DSIF9 Capstone Project

Cheese Recommender
## "Sweet Dreams are made of Cheese"

Ho Kit Fai

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Problem Statement

- The Cheese Shop (TCS) Pte. Ltd. is looking at growing their revenue further

- 3 key areas were identified – Digital Marketing, Events, and Upselling

- Typically, prior to customer check out at retail stores, staff thru their observations of previous customer purchases would recommend items to customers to go with their existing basket. However, this is would not be consistent because full time staffs work on different shifts, and part time staffs may not be familiar with customer purchases

- TCS engaged the author to build a recommender system that can be deployed at the Point of Sale terminal, and the website

Revenue → Digital Marketing / Upselling / Events → Recommender System
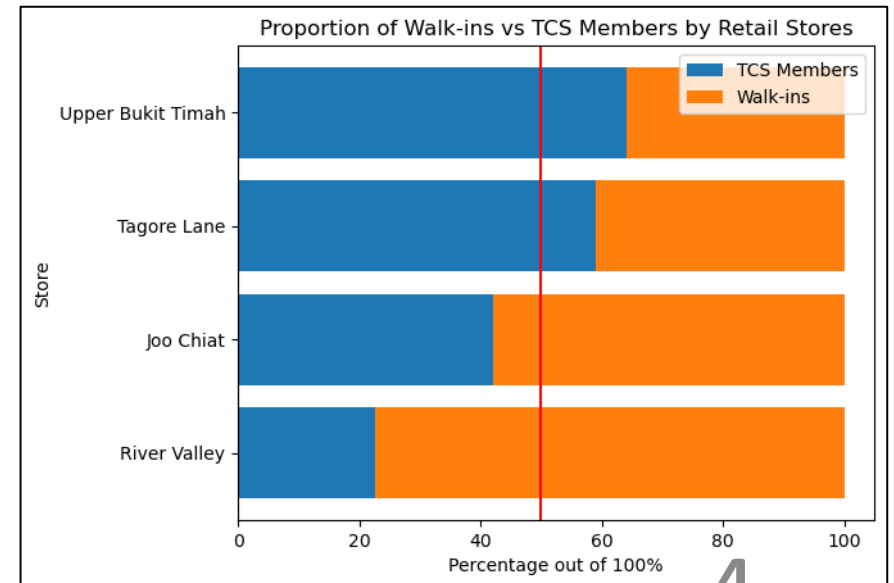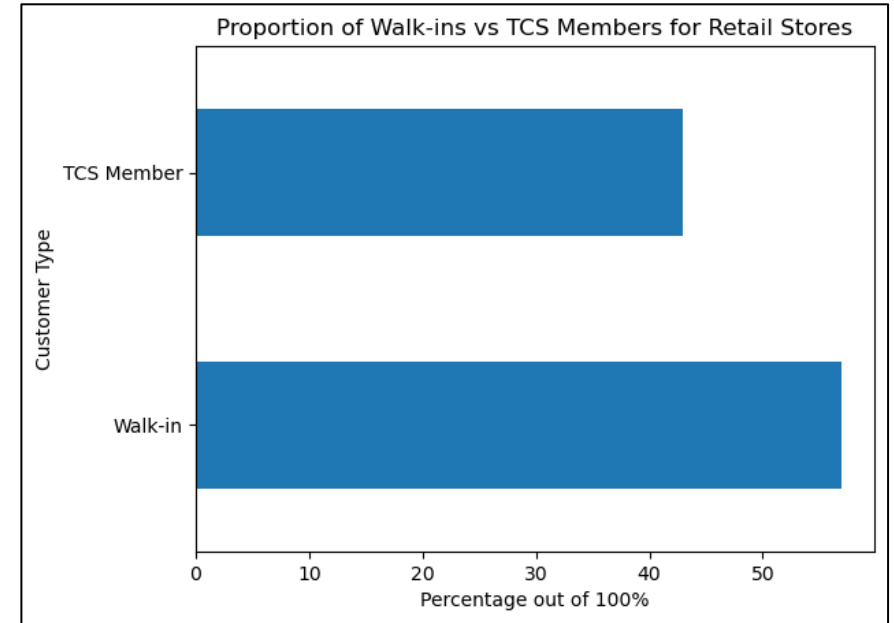
Data Collection

