Project Overview

Task 1,2

1. **Overview of tasks for H**** Project**
   1) Overview of whole tasks for the project
   2) Brief review of remarks from previous tasks

Task 3

2. **Remarkable Insights from Final Task**
   1) Trend of typical H**** customer's behavior (with KPIs)
   2) Impact of advertisement
   3) Associated feature of items in customer's basket
      (Via association analysis with A priori algorithm)

Task 1-3

- **Summary**
- **Conclusion**

1. Overview of tasks for H**** Project

- Overview of whole tasks for the project

- Brief review of remarks from previous tasks

1) Overview of tasks for H**** project

Task 1.	Task 2.	Task 3.
(Related biz. Questions)	(Data analysis)	(Final answer)

Did Loyalty Costumers spend more money than regular customers?

How can we improve sales on loyalty costumers?

Did advertisement have a real impact in sales?

- Do we have "Star" Products or Group of products? Which are the products most sold?
- Which season of the year, is best for invest in marketing?

Which products frequently returned? And what features are related to the return?

- **Calculate KPIs**
- **Univariate analysis for KPIs as below..**

- Turnover by customer loyalty(Loyalty vs. Non-Loyalty.)
  - By Products
  - By quarter(3,6,9,12)
  - By receipt

- Turnover depends on advertisement
  - Advertised vs. non-advertised items
  - By Product

- Annual turnover
  - by products
  - By Receipt
- Quarterly turnover
  - by products(3,6,9,12)
  - By Receipt

- Counts of frequently returned items

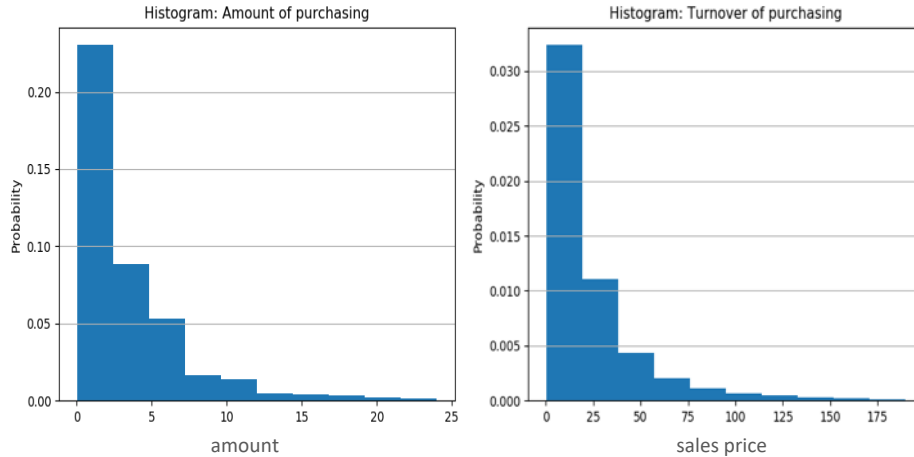- **Key Trend analysis (in detail)**

  - Identify Core KPIs

  - Identify key customer's behavior

  - Identify impact of advertisement

- **Build a simple model**

  - Association analysis
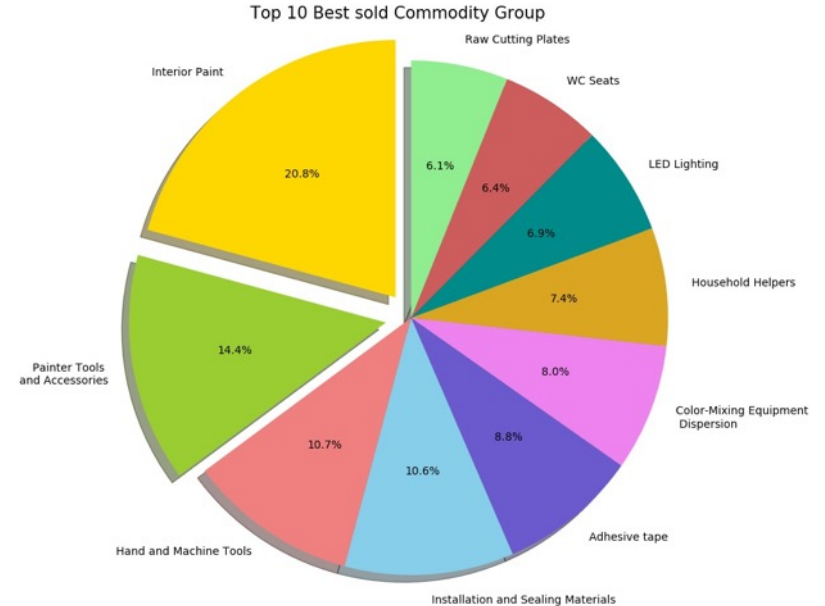   : by A priori Algorithm

