Technical Appendix
Catch the Pink Flamingo Analysis

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Acquiring, Exploring and Preparing the Data

Data Exploration

Data Set Overview

The table below lists each of the files available for analysis with a short description of what is found in each one.

File Name	Description	Fields
ad-clicks.csv	A line is added to this file when a player clicks on an advertisement in the Flamingo app.	**timestamp**: when the click occurred. **txId**: a unique id (within ad-clicks.log) for the click **userSessionid**: the id of the user session for the user who made the click **teamid**: the current team id of the user who made the click **userid**: the user id of the user who made the click **adId**: the id of the ad clicked on **adCategory**: the category/type of ad clicked on
buy-clicks.csv	A line is added to this file when a player makes an in-app purchase in the Flamingo app.	**timestamp**: when the purchase was made. **txId**: a unique id (within buy-clicks.log) for the purchase **userSessionId**: the id of the user session for the user who made the purchase **team**: the current team id of the user who made the purchase **userId**: the user id of the user who made the purchase **buyId**: the id of the item purchased **price**: the price of the item purchased
users.csv	This file contains a line for each	**timestamp**: when user first played

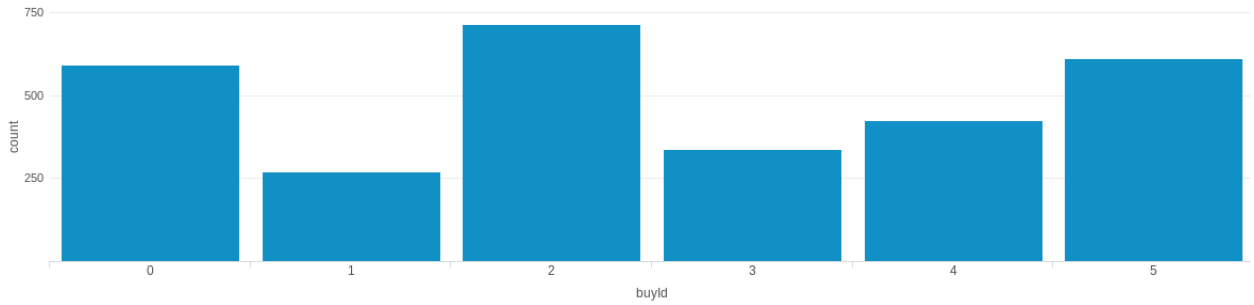
	user playing the game.	the game. **userId**: the user id assigned to the user. **nick**: the nickname chosen by the user. **twitter**: the twitter handle of the user. **dob**: the date of birth of the user. **country**: the two-letter country code where the user lives.
team.csv	This file contains a line for each team terminated in the game.	**teamId**: the id of the team **name**: the name of the team **teamCreationTime**: the timestamp when the team was created **teamEndTime**: the timestamp when the last member left the team **strength**: a measure of team strength, roughly corresponding to the success of a team **currentLevel**: the current level of the team
team-assignments.csv	A line is added to this file each time a user joins a team. A user can be in at most a single team at a time.	**timestamp**: when the user joined the team. **team**: the id of the team **userId**: the id of the user **assignmentId**: a unique id for this assignment
level-events.csv	A line is added to this file each time a team starts or finishes a level in the game	**timestamp**: when the event occurred. **eventId**: a unique id for the event **teamId**: the id of the team **teamLevel**: the level started or completed **eventType**: the type of event, either start or end
user-session.csv	Each line in this file describes a user session, which denotes when a user starts and stops playing the game. Additionally, when a team goes to the next level in the game, the session is ended for each user in the team and a new one started.	**timestamp**: a timestamp denoting when the event occurred. **userSessionId**: a unique id for the session. **userId**: the current user's ID. **teamId**: the current user's team. **assignmentId**: the team assignment id for the user to the team.

		sessionType: whether the event is the start or end of a session. **teamLevel**: the level of the team during this session. **platformType**: the type of platform of the user during this session.
game-clicks.csv	A line is added to this file each time a user performs a click in the game.	**timestamp**: when the click occurred. **clickId**: a unique id for the click. **userId**: the id of the user performing the click. **userSessionId**: the id of the session of the user when the click is performed. **isHit**: denotes if the click was on a flamingo (value is 1) or missed the flamingo (value is 0) **teamId**: the id of the team of the user **teamLevel**: the current level of the team of the user
ad-clicks.csv	A line is added to this file when a player clicks on an advertisement in the Flamingo app.	**timestamp**: when the click occurred. **txId**: a unique id (within ad-clicks.log) for the click **userSessionid**: the id of the user session for the user who made the click **teamid**: the current team id of the user who made the click **userid**: the user id of the user who made the click **adId**: the id of the ad clicked on **adCategory**: the category/type of ad clicked on