- Physical retail stores transactions are exported from Vend Point of Sale System

- Online store transactions are exported from BigCommerce System

Vend

Big Commerce

Dataset

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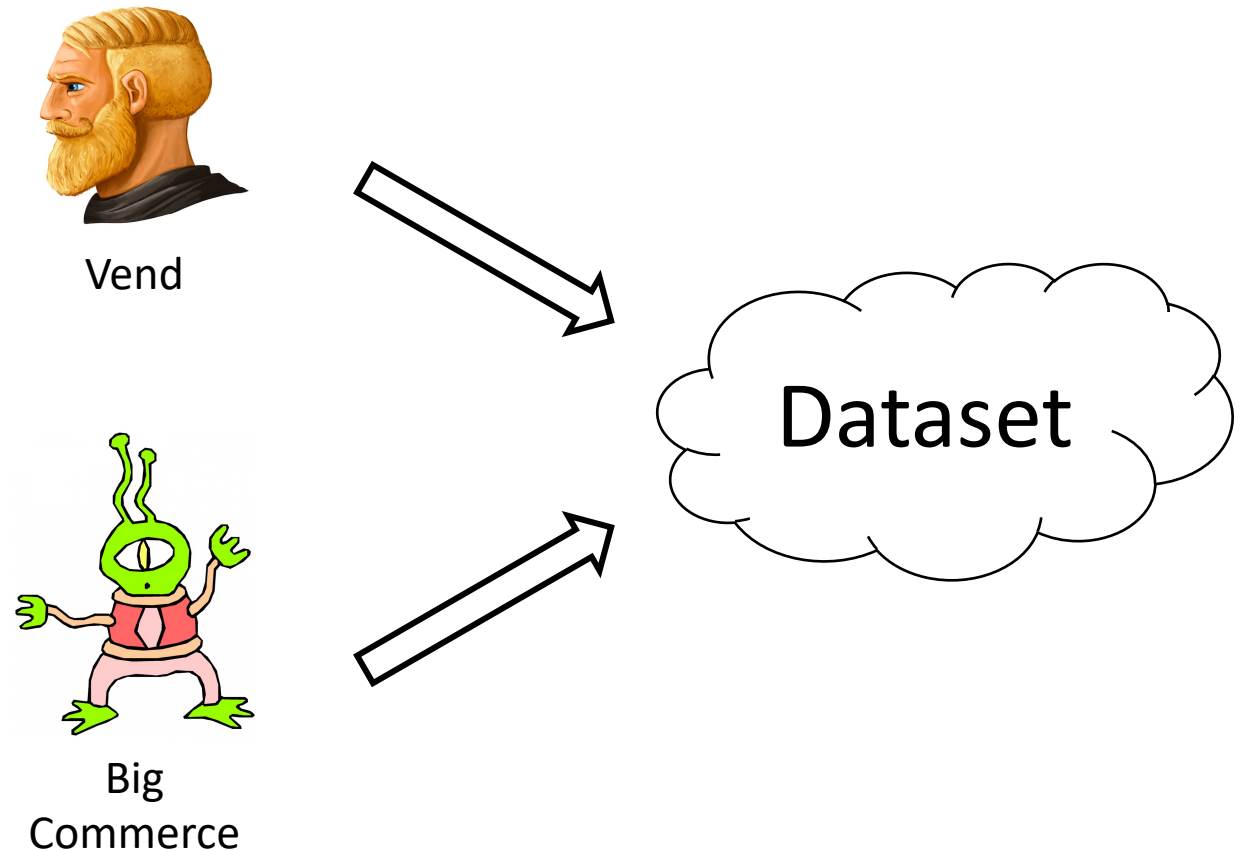
Exploratory Data Analysis – Retail Store

- More than half of the visitors to the retail stores are Walk-Ins

- The Upper Bukit Timah and Tagore Lane stores receives more member visits. This is likely due to the stores being closer to residential areas

- Where as for Joo Chiat and River Valley, it is the other way around. This is likely due to the stores being closer to lifestyle destinations