2) Brief Review of previous task : Sales Trend of H**** in 2017

Top 10 products in sales

- *Customer spent in avg. **23.27 € / purchase***
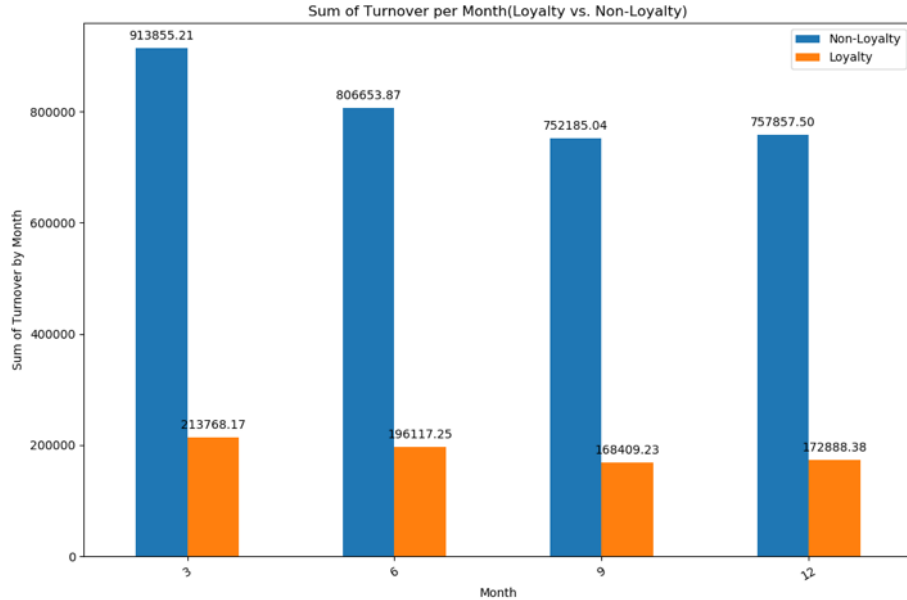- *Customer bought in avg. **3.5 qty items/ purchase***

- ***Painting, Tools, Sealing & Adhesives** related products were sold most.*

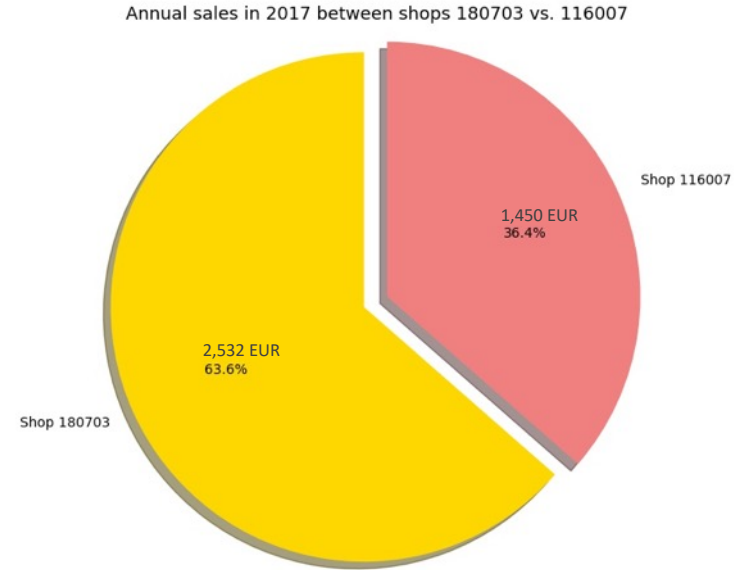# 2) Brief Review of previous task : Sales Trend of H**** in 2017