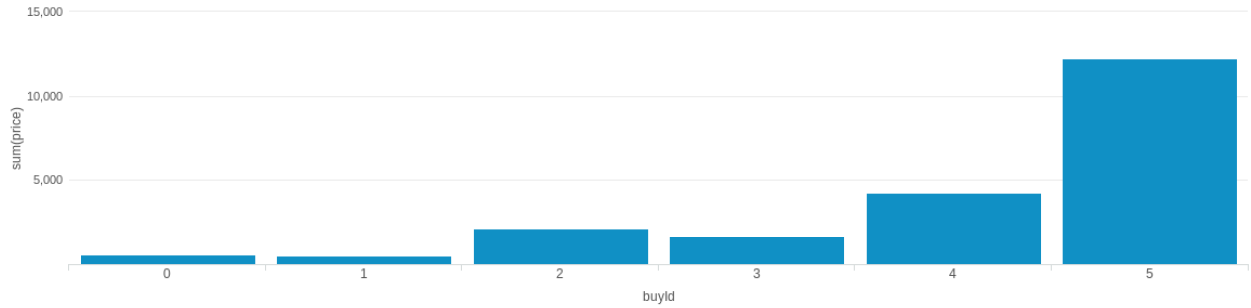
Aggregation

Amount spent buying items	$21407
# Unique items available to be purchased	6

A histogram showing how many times each item is purchased:

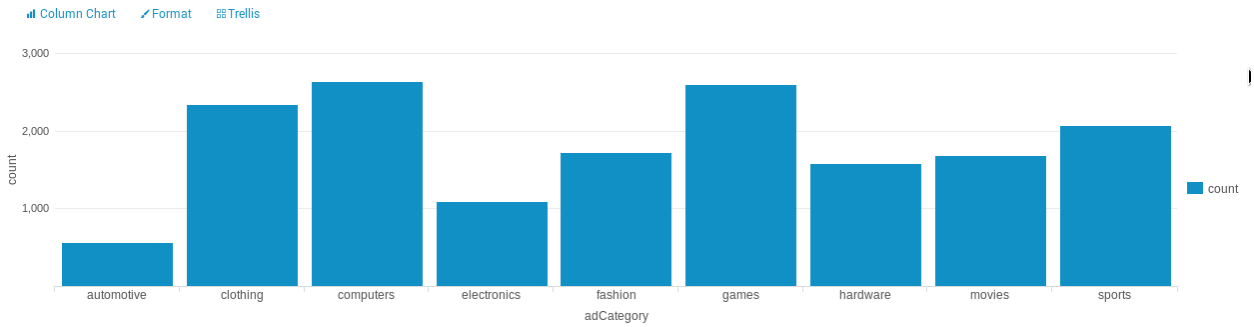


A histogram showing how much money was made from each item:



Filtering

A histogram showing how many times each category of advertisement was clicked-on:



The following table shows the total amount of ad-click revenue for a set of specific values based on the advertisement category. All non-listed categories generate .25 revenue.

Scenario #	Electronics	Fashion	Automotive	Total Revenue
1 - even	0.50	0.50	0.50	4928.25