Proportion of Walk-ins vs TCS Members for Retail Stores

Proportion of Walk-ins vs TCS Members by Retail Stores

Exploratory Data Analysis – Retail Store and Online

- The mean spend per receipt of members at Upper Bukit Timah and Tagore Lane are higher than that of Walk-ins as compared to Joo Chiat and River Valley

- The mean spend per online transaction is around that of the Walk-ins

- This is further confirmed by the total proportions of transactions

Online Spend: 100$

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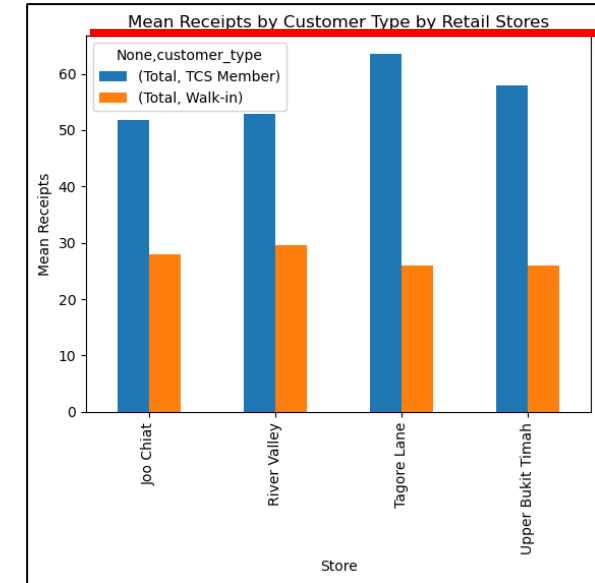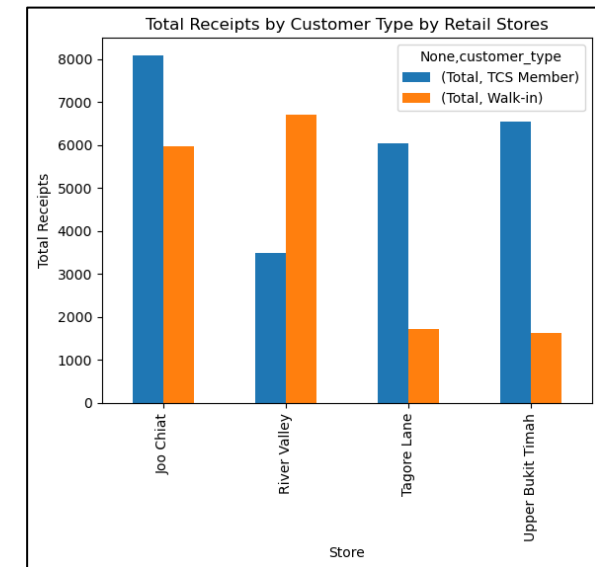
# Exploratory Data Analysis – Retail Store and Online

- While the expenditure of members more than double of that of walk-ins, it can be seen that the Top 20 items which they purchase are generally similar

- The items for the online store is quite different from that in the physical retail stores