Purchasing power of Loyalty vs. Non-Loyalty customer

Annual turnover of 2 shops

Sum of Turnover per Month(Loyalty vs. Non-Loyalty)

913855.21

806653.87

752185.04

757857.50

213768.17

196117.25

168409.23

172888.38

Non-Loyalty
Loyalty

Sum of Turnover by Month

Month

Annual sales in 2017 between shops 180703 vs. 116007

Shop 116007

1,450 EUR
36.4%

2,532 EUR
63.6%

Shop 180703

- *Depends on Membership :* **Non-Loyalty** *> Loyalty (by* **5.6 times** *more)*
- *Total monthly sales :* **Mar.** *> Jun. > Sep. > Dec.*

- *Turnover of shop* **180703** *is* **higher** *than shop 116007 by* **1.7 times** *more*

2. Remarkable Insights from Final Task

- Trend of typical H**** customer's behavior

- Impact of advertisement

- Associated feature of items in customer's basket

Remarkable Insight 1. Contribution of Loyalty customer

Difference of sales contribution from Loyalty customer between shop 180703 vs. 116007

Sum of Turnover of Loyalty customer by Month(Shop 116007 vs. 180703)
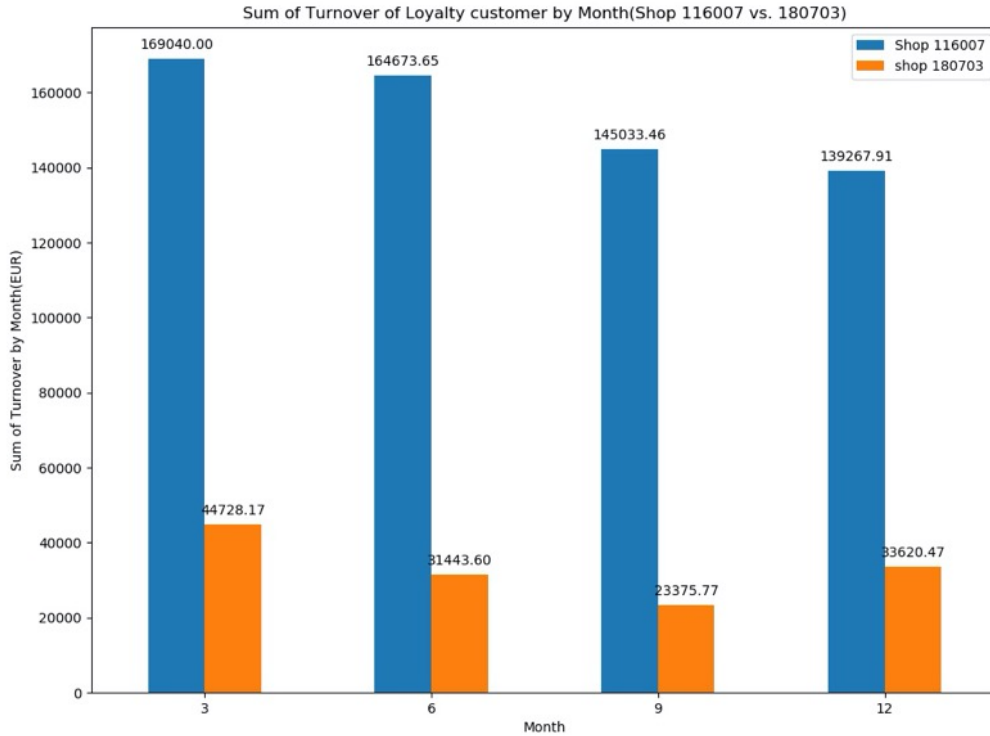
- *Total sale* : Shop **180703 >** 116007
- *Contribution of Loyalty* customer : Shop 180703 **<< 116007**

Thus, contribution to the sale of loyalty customer in shop 116007 is higher!