2 - uneven	0.55	0.60	0.55	5184.1

Data Classification Analysis

Data Preparation

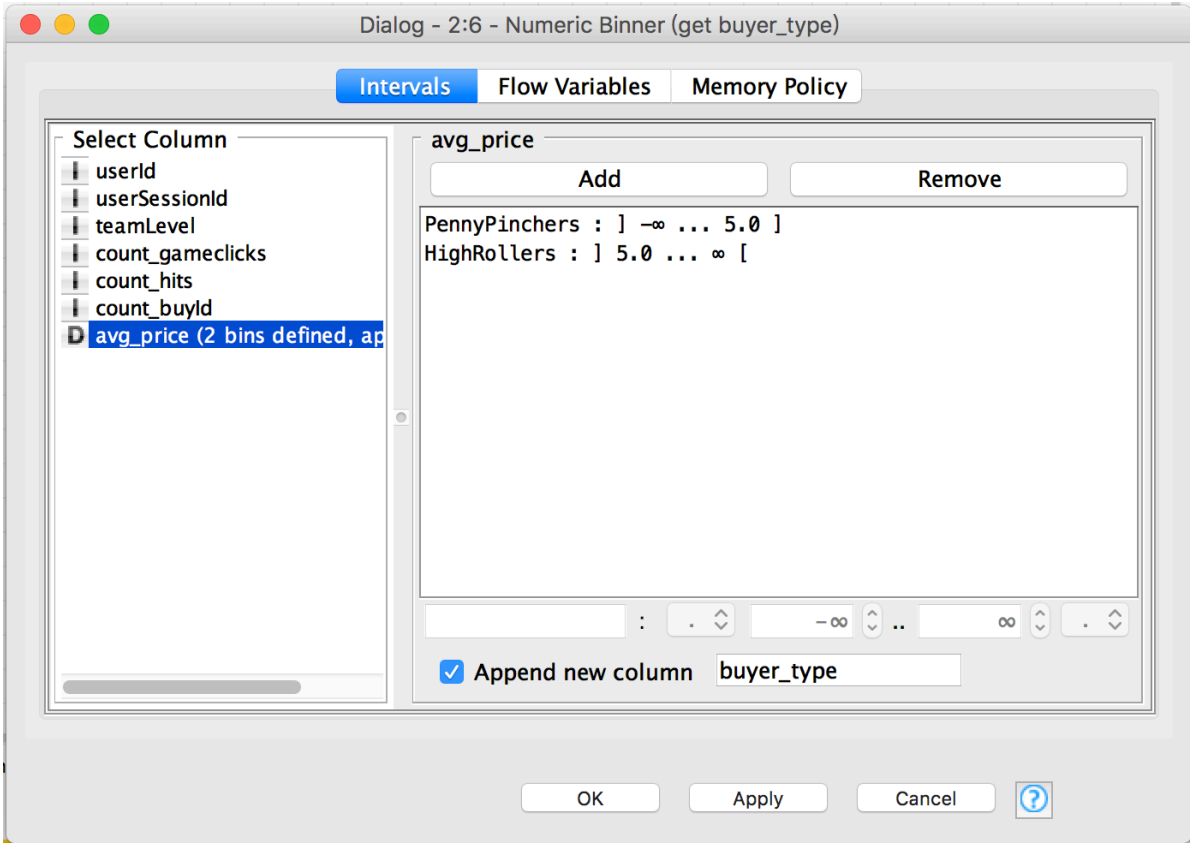
Analysis of combined_data.csv

Sample Selection

Item	Amount
# of Samples	4619
# of Samples with Purchases	1411

Attribute Creation

A new categorial attribute was created to enable analysis of players as broken into 2 categories (HighRollers and PennyPinchers). A screenshot of the attribute follows:



The column of avg_price represent average per orders of a user. If avg_price greater than 5, then the user is HighRollers. If avg_price less than or equal 5, then the user is PennyPinchers.

The creation of this new categorical attribute was necessary because the task is classifying users as HighRollers or PennyPinchers, we need categorial variate, instead of continuous variate.
.

Attribute Selection

The following attributes were filtered from the dataset for the following reasons:

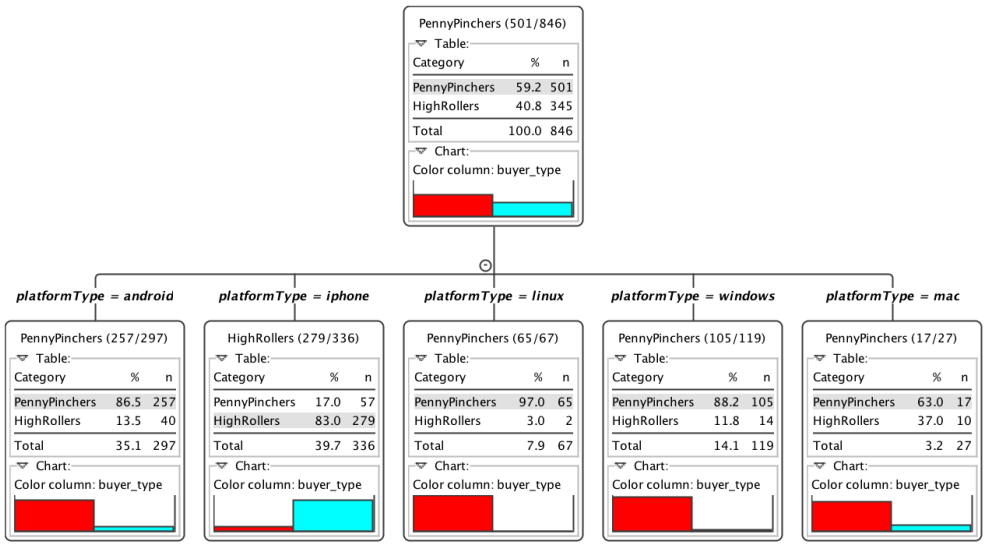
Attribute	**Rationale for Filtering**
userID	It is uniquely user id, has no sense to classify.
userSession	It is uniquely user session id, has no sense to classify.
avg-price	The target label derived from it

Data Partitioning and Modeling

The data was partitioned into train and test datasets.
The train data set was used to create the decision tree model.
The trained model was then applied to the test dataset.
This is important because preventing model overfitting.

When partitioning the data using sampling, it is important to set the random seed because the train/test dataset will not change regardless rerun all workflow.

A screenshot of the resulting decision tree can be seen below:



Evaluation

A screenshot of the confusion matrix can be seen below:

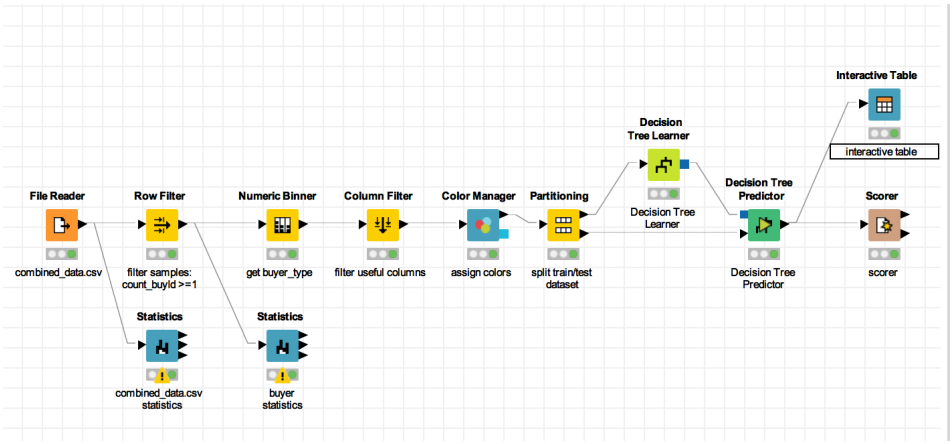
buyer_type \ Prediction (buyer_type)	PennyPinchers	HighRollers
PennyPinchers	308	27
HighRollers	38	192

As seen in the screenshot above, the overall accuracy of the model is **88.496%**

row1, col1: 308, real label is PennyPinchers, predict label is PennyPinchers, correctly predicted
row1, col2: 27, real label is PennyPinchers, predict label is HighRollers, incorrectly predicted
row2, col1: 38 real label is HighRollers, predict label is PennyPinchers, incorrectly predicted
row2, col2: 192, real label is HighRollers, predict label is HighRollers, correctly predicted

Analysis Conclusions

The final KNIME workflow is shown below:



What makes a HighRoller?
PlatformType is a key attribute to classify users. If user use iphone, he or she high probability is a HighRoller. And if users not use iphont, he or she high probability is a PennyPicher.

Specific Recommendations to Increase Revenue
1. Advertising to iphone users, to attract more new iphone users.
2. Offering discount items to users who are not use iphone.