- Online Store has more soft cheese sold

- Walk-ins buy more plastic bag

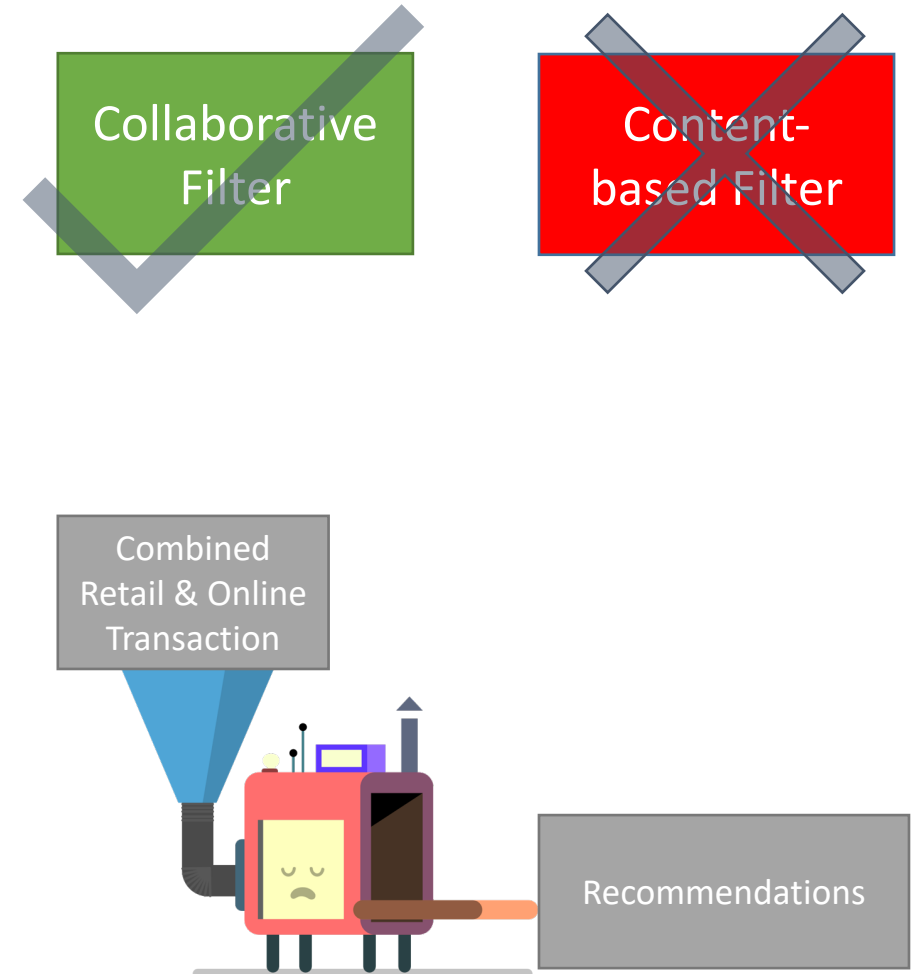| Purchase Rank	Retail Store Walk-ins	Retail Store Members	Online Store
1	Brie with Truffles	Brie with Truffles	Brie with Truffles
2	Burrata d'Oro 200g	Greenheart Mini Heirloom Tomatoes 250g	Comte Janier (18 Mths)
3	Plastic Bag	Burrata d'Oro 200g	Brillat Savarin with Truffles
4	Mr Kneady Sourdough Medium	Peter's Yard Original Sourdough Crispbread	Double Cream Brie with Garlic & Herbs
5	Greenheart Mini Heirloom Tomatoes 250g	The Fine Cheese Co. Walnut, Honey and Extra Vi...	Parmigiano Reggiano 36 months
6	Parmigiano Reggiano 36 Months	Vacherousse D'Argental	Brie de Meaux AOC
7	La Bufala Buffalo Mozzarella 100g	Jamón Serrano Ham 100g	Manchego - 12 months
8	Applewood Smoked Cheddar	OG Kristal	Délice de Bourgogne
9	Comte Janier (18 Mths)	La Bufala Buffalo Mozzarella 100g	Applewood Smoked Cheddar
10	Comte Janier (30 mths)	Brie de Meaux AOC	Gruyère de Savoie
11	Brie de Meaux AOC	Prima Donna	Camembert de Normandie (AOC)
12	Jamón Serrano Ham 100g	Mr Kneady Sourdough Medium	Gouda with Truffles
13	Pecorino Romano	Coppa di Parma 100g	Pecorino Moliterno with Truffles
14	Barney Jack's Jelly Babies	Applewood Smoked Cheddar	Brie with Cranberries
15	Vacherousse D'Argental	Plastic Bag	Cambozola Black Label
16	Double Cream Brie with Garlic & Herbs	San Francesco Prosciutto Crudo 100g	Comte Extra Mature (24 Months)
17	OG Kristal	Comte Janier (30 mths)	Pecorino Romano
18	Coppa di Parma 100g	Gouda with Truffles	Mimolette (22 months)
19	Rosette duc de Coise Sliced 100g	Comte Janier (18 Mths)	Janier Raw Cream Butter (Semi-Salted)
20	Gruyere de Savoie	Delice de Bourgogne with Pineapples	Comte Janier 30 Months

Exploratory Data Analysis – Retail Store and Online

- Generally, the median online transactions is 100$, this may be attributed to the minimum 100$ order for free delivery