	Shop - 116007	Shop - 180703
Annual sum of total sales for Loyalty customer only (€)	618,015	133,168

4.6X Higher!

Remarkable Insight 2. Loyalty customer's preferred item

- Brief introduction to approach :

Search for Highest Sales Rate(%) of Loyalty customer / Product Group

Search for each of Product Group which shows Lowest Sales Rate(%) in Non-Loyalty

If some of Product Group shows Highest Sales Rate(%) of Loyalty as well as Lowest Sales Rate(%) in Non-Loyalty at the same time, this Product Group will be selected.

- e.g.

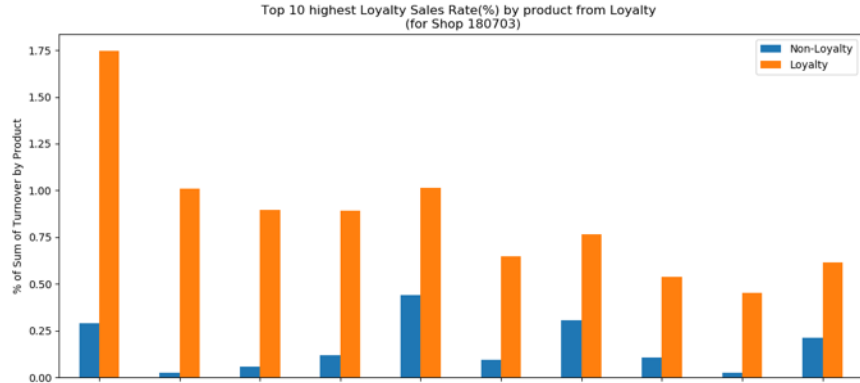| Product Group Name	Sales Rate(%) _Loyalty	Ssles Rate(%) _Non-Loyalty	Select
Vinyl-Boden	97%	2%	O
Pfosten und Palisaden	87%	82%	X
Erde gesackt	3%	5%	X

Remarkable Insight 2. Loyal customer's preferred item

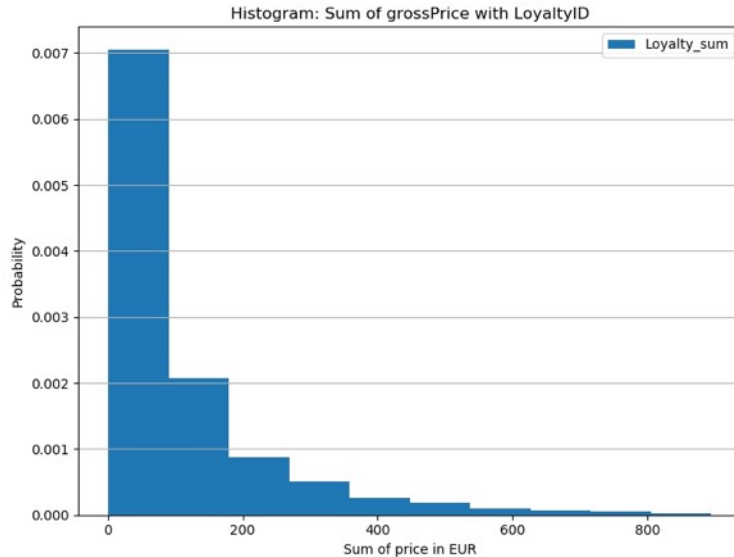The most preferred products by Loyalty customer compare to Non-Loyalty's choice