Clustering Analysis

Attribute Selection

Attribute	Rationale for Selection
totalAdClicks	Total number of ad-clicks per user
revenue	Sum of money spent on item by each user
hitRatio	Hit ratio of game-clicks per user

Training Data Set Creation

The training data set used for this analysis is shown below (first 5 lines):

	totalAdClicks	revenue	hitRatio
0	44	21.0	0.134078
1	10	53.0	0.100000
2	37	80.0	0.122047
3	19	11.0	0.109430
4	46	215.0	0.130682

Dimensions of the training data set (rows x columns) : 543 * 3

# of clusters created: 3

Cluster Centers

Cluster #	Cluster Center
1	[34.144 , 67.448 , 0.1198328]
2	[41.0666667, 145.511111, 0.128167091]
3	[26.36461126, 17.12600536, 0.1103672]

These clusters can be differentiated from each other as follows:
The features is totalAdClicks, revenue, hitRatio.
Cluster 1 is different from the others in that median totalAdClicks, median revenue, median hitRatio.
Cluster 2 is different from the others in that high totalAdClicks, high revenue, high hitRatio.
Cluster 3 is different from the others in that low totalAdClicks, low revenue, low hitRatio.

Recommended Actions

Action Recommended	Rationale for the action
Add ads to cluster 3	Cluster 3 buy little items, so we can increase ads revenue from them.
Deep research cluster 2, keep them retention	Cluster 2 are high value users, we should attention to their churn tendency, keep them retention to get more income.

Graph Analytics Analysis

Modeling Chat Data using a Graph Data Model

It's a chat graph. It's contain user create chat session, user joins a chat session and user leaves a chat session. It's also contain user chats in a chat session, and the chat may mentions other user or responds to other user.

Creation of the Graph Database for Chats

Describe the steps you took for creating the graph database.

i) **Write the schema of the 6 CSV files**

chat_create_team_chat.csv: userid, teamid, TeamChatSessionID, timestamp
A line is added to this file when a player creates a new chat with their team.

chat_join_team_chat.csv: userid, TeamChatSessionID, timestamp
Creates an edge labeled "Joins" from User to TeamChatSession. The columns are the User id,
TeamChatSession id and the timestamp of the Joins edge.

chat_leave_team_chat.csv: userid, TeamChatSessionID, timestamp
Creates an edge labeled "Leaves" from User to TeamChatSession. The columns are the User id,
TeamChatSession id and the timestamp of the Leaves edge.

chat_item_team_chat.csv: userid, TeamChatSessionID, chatitemid, timestamp
Creates nodes labeled ChatItems. Column 0 is User id, column 1 is the TeamChatSession id, column 2 is
the ChatItem id (i.e., the id property of the ChatItem node), column 3 is the timestamp for an edge
labeled "CreateChat". Also create an edge labeled "PartOf" from the ChatItem node to the
TeamChatSession node. This edge should also have a timeStamp property using the value from Column
3.

chat_mention_team_chat.csv: ChatItem, userid, timeStamp
Creates an edge labeled "Mentioned". Column 0 is the id of the ChatItem, column 1 is the id of the User,
and column 2 is the timeStamp of the edge going from the chatItem to the User.

chat_respond_team_chat.csv: chatid1, chatid2,timestamp

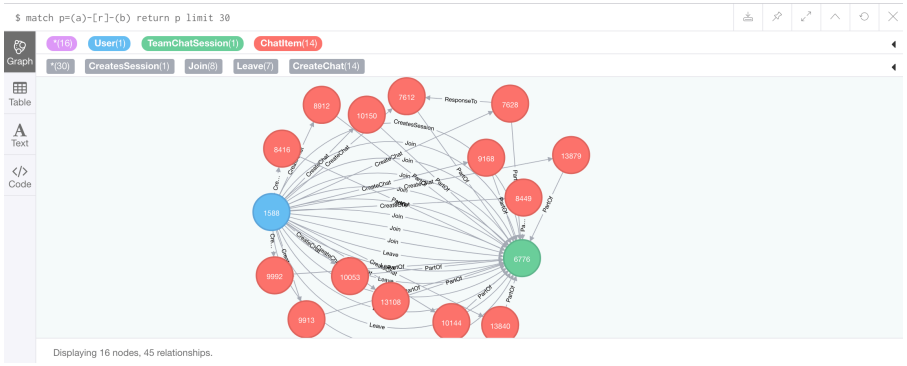
A line is added to this file when player with chatid2 responds to a chat post by another player with
chatid1.