- Members' peak count of transaction is around 25$ to 50$, with no clear median

- Walk-in customers' peak count of transaction is around 20$
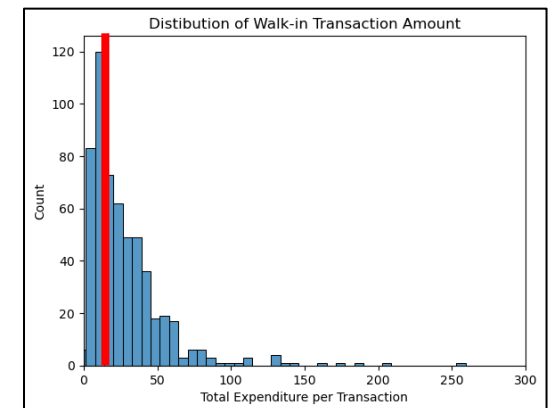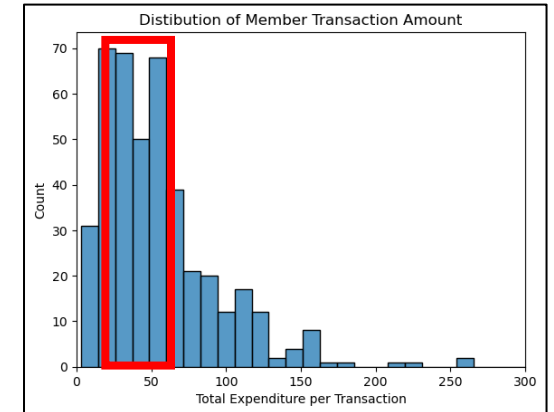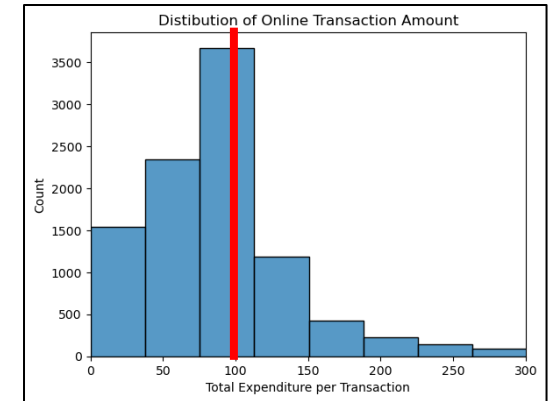
Modelling

- Collaborative Filter was chosen over Content-based Filter

- The combined retail and online transactions were fed into the collaborative filter algorithm

- As there is no explicit ratings for the product purchased, the implicit feedback – **quantities of products purchased** is the input which the collaborative filter will take in

Collaborative Filter

Content-based Filter

Combined Retail & Online Transaction

Recommendations

Evaluation

- The model achieved a mean AUC Score of 0.853

- However, a model is good in the eyes of the non-technical user, only if it makes sense