Top 10 highest Loyalty Sales Rate(%) by product (for Shop 116007)
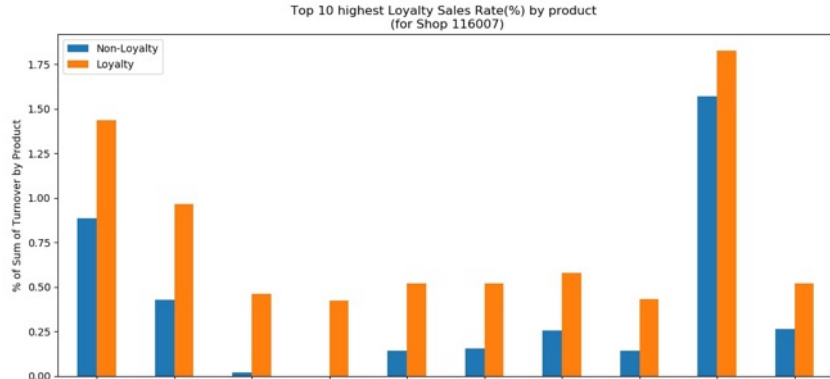
Product Group Name	Sales rate(%) Non-Loyalty	Sales rate(%) Loyalty
Wood square posts	0.88	1.44
Laminate	0.43	0.96
Metallic roofing	0.02	0.46
Garden rattan chairs/stools	0.00	0.42
Cottage until 21mm	0.14	0.52
Construction solid wood (KVH)	0.15	0.52
Other kind wood decking board	0.25	0.58
Wood recreation facilities	0.14	0.43
Fuel 7 / 13%	1.57	1.83
Standard switch series	0.26	0.52

Top 10 highest Loyalty Sales Rate(%) by product from Loyalty (for Shop 180703)

Product Group Name	Sales rate(%) Non-Loyalty	Sales rate(%) Loyalty
Laminate	0.29	1.75
Vinyl floor	0.03	1.01
electronical heater	0.06	0.90
Velor carpet	0.12	0.89
cutted coated plates	0.44	1.01
Fuel 19%	0.09	0.65
fittings accessories	0.31	0.76
city bike 26 and 28 inches	0.11	0.54
Hammocks and accessories	0.03	0.45
cutted countertop .	0.21	0.61

Remarkable Insight 3. Individual Loyalty customer's purchase

Histogram: Sum of grossPrice with LoyaltyID

Histogram: Average of grossPrice per transaction with LoyaltyID
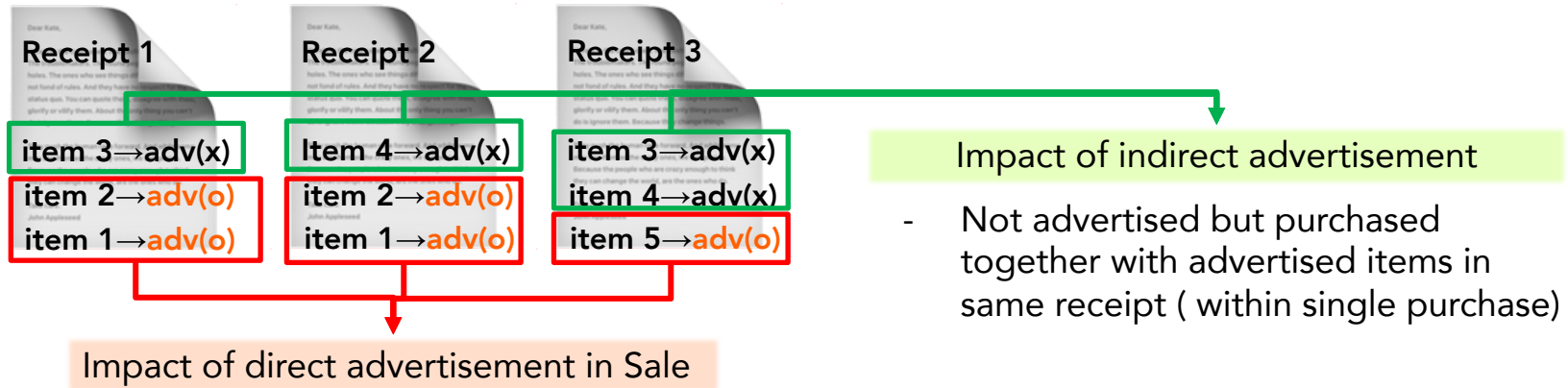
- **_Most of Individual Loyalty customer_**
  - ✓ _spent annually_ _123.98 € / person_
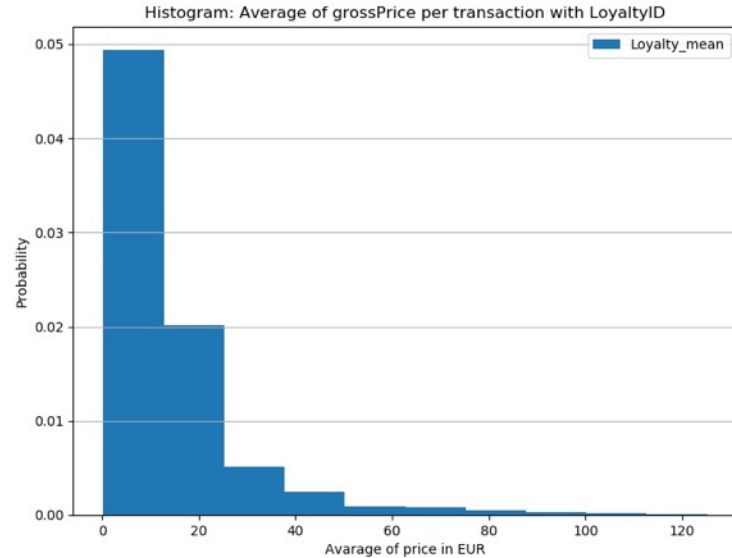
- **_Most of Individual Loyalty customer_**
  - ✓ _spent in average_ _16.58 € / person / each purchase_

