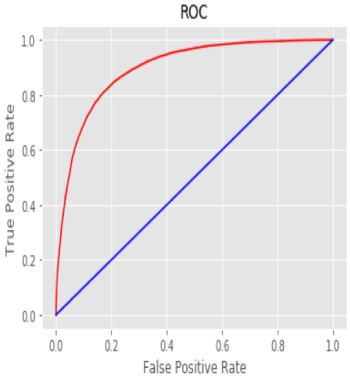
- Model Selection

Model	Logistic Regression	Random Forest	RF with Tuning	Neural Network
Hyperparameter Setting	C = 0.1 L2 penalty	N_estimator = 10	N_estimator = 300, max_depth = 30	11->8->4->1

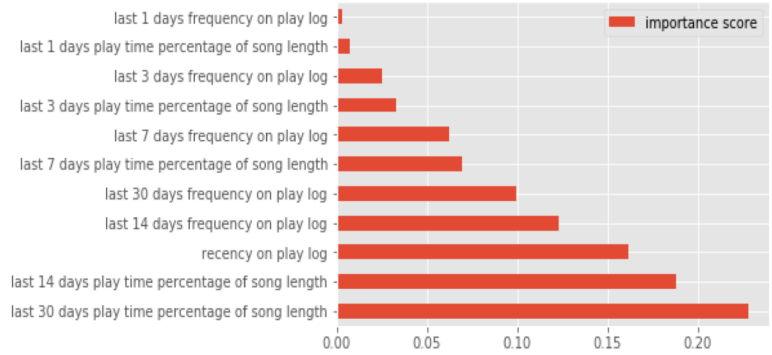
- Hyperparameter Tuning
  - Training data sets : Testing data sets = 80% : 20%
  - 5-fold cross validation on training sets for hyperparameter tuning.

Performance Evaluation

			
Logistic Regression	Random Forest	RF with Tuning	Neural Network
AUC: 0.7159	AUC: 0.8422	AUC:0.8564	AUC: 0.8198

Expected Commercial Value

- Top 3 features influencing the churn
  - last 30 days play time percentage of song length
  - last 14 days play time percentage of song length
  - recency



- Suggestions on retaining users
  - Send push notifications to users with high churn possibility, i.e. users who don't have any play activity for 14 days.
  - Recommend potential favorite songs to users, especially for those whose play time percentage per song has decreased significantly for last 14 or 30 days.

Thank you for your watching!

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