True Positive Rate

False Positive Rate
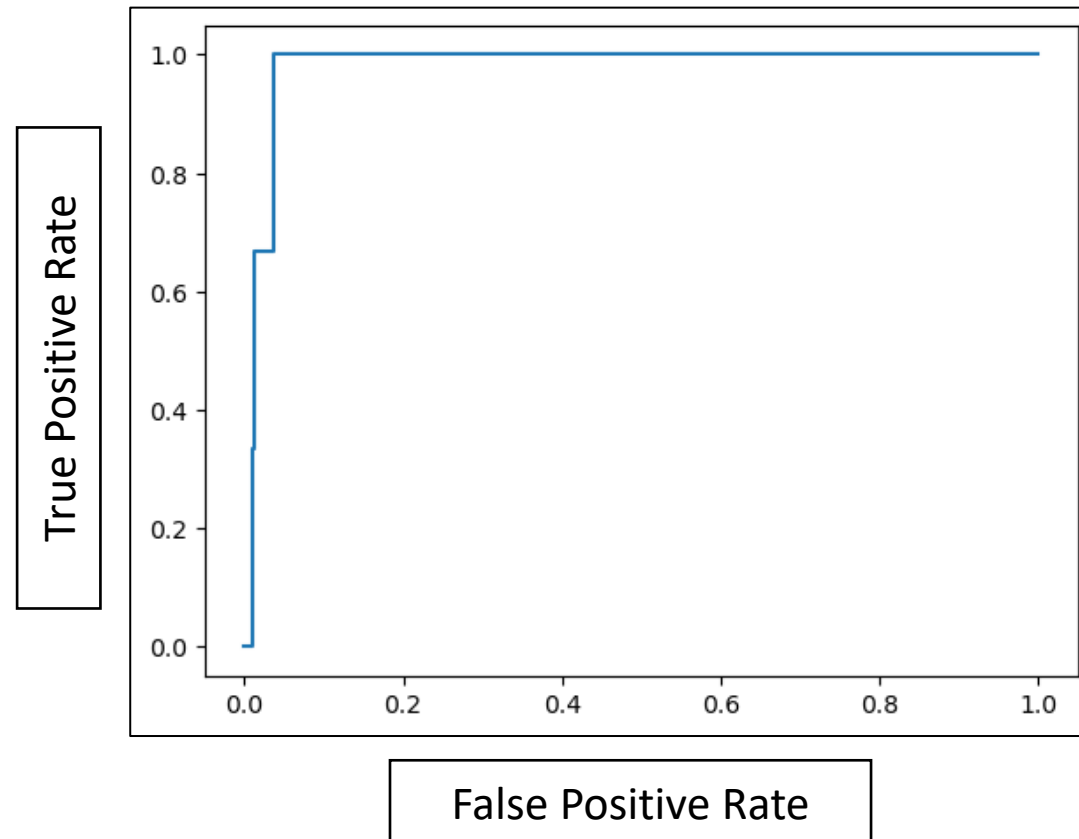
Evaluation

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- Transaction: 146471 is likely whipping up a family burger meal

Transaction: 146471	
Purchased Items	**Recommended Purchase**
Butcher Box Grain Fed Beef Mince 500g	Burrata d'Oro 200g
Alp Blossom	Cottage Delight Classic Italian Breadsticks
Chiriboga Blue	The Fine Cheese Co. Rosemary and Extra Virgin Crackers
Gorgonzola Piccante	Greenheart Mini Heirloom Tomatoes 250g
Coppa di Parma 100g	Mr Kneady Sourdough Medium

Evaluation

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- Transaction: TG25078 is likely having a party at home

Transaction: TG25078	
Purchased Items	**Recommended Purchase**
OSCAS Super Woofs 2023 Calendar	Cottage Delight Classic Italian Breadsticks
Rosette duc de Coise Sliced 100g	Greenheart Mini Heirloom Tomatoes 250g
Coppa di Parma 100g	Mr Kneady Sourdough Medium
Speck Campiglio 100g	Plastic Bag
Mr Filbert's Mixed Nuts Italian Black Truffle	Snowdonia Truffle Trove Extra Mature Cheddar
Mr Filbert's Mixed Nuts Simply Sea Salt	Granny Gothards Luxury Ice Cream Lavender Blossom
The Fine Cheese Co. Walnut, Honey and Extra Virgin Crackers	Jamón Serrano Ham 100g
Peter's Yard Original Sourdough Crispbread	Outback Pie Co. Prime Beef Pie
Burrata d'Oro 200g	San Pellegrino Pomegranate & Orange
Vacherousse D'Argental	Barney Jack's Liquorice Allsorts
Brie with Truffles	
Gouda with Caramel	

Recommendations, Conclusion, Further Work

- **Discounts/deals can be deployed to increase the revenue from Walk-in Customers**

- As members and walk-ins may require preplanning of their day activities prior to shopping at TCS, a "Deliver to your Home within 4 hours" service could be introduced to encourage these customers to purchase items (such as soft cheese) that they otherwise would not purchase

- Propose TCS to synergise their stock system (Vend POS and BigCommerce) into one single system to enable better and repeatable data analysis in the future

- The Recommender System can be deployed into Vend POS

- The Recommender System needs to be compared with BigCommerce's RecCommerce (Recommender System), prior to deployment onto Big Commerce

- Hypothesis testing on the performance of the recommender system in 3 months to confirm customer conversion