Remarkable Insight 4. Impact of advertisement in sales

- Brief introduction to approach :
  - Fundamental assumption :
    - Sales driven from advertisement means,
      sales dates is within 14 days after advertisement issued

- e.g.

Receipt 1

item 3→adv(x)
item 2→adv(o)
item 1→adv(o)

Receipt 2

Item 4→adv(x)
item 2→adv(o)
item 1→adv(o)

Receipt 3

item 3→adv(x)
item 4→adv(x)
item 5→adv(o)

Impact of indirect advertisement

- Not advertised but purchased together with advertised items in same receipt (within single purchase)

Impact of direct advertisement in Sale

Remarkable Insight 4. Impact of advertisement in sales

Impact of advertisement on sales in shop 116007 for all vs. Loyalty customer

Sales Impact of Advertisement in March for all customer
(shop 116007)

Sales from Direct advertisement

29.6%

58.4%

The rest of Sales

12.0%

Indirect impact from Advertisement
:(Sales from non-adv. products
but, purchased in same receipt)
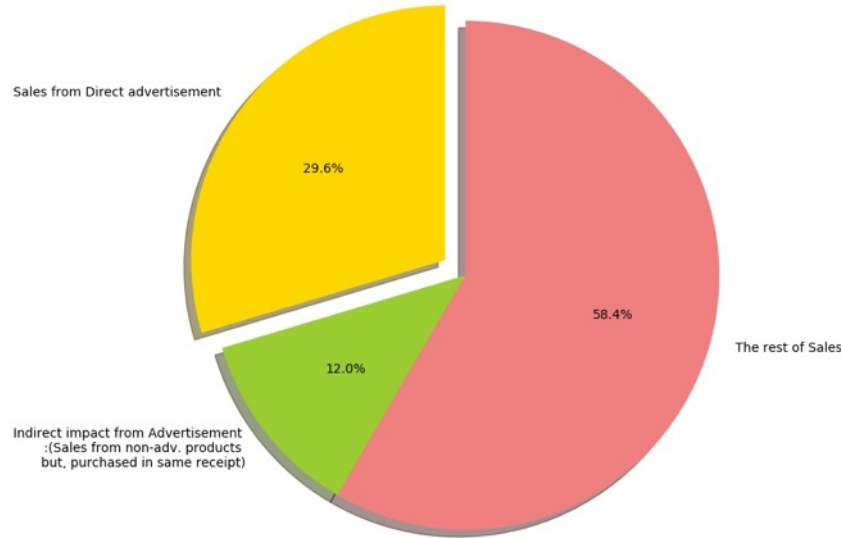
Sales Impact of Advertisement in March for Loyalty only
(shop 116007)