ii) Explain the loading process and include a sample LOAD command

The first line gives the path of the file.
Then create nodes and attributes through MERGE.
Finally, create edges (source node, destination node, and relative attribute) through MERGE.

```
LOAD CSV FROM
"file:/Users/hahadsg/Downloads/tmp/z/big_data_capstone_datasets_and_scripts/chat-data/chat_create_team_chat.csv" AS row
MERGE (u:User {id: toInt(row[0])}) MERGE (t:Team {id: toInt(row[1])})
MERGE (c:TeamChatSession {id: toInt(row[2])})
MERGE (u)-[:CreatesSession{timeStamp: row[3]}]->(c)
MERGE (c)-[:OwnedBy{timeStamp: row[3]}]->(t)
```

iii) Present a screenshot of some part of the graph you have generated. The graphs must include clearly visible examples of most node and edge types. Below are two acceptable examples. The first example is a rendered in the default Neo4j distribution, the second has had some nodes moved to expose the edges more clearly. Both include examples of most node and edge types.

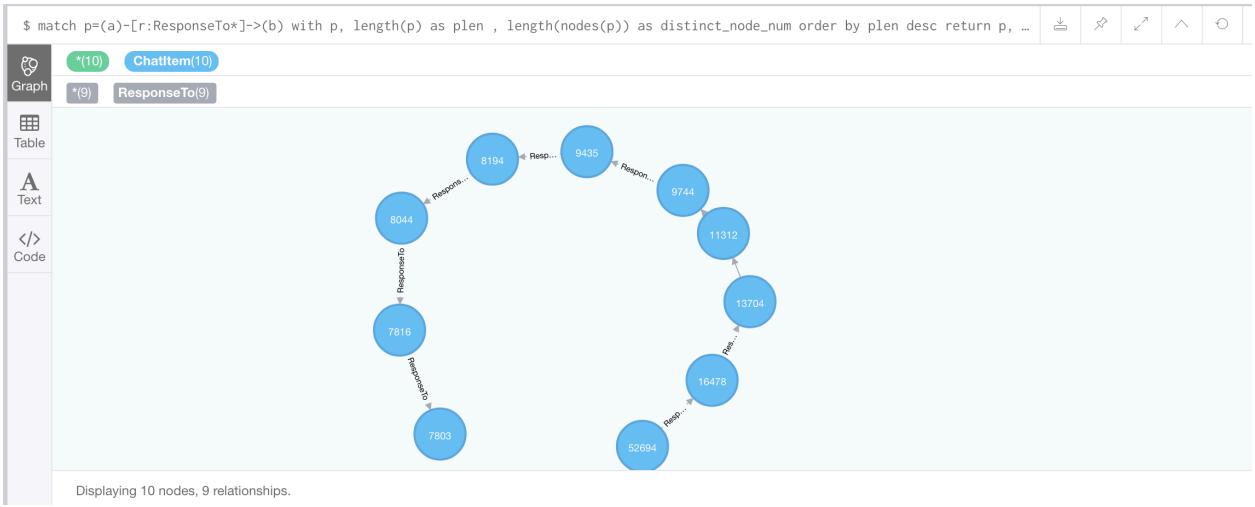


Finding the longest conversation chain and its participants

Report the results including the length of the conversation (path length) and how many unique users were part of the conversation chain. Include an image of the graph with the longest conversation chain.

The length of longest conversation is 9.

And 5 unique users were part of the longest conversation chain



Analyzing the relationship between top 10 chattiest users and top 10 chattiest teams

Include your table containing the top 3 chattiest users and teams below, and report whether or not any of the chattiest users are part of any of the chattiest teams.

Chattiest Users

Users	Number of Chats
394	115
2067	111
1087	109

Chattiest Teams

Teams	Number of Chats
82	1324
185	1036
112	957

The User 999 in Team 52

How Active Are Groups of Users?

Report the top 3 most active users in the table below.

Most Active Users (based on Cluster Coefficients)

User ID	Coefficient
209	0.9523809523809523
554	0.9047619047619048
1087	0.8

Recommended Actions

Finally, make recommendations to Eglence, Inc. and include examples of how your findings support them. Include this information in Slide 6 of your final presentation.

Recommendation (learn from classification)

1. Advertising to iphone users, to attract more new iphone users.
2. Offering discount items to users who are not use iphone.

Recommendation (learn from classification)

1. Add ads to cluster 3: Cluster 3 buy little items, so we can increase ads revenue from them.
2. Deep research cluster 2, keep them retention: Cluster 2 are high value users, we should attention to their churn tendency, keep them retention to get more income.