Indirect impact from Advertisement
of Loyalty customer

Sales from Direct Advertisement
of Loyalty customer

6.0%

8.8%

85.2%

The rest of Sales
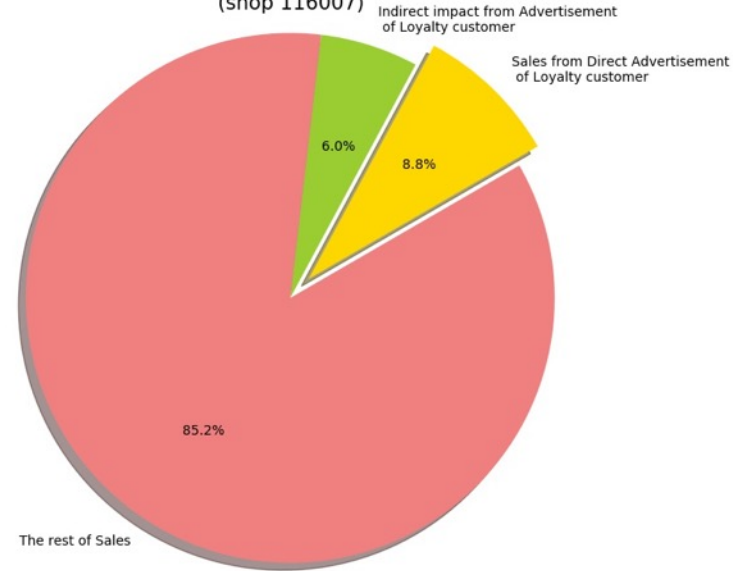
- **Impact of Advertisement for *all customers***
  - ✓ *Direct Impact: 29.6% (119,900 EUR)*
  - ✓ *Indirect Impact: 12.0% (48,500 EUR)*

- **Impact of advertisement for *Loyalty only***
  - ✓ *Direct Impact: 8.8% (54,435 EUR)*
  - ✓ *Indirect Impact: 6.0% (37,056 EUR)*

Remarkable Insight 5. Associated feature of items in Shopping basket

- Approach : Via association analysis with A priori algorithm(a.k.a, market basket analysis)
- Purpose : Produce the rule that define which pair of items happens frequently together at the same time. "What goes with what? "
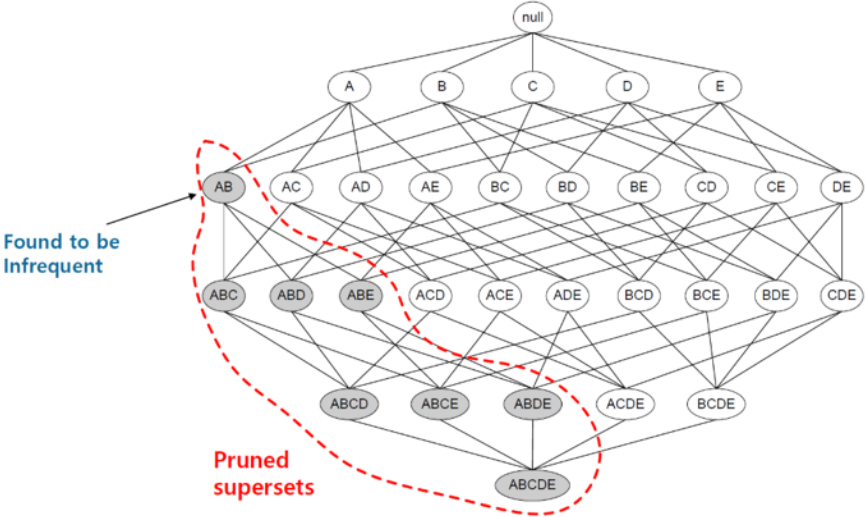- Indicator to evaluate usefulness(reliability) of rule :

$$support(A) = P(A)$$ *: How frequently "A" happen?*

$$For \quad the \quad rule \quad A \rightarrow B, \quad confidence(A \rightarrow B) = \frac{P(A,B)}{P(A)}$$ *: How strongly "A→B" related?*

$$lift(A \rightarrow B) = \frac{P(A,B)}{P(A) \cdot P(B)}$$ *: How the rule "A→B" valuable?*

Remarkable Insight 5. Associated feature of items in Shopping basket

- Brief introduction to A priori algorithm (a.k.a, market basket analysis)

	noodle	egg	coke	rice	tuna
noodle		40%	40%	20%	20%
egg			30%	0%	20%
coke				0%	10%
rice					0%
tuna					

- *Produce rules only with considering "frequent item sets"*
- *Consider as a candidate of rule ONLY when "support" shows higher value than the minimum support*
- *When one's support is not satisfy with minimum support, their all of superset doesn't have to consider.*

Remarkable Insight 5. Associated feature of items in Shopping basket

- Result : Frequently purchased pair of items in same receipt
- Min. requirements : support(>0.003), confidence(>0.5), lift(>10)

Rule #	antecedents	consequents	support	confidence	lift
30	Pfand DPG'	'Getr‰nke sonstige'	0.010764695	0.619503946	56.16964152
31	'Getr‰nke sonstige'	'Pfand DPG'	0.010764695	0.976021314	56.16964152
	Muttern SB'	Gewindeschrauben SB'	0.00520114	0.522123894	23.3692217
58	'Mineralwasser'	'Pfand DPG'	0.005504785	0.950930626	54.7256823
	Abdeckfolien, -Vlies,-Papier', 'Innenfarbe weifl'	Malerband'	0.004593851	0.552414605	17.41206061
67	'Innenfarbe weifl', 'Malerband'	'Abdeckfolien, -Vlies,-Papier'	0.004593851	0.595177665	17.47583358
	'Abdeckfolien, -Vlies,-Papier', 'Innenfarbe weifl'	Malerwerkzeug+Zubeh. Wand/Fassadenfarbe'	0.00543622	0.653710247	16.05466449
78	'Malerwerkzeug+Zubeh. Wand/Fassadenfarbe', 'Abdeckfolien, -Vlies,-Papier'	'Malerband'	0.007003418	0.570630487	17.98622362
79	'Malerwerkzeug+Zubeh. Wand/Fassadenfarbe', 'Malerband'	'Abdeckfolien, -Vlies,-Papier'	0.007003418	0.566561014	16.63558057
80	'Abdeckfolien, -Vlies,-Papier', 'Malerband'	'Malerwerkzeug+Zubeh. Wand/Fassadenfarbe'	0.007003418	0.556420233	13.66529009
	Innenfarbe weifl', 'Malerband'	'Malerwerkzeug+Zubeh. Wand/Fassadenfarbe'	0.005132575	0.664974619	16.33130955
90	'Malerwerkzeug+Zubeh. Wand/Fassadenfarbe', 'Abdeckfolien, -Vlies,-Papier', 'Innenfarbe weifl'	'Malerband'	0.003398862	0.625225225	19.70704505
91	'Malerwerkzeug+Zubeh. Wand/Fassadenfarbe', 'Innenfarbe weifl', 'Malerband'	'Abdeckfolien, -Vlies,-Papier'	0.003398862	0.66221374	19.44417239
92	'Abdeckfolien, -Vlies,-Papier', 'Innenfarbe weifl', 'Malerband'	'Malerwerkzeug+Zubeh. Wand/Fassadenfarbe'	0.003398862	0.739872068	18.17073829

3. Summary and Conclusion

3. Summary and Conclusion

Result of analysis	Possible application
Revenue of the 1st quarter, March is highest	Higher Investiment for promotion at the beginning of the year
Impact of Loyalty membership in sales is low ✓ Sales power of Non-Loyalty > Loyalty (5.6X) ✓ Sales contribution of Loyalty is not clear ✓ Advertisement's impact of Loyalty is lower than normal customer	✓ Increase the volume of Loyalty membership ✓ Increase the impact of Loyalty customer's purchase(via advertisement)

Identify frequently purchased pair of items	Useful for..
	  ✓ Display of goods
	  ✓ Advertisement
	    ✓ Selection of goods
	    ✓ Arrangement of goods in same space
	  ✓ Recommendation system